DRAFT FOR REVIEW

VOLUME 1

REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

SITE WIDE GROUNDWATER (OPERABLE UNIT 03)

WEST LAKE LANDFILL SITE

BRIDGETON, MISSOURI

June 5, 2019

Project #: 63N-001-001

SUBMITTED BY: Trihydro Corporation

1252 Commerce Drive, Laramie, WY 82070

DRAFT

Table of Contents

1.0 INTRODUCTION 1-1
1.1 Purpose and Scope 1-1
1.2 Required Contents of the Report 1-2
1.3 Report Organization 1-3

2.0 SITE BACKGROUND AND SETTING 2-1
2.1 Physical Setting 2-1
2.2 Site History 2-2
2.2.1 Landfill Permit History 2-3
2.2.2 West Lake Landfill Radiological Area 1 2-5
2.2.3 West Lake Landfill Radiological Area 2 2-6
2.2.4 Inactive and Closed Demolition Landfill Operations in OU-2 2-7
2.2.5 Bridgeton Landfill 2-8
2.2.6 Buffer Zone and Lot 2A2 2-10
2.2.7 Other Significant Features in the Vicinity of the Site 2-10
2.3 Land Use Restrictions 2-11
2.4 History of Investigative, Regulatory, and Response Actions 2-12
2.4.1 1986 Hydrogeologic Investigation 2-12
2.4.2 1989 Site Characterization and Remedial Action Concepts 2-13
2.4.3 1996 Groundwater Conditions Report West Lake Landfill Areas 1 & 2 2-14
2.4.4 1996 Physical Characterization Technical Memorandum 2-14
2.4.5 1997 Site Characterization Summary Report OU-1 2-16
2.4.6 1997 West Lake Landfill OU-2 RI/FS Site Characterization Summary Report 2-16
2.4.7 2000 OU-1 Remedial Investigation 2-17
2.4.8 2005 Revised OU-2 Remedial Investigation 2-17
2.4.9 2006 OU-2 Feasibility Study 2-18
2.4.10 2006 OU-1 Feasibility Study 2-18
2.4.11 2008 OU-1 Record of Decision 2-19
2.4.12 2008 OU-2 Record of Decision 2-19
2.4.13 2011 Supplemental Feasibility Study 2-19
2.4.14 2012 to 2014 Groundwater Monitoring Reports 2-20
2.4.15 2015 USGS Background Study 2-21
2.4.16 2016 Groundwater Technical Report 2-23

DRAFT

Table of Contents (cont.)

2.4.17 2018 OU-1 RI Addendum 2-23
2.4.18 2018 Updated Baseline Risk Assessment 2-24
2.4.19 2018 OU-1 Final Feasibility Study 2-24
2.4.20 2018 OU-1 Record of Decision Amendment 2-25
2.5 Historic Dataset 2-26

3.0 INITIAL EVALUATION AND CONCEPTUAL SITE MODEL 3-1
3.1 Preliminary Conceptual Site Model 3-1
3.1.1 Regional Setting 3-2
3.1.2 Regional Geology and Hydrogeology 3-2
3.1.2.1 Regional Geology 3-2
3.1.2.2 Regional Hydrogeology 3-3
3.1.2.3 Regional Groundwater Quality 3-4
3.1.2.4 Regional Surface Water Resources and Quality 3-5
3.1.3 Local Geology 3-5
3.1.3.1 Bedrock 3-6
3.1.3.1.1 Keokuk Formation 3-6
3.1.3.1.2 Warsaw Formation 3-7
3.1.3.1.3 Salem Formation 3-8
3.1.3.1.4 St. Louis Limestone 3-8
3.1.3.1.5 Structural Features 3-9
3.1.3.2 Unconsolidated Sediments and Materials 3-10
3.1.3.2.1 Alluvium 3-10
3.1.3.2.2 Loess 3-11
3.1.3.2.3 Soils 3-11
3.1.3.2.4 Solid Waste and Landfill Liner 3-12
3.1.4 Local Hydrology and Climate 3-12
3.1.5 Local Hydrogeology 3-13
3.1.5.1 Groundwater Occurrence 3-15
3.1.5.2 Aquifer Testing 3-16
3.1.5.2.1 Slug Testing 3-16
3.1.5.2.2 Borehole Packer Testing 3-17
3.1.5.2.3 Laboratory Testing 3-18
3.1.5.2.4 Aquifer Properties of Solid Waste 3-18

DRAFT

Table of Contents (cont.)

3.1.5.2.5 Transmissivity 3-18
3.1.5.3 Groundwater Elevations and Gradients 3-18
3.1.5.3.1 Groundwater Elevations 3-19
3.1.5.3.2 Hydraulic Gradients 3-19
3.1.5.4 Groundwater Velocity and Discharge 3-21
3.1.5.5 Surface Water/Groundwater Interaction 3-22
3.1.5.6 Groundwater Geochemistry 3-22
3.1.5.7 Effects of the Bridgeton Landfill 3-22
3.1.5.7.1 Quarry Dewatering 3-23
3.1.5.7.2 Leachate Collection System 3-23
3.1.5.7.3 Subsurface Reaction 3-24
3.1.6 Nature and Extent of Impacts 3-24
3.1.6.1 Nature and Extent of RIM 3-25
3.1.6.2 Nature and Extent of Groundwater Impacts 3-26
3.1.7 Potential Pathways of Contaminant Migration/Preliminary Public Health and Environmental Impacts 3-27
3.1.7.1 Potential Receptors 3-27
3.1.7.2 Exposure Routes and Public Health and Environmental Impacts 3-27
3.2 Preliminary OU-3 Boundary 3-28
3.3 Preliminary Identification of Response Objectives and Groundwater Remedial Action Alternatives 3-28
3.3.1 No Action 3-28
3.3.2 Institutional Controls 3-28
3.3.3 Monitored Natural Attenuation 3-28
3.3.4 Groundwater Extraction (Hydraulic Control)/Treatment/Disposal 3-29
3.3.5 Groundwater Containment 3-29
3.3.6 In-situ Treatment 3-29
3.4 Data Needs for Evaluation of Remedial Alternatives 3-29
3.5 Applicable or Relevant and Appropriate Requirements 3-30

4.0 RI/FS WORK PLAN RATIONALE 4-1
4.1 Data Quality Objectives 4-1
4.1.1 Data Quality Objectives 4-2
4.1.1.1 Statement of the Problem 4-2

DRAFT

Table of Contents (cont.)

4.1.1.2 Identify the Goals of the Investigation 4-3
4.1.1.3 Identify Inputs to the Decisions 4-3
4.1.1.4 Define the Boundaries of the Study 4-4
4.1.2 Develop the Analytic Approach (Decision Rules) 4-4
4.1.2.1 Specify Performance Criteria 4-5
4.1.2.2 Develop the Plan for Data Collection 4-6

5.0 PHASE I SITE CHARACTERIZATION 5-1
5.1 Sampling and Analysis Plan 5-2
5.1.1 Field Sampling Plan 5-2
5.1.2 Quality Assurance Project Plan 5-3
5.2 Compile Existing Data 5-3
5.3 Evaluate Existing Monitoring Well Network 5-4
5.3.1 Preliminary Monitoring Well Inventory 5-4
5.3.2 Proposed Monitoring Well Designations 5-4
5.3.3 Proposed On-site / Near-Site Monitoring Well Locations and Rationale 5-6
5.3.4 Proposed Off-site Monitoring Well Locations and Rationale 5-7
5.3.5 Proposed Background Monitoring Well Locations and Rationale 5-8
5.3.6 Proposed Monitoring Well Network and Staff Gauge Locations 5-10
5.4 Field Investigation 5-10
5.4.1 Preparatory Activities 5-10
5.4.2 Site Reconnaissance 5-11
5.4.3 Ecological Survey 5-11
5.4.4 Well Inventory and Well Repair 5-12
5.4.5 Borehole Advancement 5-12
5.4.6 Continuous Coring and Field Logging 5-12
5.4.7 Alluvium and Bedrock Aquifer Matrix Sampling 5-13
5.4.8 Borehole Geophysical Logging 5-15
5.4.9 Packer Testing 5-15
5.4.10 Monitoring Well Installation 5-15
5.4.11 Monitoring Well Development 5-16
5.4.12 Aquifer Testing 5-17
5.4.13 Groundwater Monitoring 5-17
5.4.13.1 Water-level Measurements 5-17

DRAFT

Table of Contents (cont.)

5.4.13.2 Purging 5-18
5.4.13.3 Monitoring Well Sampling 5-18
5.4.14 Staff Gauge Installation 5-19
5.4.15 Pressure Transducers 5-19
5.4.16 Current Leachate Collection System 5-20
5.4.17 Surveying and Mapping of the Investigation Areas 5-20
5.4.18 Investigation Derived Waste 5-20
5.5 Fate and Transport 5-21
5.6 Vapor Intrusion Investigation 5-22
5.7 Engineering and Institutional Controls 5-23
5.8 Health and Safety Plan 5-23

6.0 DATA MANAGEMENT AND EVALUATION 6-1
6.1 Data Management 6-1
6.1.1 Data Validation 6-1
6.1.2 Project Database 6-1
6.1.3 Spatial Data 6-2
6.1.4 Field Record Keeping 6-2
6.1.4.1 Field Logbooks 6-2
6.1.4.2 Field Datasheets 6-2
6.2 Data Evaluation 6-3
6.2.1 Geologic Database and Groundwater Modeling 6-3
6.2.2 Data Evaluation Methods Identified During Scoping 6-3
6.2.3 Preliminary Determination of Tasks to be Conducted After Site Characterization 6-4

7.0 BASELINE RISK ASSESSMENT AND RI REPORT 7-1
7.1 Baseline Risk Assessment 7-1
7.1.1 Data Collection and Evaluation 7-1
7.1.2 Exposure Assessment 7-1
7.1.3 Toxicity Assessment 7-1
7.1.4 Risk Characterization 7-2
7.1.5 Human Health Risk Assessment 7-2
7.1.6 Ecological Risk Assessment 7-2
7.2 RI Report 7-3

DRAFT

Table of Contents (cont.)

7.2.1 Introduction and Site Background 7-3
7.2.2 Study Area Investigation 7-3
7.2.3 Physical Characteristics of the Study Area 7-3
7.2.4 Nature and Extent of Contamination 7-3
7.2.5 Contaminant Fate and Transport 7-4
7.2.6 Baseline Risk Assessment 7-4
7.2.7 Summary and Conclusions 7-4

8.0 FEASIBILITY STUDY 8-1
8.1 Introduction and Background Information 8-1
8.2 Identification and Screening of Technologies 8-1
8.3 Development and Screening of Alternatives 8-1
8.4 Detailed Analysis of Alternatives 8-1

9.0 RI/FS REPORTING 9-1
9.1 Well Inventory Summary Report 9-1
9.2 Annual Hydrogeologic Investigation and Groundwater Characterization Report 9-1
9.3 Groundwater Modeling Work Plan 9-2
9.4 Groundwater Modeling Report 9-2
9.5 Vapor Intrusion Investigation Report 9-3
9.6 Baseline Risk Assessment Work Plan 9-3
9.7 RI Report 9-3
9.8 Feasibility Study Report 9-3

10.0 PROJECT MANAGEMENT PLAN 10-1
10.1 Project Personnel 10-1
10.2 Coordination with EPA 10-2
10.3 Project Schedule 10-2

11.0 REFERENCES 11-1

DRAFT

List of Tables

2-1. Site History Summary

2-2. Data Summary

3-1a. Generalized Stratigraphic Column

3-1b. Site-Specific Stratigraphic Column

3-2. Monitoring Well Survey and Construction Data

3-3. Slug Testing Results

3-4. Packer Testing Results

3-5. Laboratory Permeability Testing Results

3-6 Preliminary Chemical Specific ARARs

3-7 Preliminary Action Specific ARARs

3-8 Preliminary Location Specific ARARs

5-1. Preliminary Monitoring Well Inventory

5-2. Proposed Monitoring Well Rationale

5-3. Groundwater Velocities and Advective Transport Distances

5-4. Proposed Monitoring Well Network

5-5. Well Nest Locations to Consider for Datalogger Placement

DRAFT

List of Figures

1-1. Site Location Map

1-2. Site Layout

2-1. Areas of Landfill Operations

2-2. Landfill Property Ownership

2-3. Landfill and Surrounding Area Zoning

2-4. MDNR Permitted Areas

2-5. Land Use Restrictions

3-1. Regional Potentiometric Surface Maps

3-2. Cross Section Locations

3-3. Cross Section A

3-4. Cross Section B

3-5. Edge of the Alluvial Valley

3-6. Surface Water and Precipitation Gauges

3-7. Missouri River at St. Charles USGS Gauge and Daily Precipitation at Lambert St. Louis

3-8. Monitoring Well Status and Hydrogeologic Zone

3-9. Existing Slug Test Results Summary

3-10. Existing Packer Test Results Summary

3-11. Missouri River Alluvium Groundwater Elevation Contour Map, October 26, 1984

3-12. Missouri River Alluvium Groundwater Elevation Contour Map, April 25, 1985

3-13a. Missouri River Alluvium Groundwater Elevation Contour Map, April 2, 2013

3-13b. Upper Salem/St. Louis Formation Groundwater Elevation Contour Map, April 2, 2013

3-13c. Salem Formation Groundwater Elevation Contour Map, April 2, 2013

3-13d. Keokuk Formation Groundwater Elevation Contour Map, April 2, 2013

DRAFT

List of Figures (cont.)

3-14a. Missouri River Alluvium Groundwater Elevation Contour Map, September 30, 2013

3-14b. Upper Salem/St. Louis Formation Groundwater Elevation Contour Map, September 30, 2013

3-14c. Salem Formation Groundwater Elevation Contour Map, September 30, 2013

3-14d. Keokuk Formation Groundwater Elevation Contour Map, September 30, 2013

3-15. Preliminary OU-3 Boundary

5-1. Current Monitoring Well Network

5-2. Proposed On-Site and Near-Site Monitoring Wells

5-3. Proposed Off-Site Monitoring Wells

5-4. Proposed Background Monitoring Wells

5-5. Proposed Monitoring Well Network

5-6. Example Monitoring Well Construction Diagram

5-7. Groundwater Modeling Process Flow Diagram

10-1. Project Organization Chart

DRAFT

List of Appendices

A. AERIAL PHOTOGRAPHY

B. HISTORIC MONITORING WELL NETWORKS

C. REGIONAL GEOLOGIC CROSS SECTIONS

D. BOREHOLE LOGS AND WELL CONSTRUCTION DIAGRAMS

E. HISTORIC LOCAL CROSS-SECTIONS

F. BEDROCK SURFACE ELEVATIONS

G. SOUTH QUARRY PIT MAPS

H. ISOPACH MAPS

I. REGIONAL UPLAND SOIL PROFILE

J. PRECIPITATION DATA

K. SURFACE WATER FLOW

L. AQUIFER TESTING SUMMARY

- L-1. SLUG TESTING SUMMARY
- L-2. PACKER TESTING SUMMARY
- L-3. LABORATORY TESTING SUMMARY

M. DEPTH TO WATER MEASUREMENTS/GROUNDWATER ELEVATION DATA

N. POTENTIOMETRIC SURFACE FIGURES

O. HYDROGRAPHS

P. LOCATIONS OF PERCHED WATER

Q. VERTICAL GRADIENTS

R. GEOCHEMICAL DIAGRAMS

S. LEACHATE COLLECTION SYSTEM DATA

T. SOIL RADIONUCLIDE IMPACTS

DRAFT

List of Appendices (cont.)

U. COC ISOCONCENTRATION FIGURES

V. NEARBY RECEPTORS

W. PRELIMINARY MONITORING WELL INVENTORY PHOTO-DOCUMENTATION

X. STATISTICAL EVALUATION

DRAFT

List of Acronyms

3-D	Three dimensional
ACL	Alternative Concentrations Levels
AOA	Air Operations Area
AOC	Administrative Order of Consent
ARAR	Applicable or Relevant and Appropriate Requirement
ASAOC	Administrative Settlement Agreement and Order on Consent
AVS	Acid Volatile Sulfides
B&M	Burns & McDonnell
BMP	Best Management Practices
bgs	below ground surface
BL	Barometric Barologger
bmp	below measuring surface
BRA	Baseline Risk Assessment
BRAWP	Baseline Risk Assessment Work Plan
CaCO3	Calcium Carbonate
C&D	Construction & Demolition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Regulations
CME	Central Mine Equipment
cm/s	centimeters per second
cfs	cubic feet per second
COC	Constituents of Concern
COPC	Chemical of Potential Concern

DRAFT

List of Acronyms (cont.)

CSM	Conceptual Site Model
CSR	Code of State Regulations
CWA	Clean Water Act
DA	Desktop Assessment
DL	Data Logger
DQO	Data Quality Objective
DO	Dissolved Oxygen
DOE	Department of Energy
DQO	Data Quality Objectives
EDD	Electronic Data Deliverable
EMSI	Engineering Management Support, Inc
EME	EPA Metadata Editor
EPA	United States Environmental Protection Agency
ERE	Ecological Risk Assessment
FAA	Federal Aviation Administration
F&VD	Foth & Van Dyke
FGDC	Federal Geographic Data Committee
FS	Feasibility Study
FSP	Field Sampling Plan
ft	feet
ft/day	feet per day
ft^2/day	square feet per day
ft/year	feet per year

DRAFT

List of Acronyms (cont.)

gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
GWPS	Groundwater Protection Standards
H&A	Herst & Associates
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
IDW	Investigation Derived Waste
ITRC	Interstate Technology Regulatory Council
JTU	Jackson Turbidity Units
kPa	kilopascal
LBSR	Leached Barium Sulfate Residue
LCS	Leachate Collection Sump
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDNR	Missouri Department of Natural Resources
MED	Manhattan Engineering District
mg/L	milligram per liter
mgd	million gallons per day
MNA	Monitored Natural Attenuation
MOCS	Missouri One Call System
msl	mean sea level
MSWLF	Municipal solid waste landfill

DRAFT

List of Acronyms (cont.)

NAD83	North American Datum 1983
NAVD88	North American Vertical Datum 1988
NCC	Non-combustible Cover
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	United States Nuclear Regulatory Commission
NTU	Nephelometric Turbidity Units
OM&M	Operation, Maintenance, and Monitoring
ONMSS	Office of Nuclear Material Safety and Safeguards
ORAU	Oak Ridge Associated Universities
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
redox	oxidation-reduction
RL	Reporting Limit
ROW	Right of Way
RSL	Regional Screening Limit
RSMo	Missouri Revised Statutes
PCB	Polychlorinated Biphenyl
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PID	Photoionization detector
PPE	Personal Protective Equipment

DRAFT

List of Acronyms (cont.)

PMP	Project Management Plan
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RIA	Remedial Investigation Addendum
RIM	Radiologically Impacted Materials
RMC	Radiation Management Corporation
ROD	Record of Decision
RQD	Rock quality designation
RSL	Regional Screening Levels
RSMo	Revised Statutes of Missouri
RSP	Radiation Safety Plan
SAP	Sampling and Analysis Plan
Sch	Schedule
SDWA	Federal Safe Drinking Water Act
SEM	Simultaneously Extracted Metals
SLAPS	St. Louis Airport Site
SMART	Specific, Measurable, Attainable, Relevant, and Timely
SOP	Standard Operating Procedure

DRAFT

List of Acronyms (cont.)

SOW	Statement of Work
SP	Spontaneous Potential
SSR	Subsurface Exothermic Reaction
SU	Standard Units
SVOC	Semi-Volatile Organic Compound
TBC	To be considered
TDS	Total Dissolved Solids
T&E	Threatened and Endangered
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
UAO	Unilateral Administrative Order
µg/L	microgram per liter
UPL	Upper Prediction Limit
USC	United States Code
USACE	United States Army Corp of Engineers
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WMC	Water Management Consultants

DRAFT

1.0 INTRODUCTION

This Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Work Plan) has been prepared by Trihydro Corporation (Trihydro) on behalf of Bridgeton Landfill, LLC, Cotter Corporation (N.S.L.), and the United States Department of Energy (DOE) (collectively Respondents), for Site-wide groundwater (Operable Unit 3 or OU-3), at the West Lake Landfill Site (Site). The Site is located at 13570 St. Charles Rock Road, Bridgeton, Missouri (Figure 1-1). The Work Plan was prepared at the request of the United States Environmental Protection Agency (EPA) in accordance with requirements outlined in the Final RI/FS OU-3 Statement of Work (SOW) dated September 21, 2018, included as Appendix B in the Administrative Settlement Agreement and Order on Consent (ASAOC) dated February 6, 2019.

The Site was added to the Superfund National Priorities List (NPL) in 1990 and consists of three Operable Units (OUs) including former industrial and municipal waste cells and groundwater. The Site layout is shown on Figure 1-2. Operable Unit 1 (OU-1) includes former waste disposal areas Radiological Area 1 (Area 1) and Radiological Area 2 (Area 2) where radiologically impacted materials (RIM) have been identified (EPA ID#MOD079900932). Operable Unit 2 (OU-2) has no known areas identified as having been impacted with RIM and includes the closed construction and demolition (C&D) cell, inactive sanitary landfill, and the North and South Quarry portions of the Bridgeton Landfill. The Bridgeton Landfill and C&D portions of OU-2 are currently managed by the Missouri Department of Natural Resources (MDNR) in contrast to the remedial actions for the Inactive Sanitary Landfill which are being addressed under EPA Superfund authority. OU-3 includes groundwater beneath the entire approximately 200-acre Site and is the focus of this RI/FS.

DRAFT

1.1 PURPOSE AND SCOPE

The purpose of this Work Plan is to outline the proposed methodology to sufficiently characterize the nature and extent of hazardous substance impacts to groundwater resulting from Site activities and the potential risk posed to human health and the environment. This Work Plan has been prepared in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Regulations (CFR) Part 300 (EPA, 2011b), as well as the EPA guidance including but not limited to: "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)," Office of Solid Waste and Emergency Response (OSWER) Directive No. 9355.3-01 (Oct. 1988); "Guidance for Data Usability in Risk Assessment," OSWER Directive No. 9285.7-09A (Apr. 1992); "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," OSWER Directive No. 9200.4-18 (Aug. 1997a); "Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA," OSWER Directive No. 9200.4-23 (Aug. 1997b); "Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criteria in 10 CFR Part 40 Appendix A, I,

Criterion 6(6)," OSWER Directive No. 9200.4-35P (Apr. 2000); "Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites," OSWER Directive No. 9283.1-14 (Nov. 2001); "Monitored Natural Attenuation of Inorganic Contaminants in Ground Water, Volume 3, Assessment for Radionuclides Including Tritium, Radon, Strontium, Technetium, Uranium, Iodine, Radium, Thorium, Cesium, and Plutonium-Americium," EPA/600/R-10/093 (Sept. 2010); "Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well," (Aug. 2014a); and "Groundwater Statistics Tool," (Aug. 2014b), OSWER 9283.1-46.

Groundwater investigations have previously been conducted at the Site for OU-1 and OU-2 under EPA and MDNR oversight. Routine groundwater monitoring for the North and South Quarries of the Bridgeton Landfill is ongoing and is under MDNR oversight. The United States Geological Survey (USGS) and EPA evaluated the origin of radium in groundwater based on groundwater monitoring completed between 2012 and 2014 (USGS 2015). This study concluded the existing data set was not adequate to sufficiently characterize the nature and extent of constituents of concern (COCs) potentially present in groundwater.

The objectives of this RI/FS, as outlined in the SOW are:

- to refine the current understanding of the Site hydrogeologic system;
- to evaluate background groundwater quality near the Site;
- to determine the extent of groundwater impacts occurring at and near the Site;
- to provide predictive tools to evaluate potential future impacts; and
- to identify potential groundwater remedies that may be implemented based on the information collected at the Site, as applicable.

To meet these objectives, the OU-3 RI/FS is designed to determine the horizontal and vertical distribution of landfill contaminants/leachate effects and COCs in the subsurface at and/or near the Site.

1.2 REQUIRED CONTENTS OF THE REPORT

As outlined in the SOW, this Work Plan provides a project description, a summary of Site historical information, and a Site setting overview, and outlines the general technical approach to achieve the RI/FS objectives. The approach uses and builds upon the findings of previous groundwater data, studies, sampling plans, quality plans, and associated reports to establish and support a robust RI process for characterization of groundwater for both radiological and non-radiological parameters at the Site. This groundwater-specific OU-3 Work Plan contains a Sampling and Analysis Plan

DRAFT

(SAP) composed of a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP), included as Volume 2. A Health and Safety Plan (HASP), which includes a Radiation Safety Plan (RSP), has also been developed to support the overall planning process and is included as Volume 3. This Work Plan includes a history of investigative, regulatory, and response actions (Section 2); a preliminary local/regional well summary (Sections 2 and 3); a discussion of the nature and extent of impacts (Section 3); and a preliminary OU-3 boundary defined by the area of investigation (Section 5).

The following items were prepared, or will be prepared, as part of this effort:

- Propose a scope of investigative and analytical activities required to meet the project objectives;
- Perform sampling, analysis, and review of data sets to adequately scope the project and develop project plans;
- Develop preliminary remedial action objectives (RAOs);
- Develop understanding and presentation of current and future risk posed by contaminants to human health;
- Develop potential methods and approach for scoping the groundwater modeling effort; and
- Identify potential Applicable or Relevant and Appropriate Requirements (ARARs) associated with the location and contaminants of the Site and the potential for response actions.

1.3 REPORT ORGANIZATION

This Work Plan is being submitted in general accordance with OSWER Directive No. 9355.3-01 and contains the following sections:

- Section 2 – Site Background and Setting
- Section 3 – Initial Evaluation and Conceptual Site Model
- Section 4 – RI/FS Work Plan Rationale
- Section 5 – Phase I Site Characterization
- Section 6 – Data Management and Evaluation
- Section 7 – Baseline Risk Assessment and RI Report
- Section 8 – Feasibility Study
- Section 9 – RI/FS Reporting
- Section 10 – Project Management Plan
- Section 11 – References

DRAFT

2.0 SITE BACKGROUND AND SETTING

This section presents a brief description of the Site, including the location, an overview of past and current operations, and a discussion of activities occurring adjacent to the Site. Detailed descriptions of the Site were included in documents submitted to EPA under the OU-1 and OU-2 RI/FS process. Numerous investigations were previously conducted by Radiation Management Corporation (RMC), Burns & McDonnell (B&M), the U.S. Nuclear Regulatory Commission (NRC), Golder Associates (Golder), McLaren/Hart Environmental Engineering Corporation (McLaren/Hart), Water Management Consultants, Inc. (WMC), Engineering Management Support, Inc (EMSI), Herst & Associates, Inc. (H&A), and Feezor Engineering, Inc. (Feezor). Relevant data from each effort pertinent to OU-3 is summarized herein.

2.1 PHYSICAL SETTING

The Site is approximately 200 acres and is located on the east side of the Missouri River within the western portion of the St. Louis metropolitan area in northwestern St. Louis County (Figure 1-1 and Figure 1-2). The Site address is 13570 St. Charles Rock Road, approximately one mile north of the intersection of Interstate 70 and Interstate 270, within the City of Bridgeton, Missouri. It includes six identified historic waste disposal areas, or units, including Area 1, Area 2, a closed C&D landfill, an inactive sanitary landfill, and the North Quarry and South Quarry Portions of the permitted Bridgeton Landfill. A solid waste transfer station and an asphalt batch plant currently operate on the Site (Figure 2-1). A six-foot-high chain-link fence with a three-strand barbed wire canopy encloses most of the property. The main access gate is located on the northeastern boundary and a secondary access gate is located on the southwestern boundary of the landfill property.

Current ownership of the properties included in the definition of the Site is depicted on Figure 2-2. The landfill property is bordered by Crossroads Industrial Park to the northwest and St. Charles Rock Road (State Highway 180) to the north and east; Taussig Road, commercial facilities (including the Republic Services, Inc. hauling company facility), and agricultural land are located to the southeast; and Old St. Charles Rock Road and the Earth City Industrial Park (Earth City) stormwater/ flood control pond to the south and west and north. The Earth City commercial/industrial complex continues to the west and north of the flood control pond and extends to the Missouri River. Earth City is separated from the river by an engineered levee system owned and maintained by the Earth City Flood Control District. Terrisan Reste mobile home park is the nearest residential area to the Site, which is located to the southeast, approximately 0.7 miles from Area 1 and 1.1 miles from Area 2. The Spanish Village residential subdivision is located to the south of the Site near the intersection of St. Charles Rock Road and I-270, approximately 1 mile from Area 1 and 1.25 miles from Area 2 (EMSI 2018a).

DRAFT

The property on the west side of Area 2 was previously referred to as the Ford Property in the OU-1 RI (EMSI 2000) because it was previously owned by Ford Motor Credit, Inc (Ford). Most of the Ford Property was sold to Crossroad Properties, LLC in 1998 and has since been developed into the Crossroads Industrial Park. Ford initially retained ownership of a 1.78-acre parcel located immediately adjacent to the west of Area 2 (Figure 2-1). Ownership of this 1.78-acre parcel was subsequently transferred to Rock Road Industries, Inc., now Bridgeton Landfill, LLC, to provide a buffer between the landfill and adjacent property, and therefore this parcel has been identified as the "Buffer Zone." Crossroad Properties, LLC initially developed all the former Ford property with the exception of Lot 2A2, a 3.58-acre parcel located immediately north of the Buffer Zone. Lot 2A2 was subsequently developed by AAA Trailer, the owner of much of the property immediately to the north of the Buffer Zone and Area 2, although Lot 2A2 is still owned by Crossroad Properties, LLC. Property to the north and northeast of the landfill, across St. Charles Rock Road, is moderately developed with commercial, retail and manufacturing operations (EMSI 2018a). Zoning for the parcels that make up the landfill property and surrounding parcels is depicted on Figure 2-3.

The West Lake Landfill Superfund NPL Site consists of the various parcels that comprise the landfill property (on-property) and adjacent properties (off-property) where radionuclides were historically identified in the soil. OU-1 includes on-property Areas 1 and 2, and the adjacent off-property Buffer Zone and Parcels B and C of Lot 2A2 of the Crossroads Industrial Park (Figure 2-1). These off-property areas were not used for waste disposal but have been identified as containing radionuclides in soil as a result of transport by surficial processes from OU-1. OU-2 consists of the remaining portions of the landfill property. These areas are shown on Figure 2-1 and discussed in more detail in Section 2.2.

2.2 SITE HISTORY

Historically, the on-property portions of the Site have been divided into five areas:

- Area 1
- Area 2
- Closed Demolition Landfill
- Inactive Sanitary Landfill
- The Bridgeton Landfill

These areas are discussed below in further detail. OU-1 includes Area 1, Area 2, the Buffer Zone, and Crossroads Properties LLC Lot 2A2. The Bridgeton Landfill, the Closed Demolition Landfill, and the Inactive Sanitary Landfill are all part of OU-2 (Figure 2-1). Historical aerial photographs are included as Appendix A.

DRAFT

The West Lake Landfill contains multiple areas of differing past operations. The landfill property was used agriculturally until a limestone quarrying and crushing operation began in 1939. The quarrying operation continued until 1988 and resulted in shallow excavation areas and two quarry pits, the North Quarry Pit and the South Quarry Pit. The South Quarry Pit was excavated to a maximum depth of 240 feet below ground surface (ft bgs) and had a bottom elevation of approximately 240 feet (ft) above mean sea level (msl) (H&A 2005; Golder 1996).

The Site contains several areas where solid wastes have been disposed. The date on which landfilling activities started at the West Lake Landfill is not known with certainty and has been variously cited as beginning in or around the early 1950s (EMSI 2000), or as starting in 1952 or possibly 1962 (H&A 2005). The landfill was not officially permitted for use as a sanitary landfill until 1952. EPA has reported that "from 1941 through 1953 it appeared that limestone extraction was the prime activity at the facility; however, as time passed the focus of the activity appeared to shift to waste disposal" (EPA 1989). EPA has reported that historical aerial photography from 1953 indicates use of a landfill had commenced (EPA 1989). Mine spoils from quarrying operations were deposited on adjacent land immediately to the west of the quarry (H&A 2005). Portions of the quarried areas and adjacent areas were subsequently used for landfilling municipal refuse, industrial solid wastes, and C&D debris. EPA has reported that liquid wastes and sludges were also disposed of at the landfill (EPA 1989). These operations, which predated state and federal laws and regulations governing such operations, occurred in areas that subsequently have been identified as Area 1, Area 2, the Closed Demolition Landfill, and the Inactive Sanitary Landfill (Figure 2-1).

Due in part to the fact that the disposal of solid and liquid waste at the Site predated state and federal regulations for landfills, there is uncertainty regarding the specific Site activities and disposal practices conducted on-Site. Specifically, based upon a review of historical aerial photographs as documented in the Aerial Photographic Analysis of the West Lake Landfill Site (EPA 1989), "deep" pits, lagoons, and other Site features related to past on-Site disposal practices have been identified in several historical aerial photographs for years pre-dating the arrival of radionuclides from the Latty Avenue Site (EMSI 2018a).

DRAFT

2.2.1 LANDFILL PERMIT HISTORY

The following sections describing the landfill history are taken from the *Remedial Investigation Addendum, West Lake Landfill, Operable Unit 1* (EMSI 2018a). MDNR permitted areas are shown on Figure 2-4. The early landfilling activities (prior to 1974) were not subject to state permitting (although they were still subject to an authorization issued by the county), and the portion of the landfill property where these activities occurred has been referred to as the "unregulated landfill." Waste disposal in St. Louis County was regulated solely by St. Louis County authorities until

1974, when the MDNR was formed (H&A 2005). Landfill activities conducted in 1974 and afterwards were subject to a permit from MDNR.

In 1974, MDNR identified six waste disposal areas, four of which were subsequently permitted for waste disposal and two of which (the majority of Area 1 and the majority of Area 2) were not so permitted and were therefore closed in 1974 (H&A 2005). The areas subsequently permitted by MDNR for waste disposal are referred to as the "regulated landfill." These areas are discussed further below.

On August 27, 1974, MDNR granted authorization for a sanitary landfill on 25 acres in the area now identified as the Inactive Sanitary Landfill. MDNR subsequently issued a permit (No. 118903) for this area on January 27, 1976 (H&A 2005). MDNR also issued a permit (No. 218903) for operation of a solid waste disposal area for a demolition landfill on 27 acres of land that included a large portion of the area that has subsequently been identified as the Closed Demolition Landfill. The Closed Demolition Landfill was constructed over an area that had previously been used for disposal of sanitary waste. This permit also included the eastern portion of Area 2, the eastern portion of the inactive sanitary landfill, and the western portion of Area 1. On May 23, 1978, permit No. 118903 was modified to include an additional 3.5 acres within the area of the Inactive Sanitary Landfill. On August 27, 1980, MDNR issued a permit (No. 118908) for operation of a sanitary landfill on 6 acres located in the area now identified as the Inactive Sanitary Landfill. On September 18, 1984, MDNR issued a permit (No. 218912) for operation of a demolition landfill on 22 acres in the area now identified as the Closed Demolition Landfill.

On January 22, 1979, MDNR issued a permit (No. 118906) for operation of a sanitary landfill on 13 acres in the portion of the property described as the North Quarry Pit (H&A 2005). A subsequent permit (No. 118909) was issued August 20, 1981 to allow for expansion of the North Quarry landfill. On November 11, 1985, MDNR issued permit No. 118912, which allowed for a 33-acre expansion of sanitary landfill operations into the South Quarry area and continued waste placement in the North Quarry, thereby superseding prior permits No. 118909 and 118906. Permit No. 118912 covers a 52-acre area that encompasses the North Quarry and South Quarry, which together comprise what is currently identified as the Bridgeton Landfill. Placement of waste material in the North and South Quarry areas ceased in 2004. No active landfilling has occurred since 2004, although ongoing activities pursuant to orders from the state Attorney General's Office, EPA Region 7 and MDNR related to maintenance and monitoring of the Bridgeton Landfill continue to be conducted. Routine groundwater monitoring for the North and South Quarries of the Bridgeton Landfill is currently conducted under this permit.

DRAFT

2.2.2 WEST LAKE LANDFILL RADIOLOGICAL AREA 1

Area 1, which encompasses approximately 17.6 acres, is located immediately to the southwest of the landfill entrance (Figure 2-1). This area was part of the unregulated landfill operations conducted up through 1974, although the southwestern portion of what is currently identified as Area 1 was historically included under permit No. 218903. Pursuant to a Materials Management Plan (EMSI, 2006) approved by MDNR, inert fill material (e.g., clean materials as defined in 10 CSR 80-2.010(11), such as uncontaminated soil, concrete, asphaltic concrete, brick, or inert solids) was placed over portions of Area 1 between 2006 and 2008.

Remnants of an asphalt entrance road and parking area are located on the northwestern border of Area 1 to the south of the landfill office building. An abandoned underground diesel tank is also located beneath the asphalt-paved area, as evidenced by the presence of a fuel dispenser in Area 1. The tank is no longer in use but has not been removed because it is within the boundaries of Area 1 (current presence confirmed by Site personnel). No information has been located regarding the date of installation of the underground tank or when it ceased to be used; however, based on review of aerial photography, a pump likely associated with the underground tank was visible in aerial photography as early as October 8, 1980. A truck is visible in May 9, 1985 imagery adjacent to the pump as if it is in the process of refueling. This pump remains visible at least through the aerial photography taken on September 20, 2004.

Based on review of aerial photography, the road and parking area appear to have been constructed sometime between August 20, 1978 and May 25, 1979. Parked vehicles can be seen on aerial photographs through May 9, 1985 but are no longer visible on the April 1990 aerial photograph. A drainage structure is also visible on the northwest side of Area 1 between June 17, 1981 and May 14, 1984. Between May 9, 1985 and June 18, 1990 an additional drainage structure is visible on the northeast side of Area 1. A guard house or similar structure was constructed on the southwest corner of Area 1 between May 25, 1979 and December 2, 1979. It remains visible through April 16, 1996.

The results of the Site investigations indicated that RIM was present in the area of the road, parking area, and underground tank; however, no information is available as to whether the construction of the road and parking area or the installation of the underground tank resulted in disturbance or relocation of RIM. Prior to 2013, the remaining portions of Area 1 were mainly covered with grass, shrubs, and trees. In 2013, 2014, and 2015, vegetation was cleared along the alignments of numerous access roads and road base material was placed along these roads to support additional drilling activities. In 2016, approximately 2.6 acres in the northern portion of Area 1 were cleared of vegetation and covered with road base material as part of construction of a non-combustible cover (NCC) over areas where RIM was present at the ground surface (EMSI 2016) pursuant to a unilateral administrative order (UAO) for removal action issued by EPA (EPA 2015c). NCC cover consisted of a minimum of 8-inches of road base material placed over a geotextile placed on the existing ground surface following the removal of existing vegetation using a

DRAFT

brush hog. The extent of the NCC was based on the extent of surface RIM defined in the 2000 RI report, additional overland gamma surveying, and collection and analysis of surface soil samples. Small and medium-sized trees and shrubs still cover the northern, eastern and southwestern portions of Area 1. The southwestern portion of Area 1 was covered beneath the above-grade portion of the North Quarry portion of the Bridgeton Landfill in approximately 2002-2003.

2.2.3 WEST LAKE LANDFILL RADIOLOGICAL AREA 2

Radiological Area 2, which encompasses approximately 41.8 acres, is located in the northwestern part of the landfill property. Landfilling activities are first visible in the footprint of Area 2 between June 14, 1962 and April 10, 1964, based on a review of historical aerial photographs. Area 2 was also part of the unregulated landfill operations conducted up through 1974, although a small part of the eastern portion of Area 2 was also included within permit No. 218903 (Figure 2-4). Pursuant to a Materials Management Plan (EMSI 2006) approved by MDNR, inert fill material (e.g., clean materials, as that term is defined in 10 CSR 80-2.010(11), such as uncontaminated soil, concrete, asphaltic concrete, brick, or inert solids) was placed over portions of Area 2 between 2006 and 2008.

Review of the RMC 1982 report, NRC 1988 and 1989 reports, and review of aerial photographs indicates that a small building (referred to in the RMC and NRC reports as the Shuman building) was present in the northern portion of Area 2. This building first appears in the April 6, 1975 aerial photograph and is no longer present in the April 1990 aerial photograph. No information has been located as to the purpose or use of this building or why it was removed; however, the time of the presence of the building corresponds to the period of time when material stockpiles are visible on the surface of Area 2 and therefore its use may have been related to activities being conducted by the West Lake Quarry, which activities were terminated in 1988. With the cessation of the use of the surface of Area 2, vegetation including grasses, shrubs, and trees began to grow in this area. During the 1994-1995 field investigations, only grasses, shrubs, and small tress were present in this area, but by 2015, this vegetation had grown into large trees and extensive brush cover.

Prior to 2015, large portions of this area were covered with grasses, native bushes, and trees, while other portions were unvegetated and covered with inert fill material consisting of soil, gravel, concrete rubble, and brick material. Miscellaneous debris consisting of concrete pipe, metal and automobile parts, discarded building materials, and other non-perishable materials were also present on the surface. During the 1994-1996 OU-1 RI field investigations, a number of small depressions, some of which seasonally contain ponded water and phreatophytes such as cattails, were scattered throughout Area 2, in large part due to the presence of small berms located along the top of the major landfill berm/slope along the northern, northeastern and western portions of Area 2, which are intended to contain runoff from

DRAFT

Area 2. With the exception of the landfill slope adjacent to the Buffer Zone, the slopes of landfill berm were covered with a dense growth of trees, vines, and bushes.

In 2015, vegetation was cleared along the alignments of numerous access roads and road base material was placed along these roads to support additional drilling activities. In 2016, approximately 17.2 acres in the central portion of Area 2 were cleared of vegetation and covered with road base material as part of construction of an NCC over areas where RIM was present at the ground surface, pursuant to a UAO for removal action issued by EPA (EPA 2015c). NCC cover consisted of a minimum of 8 inches of road-base material place over a geotextile that was placed on the existing ground surface subsequent to removal of the vegetation using a brush hog. The extent of the NCC was based on the extent of surface RIM defined in the 2000 RI report, additional overland gamma surveying, and collection and analysis of surface soil samples. Vegetation, including large trees, was cleared from the southwestern portion of the landfill berm/slope adjacent to the Buffer Zone, and approximately 1.78 acres of the Buffer Zone was covered with rock, including construction of a large rock buttress in this area as part of the NCC construction for Area 2 (EMSI 2016). Large and medium-sized trees and shrubs still cover the northern, western, and southern portions of Area 2.

2.2.4 INACTIVE AND CLOSED DEMOLITION LANDFILL OPERATIONS IN OU-2

The Inactive Sanitary Landfill is located to the southwest of the Closed Demolition Landfill. The operations performed in this area were also part of the unregulated landfill operations conducted up through 1974 that were subsequently regulated by MDNR and included within the scope of permits No. 118903, 218903, 118908, and 218912 (Figure 2-4). Based on the results of visual inspection and geologic logging of drill cuttings and core samples, municipal solid waste (MSW) is the primary waste disposed in the Inactive Sanitary Landfill (H&A 2005). Some industrial wastes may also have been disposed in this area, but based on the visual inspection and geologic logging of drill cuttings and core samples, industrial wastes do not appear to have been a major portion of the wastes disposed in the Inactive Sanitary Landfill.

A Closed Demolition Landfill is located in the north central part of the landfill property. The Closed Demolition Landfill is located on the southeast side of Area 2, between Area 2 and the landfill entrance road. Based on prior reports and the results of drilling and sampling, only C&D debris and wastes are expected to have been disposed of in the Closed Demolition Landfill. However, review of the permit history indicates that sanitary wastes may have been placed in this area pursuant to Permit No. 218903 prior to placement of overlying C&D debris and wastes authorized under permit 218912 issued on January 27, 1976.

DRAFT

The first disturbance of the future demolition landfill footprint is visible in the August 11, 1966 aerial photographs. By September 19, 1969 the entire future demolition landfill footprint has been disturbed by landfilling activities. Filling within the future demolition landfill footprint appears to cease between April 6, 1975 and April 12, 1976, based on aerial photographs. The time period prior to January 27, 1976 appears to correspond to pre-demolition landfilling activities. The active spreading of cover or cap material is visible through the May 9, 1976 photograph, and the surface is revegetating by August 20, 1978. Surface activities such as pathways, surface settling and impoundments, and grading are visible, but no major landfill activities are observed within the future demolition footprint until a new episode of light-toned filling is seen on the June 18, 1990 photograph. Activities on the demolition landfill appear to have ceased by the April 16, 1996 photograph.

2.2.5 BRIDGETON LANDFILL

The Bridgeton Landfill is located in the former North Quarry and South Quarry portions of the landfill property (Figure 2-1). Collectively, the North and South Quarry landfill areas make up the former Permitted Sanitary Landfill, also known as the Bridgeton Landfill, and also referred to as the former Active Landfill in the OU-2 Record of Decision (ROD). Waste disposal in the Bridgeton Landfill consisted primarily of MSW and commercial waste. Disposal of waste materials in the Bridgeton Landfill ceased in 2004 pursuant to an agreement with the City of St. Louis to reduce the potential for birds to interfere with operations at a new runway at the nearby Lambert-St. Louis International Airport (Lambert Field), the western end of which is located approximately 9,166 ft from the landfill. The Bridgeton Sanitary Landfill is included within the scope of OU-2, and regulatory authority has been deferred to the MDNR, per the selected remedy under the OU-2 ROD.

Review of historical aerial photographs indicates that quarrying activities (removal of limestone) continued to be conducted in the North Quarry up through 1979. Based on the decrease in elevation of the quarry floor between 1969 and 1971, rock quarrying was being conducted in the southern portion of the North Quarry during this time frame. Some rock continued to be removed from this area during the period between 1971 and 1973; however, based on the change in the elevation of the quarry floor, the majority of the rock quarrying activity in the North Quarry shifted to the north during this period. Between 1973 and 1974 rock quarrying was occurring in the neck area located between the North and South Quarries. Between 1974 and 1975, quarrying occurred in the northern portion of the North Quarry. Between 1975 and 1977, the majority of rock quarrying occurred in the central and southern portions of the North Quarry. Between 1969 and 1977, the elevation of the base of the North Quarry decreased and indicates that the elevation of the floor of the North Quarry was lowered approximately 25 to 75 ft over this period. Because rock quarrying was occurring in the North Quarry area during this period and likely through 1979, placement of waste could not have occurred in North Quarry prior to 1979.

DRAFT

The first permit for placement of waste materials in the North Quarry portion of the Bridgeton Landfill (Permit No. 118906) was issued on January 22, 1979. Review of a May 1977 aerial photograph does not indicate that any waste is present in the North Quarry area at that time, while review of a July 26, 1979 aerial photograph indicates that waste placement is occurring in the North Quarry by this time. Based on the permit date and review of the historical aerial photographs, it seems likely that placement of waste in the North Quarry began in or around 1979. Landfilling continued in the North Quarry area until 1985 when the landfill underwent expansion to the southwest into the area described as the South Quarry Pit pursuant to an additional permit (No. 118912) issued by MDNR on November 18, 1985 (H&A 2005).

The North Quarry portion of the Bridgeton Landfill is located to the south of and adjacent to Area 1. The landfilling activities in the North Quarry portion of the Bridgeton Landfill included filling of the former North Quarry pit and above-grade landfilling over the top of the North Quarry pit that also extended outward beyond the edges of the former quarry pit. The above-grade portion of the North Quarry extends over, and overlaps, the southern portion of Area 1. Based on the date of Permit No. 118906 and review of historical aerial photographs, placement of waste in the North Quarry began in 1979 with initial waste placement occurring in the northeastern portion of the North Quarry area (nearest to St. Charles Rock Road) and subsequently progressing to the southwest (toward the South Quarry). By 1985, most of the northeastern part (e.g., the part adjacent to Area 1) of the below-grade (quarry) portion of the North Quarry had been filled with waste; however, waste disposal in the southwestern portion of the North Quarry (e.g., the "neck" area) continued through approximately 2002. Placement of waste in the above-ground portion of the North Quarry portion of the Bridgeton Landfill that extended over the southern portion of Area 1 occurred in approximately 2002 through 2004. Landfilling in the North Quarry ceased in 2004.

The South Quarry portion of the Bridgeton Landfill is adjacent to and southwest of the North Quarry. Historically, the quarrying operations extended from the North Quarry to the South Quarry, resulting in two quarry pits being connected via a narrow area referred to as the "neck". The South Quarry area is adjacent to the southernmost portion of the Inactive Sanitary Landfill. Landfilling in the South Quarry began in 1985 and ceased in 2004.

A subsurface reaction (SSR) began in 2010 and is currently occurring in the South Quarry portion of the Bridgeton Landfill. It has been located in the southwestern portion of the South Quarry since 2013 and appears to be stationary. A heat extraction system was installed in the neck to prevent the migration of the SSR towards Area 1. Additional discussion of the SSR is provided in Section 3.1.5.7.3.

DRAFT

2.2.6 BUFFER ZONE AND LOT 2A2

The property located to the west of Area 2 was formerly owned by Ford and was referred to as the Ford property during performance of the 2000 OU-1 RI. Ford sold most of this property in 1997, and it was subsequently developed as the Crossroads Industrial Park between approximately 1998 through 2000. Most of the parcels associated with the Crossroads Industrial Park were subsequently sold at various times to individual owners; however, Crossroad Properties LLC retained ownership of Lot 2A2 Parcels B and C. Lot 2A2 is currently used for outdoor storage of trailer trucks by AAA Trailer, which operates on a facility located on Lot 2A1 immediately to the west of Lot 2A2.

The Buffer Zone – a portion of the former Ford property that was sold to Rock Road Industries on February 2, 2001 – is located between the Area 2 slope to the east and the Crossroads Industrial Park to the west (Figure 2-1). The Buffer Zone includes the area of radiologically impacted surface soils identified in the "Phase III Radiological Assessment" performed by Dames & Moore (D&M) for Ford Financial Services Group in 1991. Investigations conducted as part of the OU-1 RI identified the presence of radionuclides in surface soil on both the Buffer Zone and Lot 2A2. The presence of radionuclides on these properties has been interpreted to be the result of historical erosion of impacted soil from Area 2.

2.2.7 OTHER SIGNIFICANT FEATURES IN THE VICINITY OF THE SITE

The West Lake Landfill is located approximately 1.75 miles to the east-southeast of the Missouri River with portions of the Site ranging from 1.4 to 2.0 miles from the river. The Earth City Industrial Park is located on the Missouri River floodplain to the west of the Site. The Earth City Industrial Park is protected from flooding by a levee (Figure 1-2) and stormwater management system operated and maintained by the Earth City Flood Control and Levee District. The stormwater management system includes a series of stormwater detention ponds, one of which is located along the west side of the landfill property (Figure 1-2). Another stormwater detention pond and is located across St. Charles Rock Road to the north of Area 2.

A low area that accumulates stormwater is located near the northern portion of Area 2, on the south side of St. Charles Rock Road (Figure 1-2). Although this low area consisted of a pond during the time frame when the original OU-1 field investigations were conducted (1995-1997), and therefore was identified as the North Surface Water Body, over the years this area has become overgrown and silted in, and only contains water after storm events. In addition to overland flow from the north slope of Area 2, stormwater runoff from much of the West Lake Landfill area is conveyed to this area via the internal stormwater conveyance ditches and the perimeter stormwater conveyance structures and ditch located along the southwest side of St. Charles Rock Road. Inspection of the North Surface Water Body has not

DRAFT

identified any outlet or pathway for discharge of water, and therefore, water that accumulates in this area appears to dissipate over time by evaporation and infiltration.

The Site, at its closest point, is within approximately 8,450 ft of the end of runway 11 of Lambert St. Louis International Airport. The Site is situated within the takeoff and approach routes for the airport. As discussed below in Section 2.3, the landfill is subject to a Negative Easement and Declaration of Restrictive Covenants Agreement between the City of St. Louis and Bridgeton Landfill, LLC (among other entities) that prohibits depositing or dumping of new or additional putrescible waste on the entirety of the Bridgeton Landfill after August 1, 2005 (City of St. Louis 2005).

2.3 LAND USE RESTRICTIONS

The landfill property is subject to several controls on land use (Figure 2-5). An institutional control in the form of a "Declaration of Covenants and Restrictions" was recorded on June 30, 1997, and a supplemental "Declaration of Covenants and Restrictions" was recorded on January 20, 1998, prohibiting residential use and groundwater use on any of the landfill property and restricting construction of buildings and underground utilities and pipes within Areas 1 and 2. On October 31, 2016, the prior institutional controls were modified by a further supplemental "Declaration of Covenants and Restrictions" recorded against all of the OU-1 Areas (Areas 1 and 2 and the Buffer Zone) and the OU-2 landfill areas to include the OU-1 areas not included under the prior institutional controls, and to prohibit use of the premises for commercial and industrial purposes including but not limited to use as a storage yard, and to prohibit placement of water wells for agricultural purposes. These institutional controls cannot be terminated without the written approval of the current property owners, MDNR, and EPA.

In addition, in 2005, the City of St. Louis entered into a Negative Easement and Declaration of Restrictive Covenants Agreement with Bridgeton Landfill, LLC (among other entities) to prohibit depositing or dumping of new or additional putrescible waste on the entirety of the Bridgeton Landfill after August 1, 2005 (City of St. Louis 2005). This negative easement stemmed in part from an earlier determination by the Federal Aviation Administration (FAA) and the United States Department of Agriculture, Animal and Plant Health Inspection Service (USDA) that the landfill was a hazardous wildlife attractant for the Lambert-St. Louis International Airport (City of St. Louis 2010). In particular, the proximity of the airport to the landfill presents a risk of bird strikes. Certain types of scavenging birds (e.g., gulls, crows) are attracted to exposed putrescible wastes at landfills, and accordingly can present a bird strike risk to passing aircraft. Similarly, bird flocks also pose a serious risk to aircraft from the potential of being sucked into the jet engines of commercial aircraft, thereby causing complete engine failure.

DRAFT

The northwest end of the Lambert-St. Louis International Airport runway 11 is approximately 8,450 ft from the nearest point of the landfill mass (east corner of the South Quarry portion of the Bridgeton Landfill). The northwest end of runway 11 is approximately 9,350 ft from the nearest point of Area 1 and approximately 11,000 ft from the nearest point of Area 2. Therefore, portions of both the Bridgeton Landfill and Area 1 are located at distances that are less than the FAA siting guidance of a 10,000-foot separation radius between an airport's Air Operations Area (AOA) and a municipal solid waste landfill (MSWLF)[1]. In addition, the FAA recommends a distance of 5 miles between the farthest edge of an airport's AOA and any hazardous waste wildlife attractant (e.g., an active MSWLF), if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. All portions of the West Lake Landfill and Bridgeton Landfill are within this 5-mile distance. Construction or establishment of new MSWLFs is prohibited within 6 statute miles of the property boundary of certain public-use airports (EMSI 2018a).

2.4 HISTORY OF INVESTIGATIVE, REGULATORY, AND RESPONSE ACTIONS

Previous investigations, regulatory actions, and response actions conducted by local, state, federal or private parties that are related to this OU-3 RI are summarized on Table 2-1 and discussed in detail in the RIA (EMSI 2018a). A summary of the pertinent groundwater-specific OU-1, OU-2, and regional groundwater investigations is presented below. These reports have been used to develop the conceptual Site model (CSM).

2.4.1 1986 HYDROGEOLOGIC INVESTIGATION

The 1986 hydrogeologic investigation was conducted to evaluate groundwater flow and to delineate the nature and extent of groundwater impacts (B&M 1986). The investigation did not take into consideration leachate collection, treatment, or monitoring at the North Quarry portion of the Bridgeton Landfill, which at the time was 180 ft below the Missouri River alluvium water table near the neck. The goal of the investigation was to establish a long-term monitoring network and background groundwater quality. The scope of work included soil sampling at 15 borings, soil engineering properties testing, piezometer installation for water levels and groundwater sampling, evaluation and gauging of 20 existing piezometers for a total of 35 periodic measurements, evaluation of groundwater head and flow at different alluvial horizons, and sampling for two rounds at 18 select piezometers/wells based on their horizontal and vertical spacing. Three casing volumes were bailed, and samples collected from 18 wells in December 1985 and May 1986 to evaluate seasonal variability. Samples were submitted to various laboratories for analysis of priority pollutants under 40 CFR Part 122, gross alpha and beta, and individual isotopes. Historic monitoring well networks are included in Appendix B.

[1] FAA Advisory Circular No. 150/5200-33B dated August 28, 2007.

DRAFT

The investigation concluded that the alluvium was the major aquifer in the vicinity, generally unconfined, in hydraulic communication with the Missouri River, with predominant regional flow towards the Missouri River, mounded with downward vertical gradients in areas of localized recharge and mounding, and could be separated into two aquifers – the upper and lower. Shallow and intermediate alluvial wells were combined as the upper aquifer, present from ground surface to approximately 65 ft bgs, or above 385 feet above mean sea level (ft msl). Deep alluvial wells were considered to monitor the lower aquifer, present from approximately 65 ft bgs to 120 ft bgs, or below 385 ft msl. Surface water monitoring point SMP-63 was located in the North Surface Water Body and was in apparent communication with groundwater but was accidentally destroyed prior to surveying. Horizonal gradients in the aquifers were small, but variable, and resulted in low flow rates in different directions. The lower aquifer exhibited shallower gradients than the upper aquifer.

Methylene chloride was the only priority pollutant volatile organic compound (VOC) detected in background, upgradient, and downgradient wells, but was below standards in all. Bis (2-ethyhexyl) phthalate and phenol were detected below standards in D-92 at 477 micrograms per liter (ug/L) and 19 ug/L, respectively. Organics exhibited an irregular distribution in monitoring wells, so the landfill was identified as a possible source. Metals also were distributed irregularly with none in exceedance of state and federal standards and no significant differences observed between background, upgradient, and downgradient wells. No significant difference was observed between constituent concentrations in deep and shallow wells. Seasonality was observed between events with more constituents detected at higher concentrations during December 1985 than May 1986. Pesticides were detected at S-82, D-83, and S-84, but their source was not determined since pesticides were detected in background, upgradient, and downgradient wells. Chlordane and 4,4'-dichlorodiphenyltrichloroethane exceeded Health Risk Criteria at these locations. Gross alpha radiation exceeded drinking water standard at downgradient well S-82, and radium concentrations exceeded the drinking water standard at piezometers S-82 and D-83.

The investigation recommended short-term supplemental data investigation to evaluate seasonal variability in concentrations, potential impacts to fish in nearby surface water bodies to the north, the source of constituents in upgradient wells, and installation of an additional piezometer near D-89. Routine long-term monitoring was also recommended for a select list of constituents. These recommendations do not appear to have been implemented until a later date.

2.4.2 1989 SITE CHARACTERIZATION AND REMEDIAL ACTION CONCEPTS

The report by the Office of Nuclear Material Safety and Safeguards (ONMSS) evaluated previous Site characterization of remedial actions and updated groundwater monitoring data (NRC 1989). Their report presented the results,

DRAFT

environmental characteristics of the Site, the extent and characteristics of the radioactive material, some considerations with regard to potential disposal of the materials, and some concepts of remedial measures. The investigation concluded that, due to the fairly impervious limestone, groundwater flowed in most areas from the bedrock into the alluvium, and, therefore, contamination of water in the bedrock aquifer did not appear likely. The investigation also concluded that radioactive material, as it then existed, did not pose an immediate health hazard. However, it also identified that there was a long-term potential for the radioactive material to pose a health problem without the proper construction of a soil cap.

2.4.3 1996 GROUNDWATER CONDITIONS REPORT WEST LAKE LANDFILL AREAS 1 & 2

A groundwater conditions investigation for Areas 1 and 2 was completed in 1996 and included grab groundwater sampling for gross alpha analysis, installation of 14 alluvial monitoring wells, development of existing and new wells, groundwater elevation monitoring, radiological and non-radiological groundwater sampling and analysis, and aquifer testing of 18 monitoring wells (McLaren/Hart 1996). Gross alpha samples were first collected from existing monitoring wells to evaluate whether groundwater was radiologically impacted and required specific investigation derived waste (IDW) handing during monitoring well re-development. All 31 wells sampled, after filtering 3 that failed initially, met the gross alpha concentrations of less than 15 picocuries per liter (pCi/L) acceptable for discharge directly to the Metropolitan St. Louis Sewer District.

A total of four wells were installed in Area 1, four wells were installed in Area 2, and six wells were installed on the Ford property. Large diameter holes were first drilled through landfill debris, logged using downhole gamma geophysical tools, then re-drilled using a smaller diameter auger rig, and completed as monitoring wells beneath the refuse. Newly completed wells were downhole gamma logged and developed, and 30 non-damaged existing wells were re-developed. A total of 44 wells were gauged and sampled for radiological and non-radiological COCs after development (Appendix B). Constituents in the uranium-228, uranium-225, and thorium-232 decay series, eight priority pollutant metals, eleven VOCs, four semi-volatile organic compounds (SVOCs), and three pesticides were detected in groundwater.

2.4.4 1996 PHYSICAL CHARACTERIZATION TECHNICAL MEMORANDUM

The report was completed to review past investigations, describe the surface and subsurface features, and recommend a groundwater monitoring network for OU-2 (Golder 1996). Site characterization included a desk study and literature review; detailed geologic mapping of the exposed quarry walls; advancement of soil, bedrock, and solid waste borings; soil and rock geotechnical testing; chemical analysis of soil; borehole geophysical logging; packer testing; piezometer/monitoring well construction; conversion of MW-1201 from open-borehole monitoring well to 2-inch cased

DRAFT

well; installation of leachate risers in solid waste; developing and slug testing piezometers; gauging monitoring wells; and measuring surface water levels in Site surface water bodies. This resulted in development of a conceptual Site hydrogeologic model and groundwater monitoring network. The conceptual Site hydrogeologic model evaluated the importance of the Bridgeton Landfill leachate collection system, which removed approximately 216,500 gallons of leachate per day during 1994. Leachate included surface water and groundwater that flowed into the landfill. The groundwater monitoring network was designed, in part, to understand the influence of the leachate collection system.

A total of 49 single, paired, and clustered piezometers/monitoring wells were installed at 33 locations approximately 350 ft apart to characterize unconsolidated and bedrock materials. Screened intervals were selected based on contacts between strata. Leachate risers were also installed where EPA inferred the presence of industrial and/or hazardous waste. Deep boreholes were continuously logged with some selected for geophysical logging and packer testing after drilling. Piezometers were then installed, surveyed, developed, and slug tested. Solid waste boreholes were completed as leachate risers.

Boreholes were reamed for geophysical testing, packer testing, and piezometer installation. Packer tests were conducted by selecting and isolating fractured/unfractured and porous/non-porous zones to provide a range of conductivities for each unit. Geotechnical sampling was also conducted on undisturbed Shelby tube unconsolidated samples, two disturbed unconsolidated samples, and two bedrock samples collected near the top of the Warsaw Formation. Open hole monitoring well MW-1201 was converted from a completion depth of 250 ft bgs to a piezometer PZ-1201-SS to a depth of 148.5 ft bgs. Staff gauges were installed in Earth City Industrial Park stormwater retention pond southwest of the leachate retention pond and monitored monthly coincident with water level gauging. Wells were developed by surging, bailing, and air lifting. Wells were then slug tested. Monthly groundwater levels and surface water levels were collected. Precipitation data was collected daily during well installation, averaged monthly, and compared to Lambert Field totals with good correlation, so Lambert Field data were used thereafter. Geologic mapping of the exposed St. Louis Formation in the limestone quarry walls was conducted to correlate large scale features to those identified in rock cores and evaluated seepage from the quarry walls into the pit. The St. Louis Formation was divided into five sub-units, as discussed below.

A monitoring network of 24 monitoring wells/piezometers, 2 surface water points, 2 sediment sampling points, and 8 leachate sampling points in OU-2, and 28 monitoring wells/piezometers in OU-1, resulting in a total of 54 separate sampling locations across the Site, was proposed based on the conceptual Site hydrogeologic model. These were considered sufficient for Site characterization, risk assessment, and remedy evaluation. Results of the investigation are discussed in Section 3.

DRAFT

2.4.5 1997 SITE CHARACTERIZATION SUMMARY REPORT OU-1

This report was submitted as an interim evaluation to assist in the development of the baseline risk assessment for OU-1 (EMSI 1997). The report included a review of previous investigations; description of surface and subsurface features; and a summary of the nature, extent, and migration potential of contamination. An updated CSM was provided for radionuclides.

2.4.6 1997 WEST LAKE LANDFILL OU-2 RI/FS SITE CHARACTERIZATION SUMMARY REPORT

Site characterization activities were conducted as part of the OU-2 RI/FS (WMC 1997). They reviewed previous investigative activities, described the nature and extent of surface and subsurface impacts, and evaluated transport mechanisms through various media. The primary objectives were to collect additional data to better characterize the environment, chemical occurrence, migration pathways, and transport mechanisms. Two rounds of sampling were conducted in February-March 1997 and May-June 1997 in piezometers/wells at the 24 locations selected by Golder for the OU-2 monitoring network. A non-routine background groundwater sampling event was also conducted in December 1995 at piezometers PZ-300-AS, PZ-300-AD, and PZ-300-SS, and wells I-50 and S-80, prior to those wells being decommissioned for development of nearby properties.

Samples collected during monitoring events were submitted for analysis of metals, general parameters, radionuclides, VOCS, SVOCs, pesticides, and polychlorinated biphenyls (PCBs). Results of routine events were compared to results of the non-routine background event and separated into alluvial and bedrock samples. Deep Salem Formation groundwater monitoring results suggested impacts related to Site activities were absent. Groundwater quality data also confirmed the inward gradient created by the leachate collection system in the Bridgeton Landfill. Surface water and sediment quality was deemed free of impacts from OU-2.

A total of five leachate riser (prefix LR) sampling points were installed in the inactive landfill to evaluate whether standing water visible in aerial photographs represented liquid waste disposal areas. Four of these leachate risers contained sufficient liquid thickness for sampling. Samples were also collected from four leachate risers (prefix LCS) in the Bridgeton Landfill for comparison. Samples were submitted for the same analyte suite as groundwater monitoring wells. Organic compound and radionuclide concentrations were similar for the inactive landfill and the Bridgeton Landfill. Solvents were not detected in the inactive landfill. The report concluded that the standing water seen in the aerial photographs were most likely ponded precipitation.

DRAFT

Soil samples from the screened intervals of 300 series piezometers, leachate risers LR-103 and LR-104, and soil gas boreholes were submitted for laboratory analysis of total organic carbon (TOC). Select samples were also submitted for analysis of VOCs, purgeable-range total petroleum hydrocarbons (TPH), and extractable-range TPH. VOC and TPH results suggested impacts were limited to an area west/southwest of the asphalt plant UST site near monitoring well MW-F2.

The OU-2 Site characterization did not identify any hazardous substance source areas. The report suggested that groundwater quality in the Deep Salem Formation, Upper Salem Formation/St Louis Formation, and alluvial hydrogeologic units within and near OU-2 was similar to upgradient, background groundwater quality with the exception of a limited area in the alluvial aquifer. VOCs were detected infrequently at low concentrations. According to the 1997 study, landfill gas likely affected groundwater quality throughout the Site.

2.4.7 2000 OU-1 REMEDIAL INVESTIGATION

The OU-1 RI report was submitted in April 2000 and presented the results of Site characterization field activities (EMSI 2000). An addendum to this report was submitted in 2018 and included the contents of the 2000 OU-1 RI report. Further discussion of this report follows below, in connection with the 2018 Addendum discussion.

2.4.8 2005 REVISED OU-2 REMEDIAL INVESTIGATION

The revised OU-2 RI presented the results of previous Site characterization activities (H&A 2005). In particular, it focused on work done as part of the groundwater investigation and documented in the Physical Characterization Memorandum (see Section 2.4.4.) that included aquifer testing, laboratory permeability testing, groundwater level monitoring, horizontal and vertical gradient evaluation, seasonal variability, influence of precipitation, surface water groundwater interaction, and leachate evaluation. Monthly groundwater level measurements indicated that water levels did not vary significantly from month to month or season to season. Water levels typically varied by approximately one foot. Alluvial piezometers showed little response.

The 2005 RI concluded it was likely that the relatively high permeability of the alluvium generally allowed rapid dissipation of recharge and prevented mounding. In the Upper Salem Formation/St. Louis Formation little response was noted, and response occurred within one to five days of a precipitation event. In the Deep Salem Formation, a relatively rapid response to precipitation (one day) was registered. In the Keokuk, response to a rainfall event was slight, as expected, given the presence of an overlying aquitard.

DRAFT

The 2005 RI report also included the results of groundwater sampling documented in the 1997 Site Characterization Summary Report and supplemental sampling completed at a list of selected alluvial wells in December 2003 and May 2004 to verify previous results. A detailed comparison of results against background was completed. The detailed groundwater quality assessment and source characterization did not identify any hazardous substance source areas and concluded that the leachate collection sumps in the Bridgeton Landfill maintained an inward hydraulic gradient. The OU-2 RI also concluded that groundwater quality in the alluvium and Deep Salem and Upper Salem Formation / St. Louis Formation hydrogeological units near and within OU-2 was similar to upgradient, background groundwater quality. Groundwater impacts were limited to iron, manganese, total dissolved solids (TDS), arsenic, chloride, TPH, benzene, vinyl chloride, and fluoride. Inorganic and conventional parameters were explained by variability in background concentrations. The OU-2 RI did not identify any surface water or sediment impacts.

2.4.9 2006 OU-2 FEASIBILITY STUDY

The OU-2 FS presented remedy considerations under the presumptive remedy approach based on the findings of the OU-2 RI (H&A 2006). The presumptive remedy of containment for CERCLA municipal landfill sites was outlined and approved in the OU-2 AOC and discussed in the EPA approved Remedial Action Objectives Report. An MDNR-prescribed landfill cover with long-term monitoring and institutional controls was proposed as the final remedy for OU-2, but design was postponed until a decision was made for OU-1 so the final remedies could be coordinated.

2.4.10 2006 OU-1 FEASIBILITY STUDY

The OU-1 FS presented remedial action alternatives for Area 1 and Area 2 in OU-1 and the Buffer Zone/Crossroad Property (Ford Property) (EMSI 2006). Impacted soil in Area 1 and Area 2 is interspersed with and contained within an overall matrix of solid waste materials. Both Area 1 and 2 are part of larger areas of previously placed solid wastes within the 230-acre landfill complex. Consequently, the OU-1 FS concluded possible remedial actions for the RIM in Areas 1 and 2 could not be implemented without consideration of ongoing activities at the landfill and possible future landfill operations, closure activities, or remedial actions that may be implemented for other portions of the landfill. Selection and implementation of a remedy for OU-1 would involve coordination with the remedial action, if any, to be selected for OU-2. Of particular interest was the coordination of any grading, landfill cover, or drainage improvements that may be implemented for either of the OUs. The remedy for OU-1 was proposed as an upgraded landfill cover over OU-1 and removal of impacted soil from the Buffer Zone/Crossroad Property. No technical compatibility issues were anticipated with implementation of any cover designs for OU-2. Protection of public health would have been achieved through the installation of a Subtitle D-equivalent landfill cover, removal of impacted soils from the Buffer Zone/Crossroad Property, and the maintenance of the existing and additional land use covenants.

DRAFT

2.4.11 2008 OU-1 RECORD OF DECISION

The OU-1 ROD proposed a landfill cover, soil consolidation from the Buffer Zone/Crossroad Property to the containment area, groundwater monitoring, surface water runoff control, gas monitoring and control, institutional control, and long-term surveillance and maintenance as the major components of the selected remedy (EPA 2008a). The public comment period was open for over six months in 2006 and reopened for approximately 2 weeks in 2008. The OU-1 ROD was intended to provide the final remedies for source control and groundwater to complete CERCLA decision-making for the Site. The OU-1 ROD concluded that isolated detections of a small number of constituents were not indicative of on-Site contaminant plumes, radial migration, or other forms of contiguous impacts related to landfilling. It also concluded that there was no evidence of significant leaching and migration of radionuclides from Areas 1 and 2 to perched water or groundwater, but that the pathway should be addressed. It identified the primary transport mechanism in alluvial water from Area 2 to the northeast, since hydrologic divides created by the leachate collection system and Earth City flood control prevent migration elsewhere.

2.4.12 2008 OU-2 RECORD OF DECISION

The OU-2 ROD proposed containment using a landfill cover with appropriate closure and post-closure care requirements as the Selected Remedy (EPA 2008b). This included groundwater monitoring and protection, surface water runoff control, gas monitoring and control, institutional controls, and long-term surveillance and monitoring. The Bridgeton Landfill has been pumping approximately 300 million gallons of leachate/groundwater per year since approximately1993 and will continue with said pumping through at least 2036. Groundwater and surface water analytical results from the OU-1 and OU-2 RI/FS projects combined indicated the constituents detected at the Site in excess of MCLs were chlorobenzene, benzene, dissolved and total lead, dissolved and total arsenic, and dissolved and total radium. The results generally showed sporadic and isolated detections of a small number of contaminants at relatively low concentration levels. These results were not necessarily indicative of on-Site contaminant plumes, radial migration, or other forms of contiguous groundwater contamination attributable to the landfill units. The Selected Remedy for the Inactive Sanitary Landfill was to install a cover system consistent with relevant and appropriate Missouri requirements for sanitary landfill caps, including two feet of engineered materials meeting permeability and vegetation maintenance requirements, institutional controls, long term monitoring, and periodic reviews.

2.4.13 2011 SUPPLEMENTAL FEASIBILITY STUDY

The Supplemental FS for OU-1 was prepared to provide additional evaluation of a select group of potential remedial alternatives for OU-1 (EMSI 2011). The EPA required that the Supplemental FS be performed to provide an engineering and cost analysis of the ROD-selected remedy, and to evaluate two new, additional remedial alternatives

DRAFT

for removal of all material containing radionuclides at levels greater than those that would allow for unrestricted use of the radiologically-contaminated areas, one for on-Site disposal and one for off-Site disposal.

2.4.14 2012 TO 2014 GROUNDWATER MONITORING REPORTS

Between July 2012 and October 2013, four additional groundwater sampling events occurred at OU-1 at the request of the EPA (EMSI 2012, 2013a, 2013b, and 2014). The EPA requested that all available groundwater monitoring wells at the West Lake Landfill be included, and directed that samples obtained from the wells be analyzed for uranium, thorium, and radium radioisotopes (including Radium-226 and Radium-228), with all radioisotopes analyzed for both total (unfiltered samples) and dissolved (filtered samples) phases, plus total and dissolved phase trace metals, VOCs and SVOCs.

The results of the July 2012 sampling event support the EPAs May 2008 ROD conclusion: namely, isolated and sporadic detections of a small number of radiological and conventional contaminants exist in Site groundwater, but no contiguous plumes of radiological or conventional groundwater contaminants are present underneath the Site or migrating from the Site. With respect to radionuclides, uranium is not present in Site groundwater above the EPA MCL, and thorium is present only at low levels. Two forms of radium are present in Site groundwater: Radium-226 and Radium-228. The report stated that the absence of any spatial relationship between the RIM locations and the radium exceedances indicates the Radium-226 and Radium-228 found in Site groundwater are of natural origin. Seventy-six wells were sampled as part of this event.

Seventy-five wells were sampled during the April 2013 sampling event. Only one well (S-53) contained a calculated total uranium mass concentration that exceeded the EPA MCL. Due to limited water in the well, it was sampled without purging and had a turbidity of approximately 524 NTU, which indicates that the sample contained a large fraction of suspended sediment. This well was dry during the July 2012 sampling event and was therefore not sampled. Additionally, this well was not included in either the OU-1 or the OU-2 RI/FS groundwater sampling programs. All other wells were below the EPA MCL for uranium. Overall for thorium isotopes, only low levels (less than 1 pCi/L) were detected in the majority of the wells. The highest was found in S-53. A total of 19 of the 75 monitoring wells contained total and dissolved fraction or total fraction only results for combined Radium-226 plus Radium-228 at levels exceeding the EPA MCL. Trace metals were also detected in wells. The most frequent were iron and manganese, which were detected in nearly all the monitoring wells. VOCs were detected in groundwater samples. The most common was benzene, which was reported to be present in 26 of the 75 wells. Benzene was detected in 11 wells at concentrations greater than the applicable water quality standard of 5 µg/L. The highest concentrations of benzene were found in wells located adjacent to the South Quarry Landfill.

DRAFT

Seventy-five wells were sampled during the July 2013 sampling event. None of the samples contained calculated total uranium mass concentration that exceed the EPA MCL of 30 µg/L. Overall for thorium isotopes, only low levels (less than 1 pCi/L) were detected in the majority of the wells. The highest was found in S-53. A total of 25 of the 75 monitoring wells contained total and dissolved fraction or total fraction only results for combined Radium-226 plus Radium-228 at levels that exceeded the EPA MCL. Trace metals were detected in wells. The most frequently detected were iron and manganese, which were detected in nearly all the monitoring wells. VOCs were detected in groundwater samples. The most common was benzene, which was reported to be present in 27 of the 75 wells. Benzene was detected in 13 wells at concentrations greater than the water quality standard of 5 µg/L. The highest concentrations of benzene were found in wells located adjacent to the South Quarry Landfill.

Eighty-four wells were sampled in the October 2013 sampling event. One well (PZ-211-SD) contained a calculated total uranium mass concentration (70.25 µg/L) that exceeded the EPA MCL of 30 µg/L. Overall for thorium isotopes, only low levels (less than 1 pCi/L) were detected in the majority of the wells. The highest total thorium values were in bedrock monitoring wells PZ-211-SD and PZ-102-SS and in alluvial wells D-85, S-61, and MW-104. A total of 30 of the 84 monitoring wells contained total and dissolved fraction or total fraction only results for combined Radium-226 plus Radium-228 at levels that exceeded the EPA MCL. The combined Radium-226 plus Radium-228 results from 14 of the 84 monitoring wells exceeded the CML for both the total fraction and the dissolved fraction. Trace metals were detected in wells. The most frequently detected were iron and manganese, which were detected in nearly all the monitoring wells. VOCs were detected in groundwater samples. The most common was benzene, which was reported to be present in 36 of the 84 wells. Benzene was detected in 18 wells at concentrations greater than the water quality standard of 5 µg/L. The highest concentrations of benzene were found in wells located adjacent to the South Quarry Landfill.

DRAFT

2.4.15 2015 USGS BACKGROUND STUDY

EPA Region 7 asked the USGS to review data from the comprehensive groundwater sampling completed at the Site between 2012 and 2014 and evaluate the source of combined radium in groundwater above the maximum contaminant level (MCL). Their background study included a review of regional historical data, occurrence and geochemistry of radionuclides in various aquifer systems, geochemistry of MSWLFs, and historical data for the Site. Four general hypotheses for the origin of dissolved combined radium in groundwater above the MCL were presented:

- Leaching of radium from RIM;
- Natural variability;
- Leaching of radium from non-RIM wastes; and
- Mobilization of naturally occurring radium from aquifer solids due to leachate.

Radionuclide data from 9 alluvial wells and 2 bedrock wells open to Mississippian-age rock within 5 miles of the Site were combined with data from PZ-212-SS and PZ-212-SD (installed in 2013) and data from off-Site well clusters south of the Site to calculate background concentrations of dissolved and total combined radium in groundwater. The upper limits of background (95th percentile) for dissolved and total radium were 1.98 and 2.81 pCi/L for the alluvium, and 3.56 and 3.34 pCi/L for Mississippian-age bedrock. Ratios of total and dissolved Ra228/226 ranged from 1.0 to 4.98 for the alluvium and 0.09 to 2.11 for the bedrock. The background dataset was limited with only 17 alluvial groundwater samples and 11 bedrock groundwater samples from Mississippian age.

Background data were compared to data from 83 monitoring wells sampled at least once during 2012 to 2014 Site-wide groundwater monitoring. Chloride, bromide, and iodide were considered the primary indicators of landfill leachate due to naturally occurring sodium, sulfate, and boron present in samples collected from the nearby Champ Landfill expansion. Wells were scored and weighted based on concentrations of primary leachate indicators. Results suggested that 47 wells (37 alluvial and 10 bedrock) scattered across the Site were affected by landfill leachate and given an L score greater than 0 suggesting landfill materials are widespread. A total of 10 of these 47 wells had an L score of 0.5 and slight possible effects of landfill leachate. The eight alluvial wells with no leachate effects were all less than 45 ft deep (shallow or intermediate) and located on the western part of the Site. Several constituents in groundwater had moderate to strong correlations with leachate effects related to a change in the geochemical conditions.

Average combined dissolved radium was above the MCL in 13 wells and positively correlated with landfill impacts with 11 wells having a leachate score greater than 0. On-Site dissolved or total combined radium in groundwater was variable with concentrations generally lower in wells open to the Keokuk Limestone and higher in wells open to the deep alluvium. All five of the alluvial wells with average dissolved combined radium above the MCL were deep wells with naturally anoxic and/or leachate-affected conditions. Average combined dissolved radium in groundwater in bedrock wells were generally located around the North and South Quarry areas.

The USGS concluded that although there was a strong positive correlation between leachate effects and the average combined dissolved radium detections above the MCL, it did not indicate that RIM was the source. The USGS's evaluation suggested that the likely origin of the radium in groundwater was a combination of the four potential sources. Contributing to the uncertainty in determining the origin of combined radium in groundwater was the small background dataset, and the insufficient data on concentrations/ratios and phase associations of radium in aquifer materials, RIM, and in leachate from other MSWLFs.

DRAFT

2.4.16 2016 GROUNDWATER TECHNICAL REPORT

A technical evaluation of the OU-2 groundwater monitoring network was completed at the request of MDNR (Feezor 2016). The scope included a detailed review of data collected from wells within approximately 350 ft of the landfill's waste boundary during quarterly monitoring events between fourth quarter 2015 and third quarter 2016 and field and laboratory analytical results presented in the Physical Characterization Technical Memorandum (Golder 1996). The evaluation included a detailed hydrogeological review of the different zones and non-routine monitoring wells, and suggested modifications to the OU-2 routine monitoring network.

2.4.17 2018 OU-1 RI ADDENDUM

EPA requested an OU-1 RI Addendum (RIA), updated baseline risk assessment (BRA), and final FS in the OU-1 ASAOC as amended and associated SOW dated December 9, 2015. The OU-1 RIA updated the CSM based on additional data and various Site characterization activities completed after submittal of the OU-1 RI in 2000. The CSM presented in the OU-1 RIA serves as the basis for the CSM presented in this Work Plan. It identified the following data gaps:

- background groundwater quality;
- groundwater geochemistry;
- regional, Site, and local hydraulic gradients;
- recharge and discharge points;
- leachate chemistry and occurrence;
- effect of leachate extraction on groundwater levels and hydraulic gradients;
- nature and extent of off-Site contamination;
- adequacy of the groundwater monitoring network along the perimeters of Areas 1 and 2;
- hydraulic properties of the aquifer;
- effect of suspended sediment on groundwater quality;
- potential for vapor intrusion into onsite buildings;
- potential correlations between radium and geochemical indicators; and
- evaluation of potential leaching of wastes.

DRAFT

The OU-1 RIA included a discussion of the potential subsurface transport mechanisms and recommended additional groundwater investigations under the OU-3 RI/FS to address the data gaps.

2.4.18 2018 UPDATED BASELINE RISK ASSESSMENT

An updated BRA was prepared in conjunction with the RIA by Auxier & Associates (Auxier 2018). The BRA consisted of a human health evaluation and screening level ecological risk assessment. The overall objectives were to evaluate whether radiological and chemical constituents detected in the environmental media at OU-1 pose lifetime cancer risks (LCRs) or non-cancer effects that exceed EPAs regulatory threshold levels under current and anticipated future conditions if no remedial actions are taken and support decisions concerning risk management. The BRA identified radionuclides associated with uranium, actinium, and thorium decay series as well as 13 inorganic COCs at OU-1. Further evaluation of the COCs in the BRA indicated:

- There are no unacceptable LCRs or non-cancer effects to on-property or off-property human receptors under current conditions.
- For scenarios 1,000 years in the future, LCRs and non-cancer effects to landfill workers that access the surface of the landfill and some off-property receptors exceed regulatory thresholds.

The future risks were determined by assuming that the landfill will not have a cover and no remediation will occur.

2.4.19 2018 OU-1 FINAL FEASIBILITY STUDY

The Final Feasibility Study (FFS) for OU-1 was prepared to present further evaluation of potential remedial alternatives to address the presence of RIM contained within portions of some of the landfill units at the Site (EMSI 2018b). The FFS provides further evaluation of the containment remedy with some modifications, and additional evaluations of a containment remedy alternative with an engineered cover designed to meet the Uranium Mill Tailings Radiation Control Act (UMTRCA) performance standards; a full excavation with off-site disposal alternative; a partial excavation alternative that would remove RIM containing either combined radium or combined thorium activities above 52.9 pCi/g and located within 16 feet of the 2005 topographic surface; a partial excavation alternative that would remove RIM containing either combined radium or combined thorium above 1,000 pCi/g regardless of depth; a risk based partial excavation alternative to remove RIM such that the remaining materials would be protective of industrial land uses (the reasonably anticipated future land use) without consideration of the presence of an engineered cover system; and a full excavation alternative with the option to re-dispose the excavated material in an on-site engineered cell. Of the seven remedial alternatives (excluding the No Action alternative), all meet the EPAs criteria for protection of Human Health and the Environment, compliance with ARARs, long-term effectiveness and performance, reduction in toxicity, mobility or volume through treatment, short-term effectiveness, implementability, and cost.

DRAFT

2.4.20 2018 OU-1 RECORD OF DECISION AMENDMENT

The EPA determined that further evaluation of remedial alternatives was warranted as a result of stakeholder and community concerns following the 2008 ROD (EPA 2018c). Based on the results of those investigations and evaluations, the EPA determined that a fundamental change to the 2008 ROD is appropriate. In summary, the Amended Remedy is based on the following:

- A better understanding of the volume, concentration and location of RIM at the Site that may present an unacceptable risk.
- New information regarding the potential for RIM to leach under certain circumstances.
- Concern that, should a subsurface heating event occur in OU-1, the heat could dry and desiccate a cap, providing a conduit for increased release of radon from the subsurface and potentially for the leaching of RIM.
- A determination that implementation of the 2008 ROD could not be accomplished without disturbance of both putrescible waste and RIM.

The EPAs Amended Remedy includes:

- Excavation and stockpiling of overburden in OU-1 Radiological Areas 1 and 2 to access the RIM.
- Excavation of RIM from the Areas 1 and 2 of OU-1 that contains combined radium or combined thorium activities greater than 52.9 pCi/g that is located generally within 12 feet of the 2005 topographic surface. Optimization of RIM removal above and below the 12-foot target depth (excavation as deep as 20 feet or as shallow as 8 feet) will be performed during the remedial design.
- Excavation of RIM soil from the Buffer Zone and/or Lot 2A2 sufficient to reduce concentrations of radionuclides to background in order to allow for unlimited use and unrestricted exposure (UU/UE).
- Loading and transport of the RIM and radiologically impacted soil for disposal at an off-site permitted disposal facility.
- Re-grading of the remaining solid waste materials within Areas 1 and 2 to meet the minimum (5%) and maximum (25%) slope criteria.
- Installation of a landfill cover over Areas 1 and 2 designed to meet the RCRA hazardous waste design criteria, municipal waste landfill regulations, and UMTRCA performance and longevity standards.
- Design, installation, and maintenance of surface water runoff controls.
- Groundwater monitoring.
- Landfill gas and radon monitoring and control, in accordance with ARARs.

DRAFT

- ICs to prevent land uses that are inconsistent with a closed landfill containing radiological materials.
- Long-term surveillance and maintenance of the landfill cover in Areas 1 and 2 and other remedial components.

2.5 HISTORIC DATASET

All of the investigations summarized in the previous sections were reviewed in detail during preparation of this RI/FS Work Plan and mined for relevant and pertinent information for OU-3. A summary of existing data and approximate date ranges during which they were collected is included as Table 2-2. This dataset has been considered in preparation of a preliminary CSM.

DRAFT

3.0 INITIAL EVALUATION AND CONCEPTUAL SITE MODEL

An evaluation of the existing dataset and review of the documents described in Section 2 were completed as part of the preparation of this Work Plan. This included compilation and review of available borehole logs, well construction details, field logs, analytical data, field measurements, aquifer testing data, and geochemistry data to refine the groundwater CSM and develop an OU-3 database. As previously discussed, the data evaluated spanned a nearly 40-year time period, from 1979 to 2018. The data for each of these investigative periods was combined and collectively analyzed with respect to understanding conditions near the Site. The preliminary CSM provides an understanding and summary of:

- The potential and known sources of groundwater impacts;
- Potential release mechanisms;
- Potential routes of migration, including any known or suspected preferential pathways;
- Groundwater flow (vertical and horizontal);
- Missouri river and groundwater interaction;
- Factors controlling contaminant distribution; and
- Potential human and environmental receptors.

The CSM will be updated with additional data as the investigation progresses and will be presented in the Annual Hydrogeologic Investigation and Groundwater Characterization Reports and the OU-3 RI Report. Real-time data collected during field activities will be incorporated to reflect newly collected information in accordance with Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model (EPA 2011). The preliminary CSM is presented below.

DRAFT

3.1 PRELIMINARY CONCEPTUAL SITE MODEL

The preliminary CSM synthesizes the regional setting with Site-specific geology, hydrology, hydrogeology, geochemistry, and ecology data. Existing demography, land, groundwater, and surface water data are discussed along with flora and fauna of the Site and surrounding areas, threatened and endangered species, rare species, sensitive environmental areas, and critical habitats to identify potential human and ecological receptors. Potential surface, subsurface, atmospheric, and biotic migration pathways are also identified.

3.1.1 REGIONAL SETTING

The Site is located near the confluence of the Missouri River and the Mississippi River, in the gently undulating Dissected Till Plains Physiographic Province ranging in elevation from approximately 500 to 700 ft msl. The Site is close to the southernmost extent of Pleistocene glaciation, but morainal topography is absent and till is thin and dissected (Miller et al. 1974). Loess was deposited in upland areas during Pleistocene glaciation and alluvium was deposited in river valleys. Surface water runoff reaches the Missouri or Mississippi Rivers. Quaternary deposits are generally underlain by Pennsylvanian shale, limestone, clay, sandstone, siltstone, and coal, and Mississippian limestone (Harrison 1997). Regional and local geology and hydrogeology are described in the following subsections.

3.1.2 REGIONAL GEOLOGY AND HYDROGEOLOGY

The geology of the region is described in detail on the St. Louis 30' x 60' Quadrangle of Missouri and Illinois and accompanying cross-sections (Harrison 1997). These cross sections are included as Appendix C. A regional stratigraphic column with detailed descriptions of bedrock present at the Site is included as Table 3-1a. The stratigraphic sequence generally consists of strata deposited in shallow epicontinental seas.

3.1.2.1 REGIONAL GEOLOGY

Regional geology can generally be described as Precambrian igneous crystalline basement rock overlain by the cyclic deposition of Paleozoic sandstone, shale, limestone and dolomite belonging to the Illinois Basin (Table 3-1b). The basin consists of nearly three vertical miles of largely shallow water marine deposits that thicken to the east and toward the Ozark Dome to the southwest. The bedrock units are oriented nearly horizontal in the St. Louis area and dip less than 1 degree to the northeast as a result of uplift of the Ozark Dome (USACE 1998). Other regional structural features include the Cheltenham Syncline, the Dupo Anticline, and the Florissant Dome (McCracken 1965; Harrison 1997).

That shallowest units of the Illinois Basin near the site consist of Pennsylvanian and Mississippian age bedrock. The Pennsylvanian units consist primarily of siliciclastic deposits (i.e., shale, siltstone and sandstone), whereas the underlying Mississippian units consist primarily of fractured carbonate units (limestone and dolomite). Though bedrock units of Pennsylvanian age are present throughout the area, they were removed by erosion in the immediate vicinity of the site. Limestones, dolomites, and shales of the Mississippian System (Kinderhookian, Osagean, and Meramecian Series) are the dominant bedrock units at the Site and are described in more detail in Section 3.1.3. The approximately 1,250 ft thick Mississippian System Series are all separated by non-distinct unconformities and are therefore defined by paleontology (Howe 1961).

DRAFT

Unconsolidated deposits of Quaternary age (Pleistocene to Holocene) unconformably overly the Paleozoic bedrock units of the Illinois Basin and generally occur in low-lying areas associated with the floodplains of the Missouri and Mississippi rivers. Melt water from glaciers during the Pleistocene generated tremendous volumes of runoff, carrying immense quantities of sediment that had to be transported down the Missouri River. In response, the river carved a much deeper and wider channel than the river occupies today (MDNR 1997). These younger unconsolidated units consist of alluvial and terrace deposits of the Missouri River Alluvium and upland aeolian loess deposits. The Missouri River Alluvium dominates the Missouri and Mississippi River valleys, ranges up to 210 ft thick regionally and consists of gravel, sand, silt, and clay. Aeolian loess deposited during Pleistocene glaciation covers much of Missouri and Illinois and overlies bedrock as the upland bluffs near the Missouri River valley. While the upland loess can range up to 215 ft regionally, the loess at the Site is usually less than 40 ft thick but has been observed up to 80 ft thick in some areas generally consisting of 20 to 30 ft of pure silt overlying 20 to 49 feet of clay silt (Lutzen & Rockaway 1971; USACE 1998).

3.1.2.2 REGIONAL HYDROGEOLOGY

The Missouri River generally flows to the east through Missouri, flows to the north near the Site, and is a tributary to the Mississippi River, which flows south along the eastern state boundary (Golder 1996). In 1974, of the 1,200 million gallons of water used daily in the St. Louis area 82 percent was pumped from the Mississippi River, 15 percent from the Missouri and Meramec Rivers, 2 percent from alluvial aquifers, and 1 percent from bedrock aquifers. Water withdrawn from surface water features required extensive treatment prior to use as potable water (Miller et al. 1974).

The major aquifers of the region are both the alluvial aquifers and the bedrock aquifers. Alluvial aquifers are generally present in the Missouri and Mississippi River valleys within saturated sands and gravels. Production of wells installed in the alluvium is dependent on sediment sorting, saturated thickness, connection to surface water, and infiltration (Miller et al. 1974). Alluvial aquifers are recharged by infiltration of surface water and precipitation, and upward movement of groundwater from underlying bedrock aquifers near the margins of the alluvial floodplain. Some wells installed in the alluvium yield over 2,600 gallons per minute (gpm).

Groundwater within bedrock is present within fractures, bedding planes, and solution cavities of limestone and dolomite, and within porous sandstones. The Warsaw Formation shale and the Maquoketa Shale are considered aquitards in the region. Economically feasible bedrock aquifers include the Ordovician St. Peters Sandstone, Roubidoux Formation, the Gunter Sandstone Member of the Gasconade Dolomite, and the Cambrian Potosi Dolomite. The uppermost of these, the St. Peters Sandstone, is encountered at approximately 1,450 ft below ground surface near the Site and ranges from 60 to 165 ft thick with moderate reported yields between 10 and 140 gpm (Harrison 1997). The Roubidoux Formation is encountered at approximately 1,930 ft bgs and ranges from 110 to 170 ft thick (Harrison

DRAFT

1997). Directly underlying the Roubidoux Formation is the Gasconade Dolomite. The basal unit of the Gasconade Dolomite is the Gunter Sandstone member that ranges between 25 and 30 ft thick. The Roubidoux Formation and Gunter Sandstone Member have yields between 10 and 300 gpm. The Potosi Dolomite is present at approximately 2,650 ft bgs with a thickness of approximately 200 ft and yields between 10 to 400 gpm.

Regional potentiometric surface maps for the alluvium and bedrock are shown on Figure 3-1. Regional groundwater flow in the bedrock is generally toward the Missouri and Mississippi Rivers with a bedrock groundwater divide approximately 3.5 miles southeast of the Site. Regional groundwater flow in the shallow alluvium is generally toward the Missouri River. This flow direction near the Site is variable with depth, precipitation, and river stage and is presently less understood. However, it will be characterized and evaluated during the implementation of this Work Plan.

3.1.2.3 REGIONAL GROUNDWATER QUALITY

Bedrock aquifers in the St. Louis area were described as not favorable for development of high-yield wells because these potable water wells typically have yields of less than 50 gpm and the deeper aquifers yield saline water (Miller et al. 1974). Regional groundwater quality is variable with calcium-magnesium-bicarbonate type water at low TDS and sodium chloride, sodium sulfate, or sodium bicarbonate type water depending on the source at high TDS. TDS generally ranges between 122 and 17,500 milligrams per liter (mg/L). Regional groundwater quality is affected by lithologic interrelations, permeability, structural features, residence time, distance traveled, flushing of entrapped saline connate water, and development (Miller et al. 1974). Compressional structural features such as anticlines and synclines can affect groundwater quality, with recharge occurring via secondary permeability of fractures and jointing in anticlines, and mineralized water traps in synclines (Miller et al. 1974).

The uppermost Post-Maquoketa bedrock aquifers are above the economically feasible aquifers. TDS in samples collected from wells in the Post-Maquoketa aquifers varied between 246 and 6,880 mg/L with low iron concentrations (<0.3 mg/L), high hardness (>180 mg/L), and relatively high fluoride concentrations (>1.4 mg/L in 50% samples). Most potable water wells are located near the outcrops of Meramecian Series rocks and yield water of the calcium-magnesium-bicarbonate type. Water in northwestern St. Louis County has higher TDS generally of the sodium-chloride type with variable concentrations of calcium and sulfate. Chloride concentrations near the Site are as high as 250 mg/L and could result from a lack of flushing of connate water or migration of mineralized water from deeper horizons or adjacent oil and gas rocks. High fluoride could result from solution of fluorite or saline water encroachment (Miller et al. 1974). Groundwater quality of the Ordovician, Cambrian, and Precambrian Systems is not evaluated in this CSM.

DRAFT

Missouri and Mississippi River alluvial aquifers have relatively well mixed and uniform concentrations of constituents but a wide variability of TDS. The water is of calcium-magnesium-bicarbonate type with localized high sulfate concentrations, high iron and manganese, and is very hard. High nitrate concentrations are likely due to impacts from surface waste (Miller et al. 1974).

3.1.2.4 REGIONAL SURFACE WATER RESOURCES AND QUALITY

The Mississippi and Missouri Rivers are a major reason for the growth and development of St. Louis and serve as commercial arteries for the nation. Combined flows historically averaged 112,000 million gallons per day (mgd) and provided 97 percent of the regional water use that includes industry, commerce, and recreation. They also provide means to dispose of waste and sewage. Missouri River flows are controlled upstream in the headwaters with a reservoir system reducing the flooding potential and maintaining navigable flows. Mississippi River flows are not controlled until they reach the locks and dams after the confluence with the Missouri River (Miller et al. 1974).

The Missouri and Mississippi Rivers provide an important supply of surface water to the area, with approximately 1 percent of the daily flow used for industry and commerce. These rivers also assimilate large quantities of municipal, industrial, and agricultural waste, which limits usage. Missouri River water in the St. Louis area is hard /moderately mineralized with calcium, magnesium, sodium, bicarbonate, and sulfate that control TDS and need treatment prior to use. Turbidity has trended downwards due to upstream dams but remains high, and needs reducing prior to use. Missouri River discharge is directly correlated with the chemistry showing a positive correlation with turbidity, and a negative correlation with hardness and alkalinity.

Chemical and physical characteristics of the Missouri River were averaged over the 20 years prior to 1970 from the Howard Bend Plant just upstream of the Site (Miller et al. 1974). Temperature ranged from 0 degrees Celsius (°C) to 31°C with a mean of 14.5°C. Water was generally neutral to basic with a pH between 7.5 and 9.6 standard units (SU) and a mean of 8.1 SU. Alkalinity as calcium carbonate ($CaCO_3$) ranged from 53 to 294 mg/L with a mean of 150 mg/L. Hardness as $CaCO_3$ ranged between 83 and 366 mg/L with a mean of 206 mg/L. Turbidity ranged between 5 and 12,000 Jackson Turbidity Units (JTU) with a mean of 694 JTU. Annual average constituent summaries from 1951 through 1970 are included in Miller et al. 1974.

3.1.3 LOCAL GEOLOGY

Local geology is generally described as Loess, Missouri River Alluvium, and limestone bedrock. Detailed characterization of the Quaternary alluvium and Mississippian bedrock has been conducted at the Site through installation of boreholes and detailed descriptions of the South Quarry Pit. Updated geologic cross-sections are shown

DRAFT

on Figures 3-2 through 3-4. Cross-sections were updated for this preliminary CSM based on a detailed review and evaluation of the borehole logs, hydrostratigraphy of the alluvium, and mapping of the South Quarry Pit. Additionally, this data evaluation review process included applying the environmental sequence stratigraphic analyses to update the data and its interpretation and presentation. The available borehole logs for monitoring wells and historic geologic cross sections are included in Appendices D and E, respectively.

3.1.3.1 BEDROCK

The bedrock units of hydrogeologic importance to the OU-3 RI/FS from oldest to youngest are: the Keokuk Formation (upper portion of the Osagean Series), the Warsaw Formation (lower portion of the Meramecian Series), the Salem Formation (middle portion of the Meramecian Series), and the St. Louis Limestone (middle portion of the Meramecian Series). Bedrock surface elevations are included in Appendix F. The St. Louis Formation was described in additional detail, mapped in the quarry, and subdivided into five units as documented in Appendix G (Golder 1996). Bedrock at the Site is described in detail below.

3.1.3.1.1 KEOKUK FORMATION

The Keokuk Formation is generally described as a bluish-gray, medium to coarsely crystalline, medium bedded limestone with abundant light gray tripolitic chert layers and nodules, some finely-crystalline zones, and/or crinoidal zones (Spreng 1961; Thompson 1986). Brachiopods, horn corals, and bryozoans are abundant in the formation (Spreng 1961). Four boreholes at the Site penetrate the Keokuk Formation at depths between 365 and 375 ft bgs on the eastern edge of the Bridgeton Landfill and at a depth of 345 ft bgs on the western edge of the Bridgeton Landfill.

The surface elevation of the Keokuk Formation is shown in Appendix F and ranges from approximately 126 ft msl on the southeastern corner of the North Quarry and dips toward the west to approximately 116 ft msl on the western edge of the South Quarry (Golder 1996). The description of the Keokuk Formation at the Site is consistent with the general description and is a fresh to slightly weathered, medium light gray, fine to coarsely crystalline, thin to medium bedded, medium strong to strong, fossiliferous limestone with argillaceous shaley partings, numerous light bluish gray chert layers 1-2 inches thick, chert nodules between 1 to 10 mm, and disseminated pyrite. Layers of moderately weathered, medium bedded, light olive gray, medium strong arenaceous dolomite and thinly laminated, dark greenish gray, silty claystone were noted. Styolitic chert nodules, silicified zones, highly weathered joints, weak rock, and porous open vugs containing calcite crystals were noted at the bottom of the boreholes. Joints observed in rock cores during drilling were generally horizontal and infrequent with less than 2 per foot and described as irregular and rough, with some described as smooth, bedded, or planar. Open vugs and pores were commonly encountered below approximately 100 ft msl (Golder 1996).

DRAFT

3.1.3.1.2 WARSAW FORMATION

The Warsaw Formation at the Site can be divided into two distinct lithologic zones: an upper shale-dominated zone and lower limestone-dominated zone (Spreng 1961; USGS 1997). The conformable boundary between the Osagean Series Keokuk Formation and the Meramecian Warsaw Formation is easier to distinguish in the eastern part of Missouri where the clastic Warsaw limestone overlies pure Keokuk limestone but there is not a clearly defined faunal break (Thompson 1986). The Warsaw characteristically has geode beds underlying the Archimedes beds (Thompson 1986).

The Warsaw Formation is encountered at the Site at approximately 245 ft bgs (240 ft msl elevation) to the east of the Bridgeton Landfill and at approximately 200 to 210 ft bgs (250 – 260 ft msl elevation) on the western side of the Bridgeton Landfill (Appendix F). The elevation of the top of the Warsaw Formation is consistent with the basal elevation of the South Quarry Pit and suggests that quarrying terminated once encountering the formation. The total thickness of the Warsaw at the Site ranges from approximately 130 to 145 ft (Golder 1996).

The upper portion of the Warsaw Formation is regionally described as a yellowish brown to olive black, fresh to highly weathered, thinly bedded, very fine grained, weak clayey siltstone, silty claystone, or fissile shale with fine pyrite crystals and calcite infilled veins interbedded with silty limestone and/or dolomitic limestone (EMSI 2000). The uppermost portion of the Warsaw Formation was characterized with an olive to medium dark gray, fresh, thinly to thickly bedded, fine grained, weak to medium strong siltstone or claystone reported to range from approximately 2.5 to 10 ft thick. However, based on observations at nearby offsite private wells, the thickness of upper zone at the Site could be significantly thicker. The Warsaw Formation in general has a high rock quality designation (RQD) and very few fractures that were jointed, irregular or planar, and rough or smooth (Golder 1996). As discussed in Section 5.1.5.2, the Warsaw Formation is considered an aquitard between the Salem and Keokuk Formations.

The underlying upper Keokuk Formation grades upward into the lower portion of the Warsaw Formation at the Site. The lower portion of the Warsaw Formation is generally described as an olive to dark gray, fresh, thinly to medium bedded, fine to very coarse crystalline, medium strong, vuggy, nodular, argillaceous, dolomitic, limestone with fossils, chert, and thinly bedded claystone and siltstone interbeds. The lower portion of the Warsaw Formation had a greater apparent thickness in PZ-106-KS and PZ-111-KS where it was encountered at approximately 295 to 300 ft bgs with a thickness of approximately 45 to 50 ft, than in PZ-100-KS and PZ-104-KS where it transitioned to silty claystone and clayey siltstone of the upper portion at approximately 350 ft bgs with a thickness of approximately 10 ft.

DRAFT

3.1.3.1.3 SALEM FORMATION

The Salem Formation consists predominantly of fossiliferous calcarenite (a limestone with more than 50 percent transported sand-size carbonate grains) that ranges regionally from 70 to 180 feet thick (USGS 1997). A distinct "cannonball" or "bulls-eye" chert zone is present near the top of the limestone with 4 to 6-inch diameter, concentrically banded, spherical nodules and is often overlain by a thin shale (Thompson 1986). The remainder of the unit is highly variable with interbeds of fine-grained limestone, sandstone, chert and evaporites (USGS, 1997). The Salem Formation is commonly quarried in the region (Thompson 1986).

The Salem Formation is encountered at the Site at a depth of approximately 165 ft bgs (320 ft msl) on the eastern edge of the Bridgeton Landfill and between approximately 115 to 135 ft bgs on the western edge of the Bridgeton Landfill (328 to 340 ft msl) with a thickness of approximately 67 to 83 ft (Appendix F). It is described as a very light to medium dark gray, fresh, medium to coarse grained, thinly to thickly bedded, medium strong, fossiliferous, arenaceous, and bioclastic calcarenite with some iron oxide staining, chert zones and nodules, and some cross bedded layers. RQD was generally high in rock cores during drilling at the Site with very few fractures in the lower portion of the formation (0 to 1 per foot) and up to 2 fractures per foot in the upper portion of the formation. The Salem Formation was exposed in the bottom parts of the North and South Quarry Pits.

3.1.3.1.4 ST. LOUIS LIMESTONE

The St. Louis Limestone represents the first-encountered bedrock at the Site and is described as a gray, lithographic to finely crystalline, medium to massively bedded limestone that ranges from 100 to over 250 feet thick that is quarried for cement manufacture and aggregate. The unit is highly variable with interbeds of dolomite, cherty limestone, fossiliferous limestone, and evaporites. Minor thin beds of shale are present throughout the formation (USGS, 1997). Limestone breccia with a shale matrix is common in the lower part of the formation. Chert is uncommon, but where present is fragmented and brown. Parts of the limestone are dolomitic. Lithostrontionella castelnaui and Lithostrotion proliferun are diagnostic compound corals (Spreng 1961).

The St. Louis Formation has been well characterized at the Site via rock cores and geologic mapping of the exposed South Quarry Pit walls and is encountered at depths between 14 to 52 ft bgs (425 to 450 ft msl) in the eastern portion of the Site and at depths between 20 and 110 ft bgs (379 to 442 ft msl) in the western portion of the Site (Appendix F). The variability in depth and elevation is due to erosion by the Missouri River. It ranges in thickness from approximately 65 to 130 ft and was previously separated into six different sub-units from oldest to youngest as Lc, Lb, Ls, Ld, Bx, and Lx as described below (Golder 1996). Data analysis conducted by Trihydro showed an additional older unit Lc, which was mapped and used in development of the current preliminary CSM. These sub-units are described below:

DRAFT

- Lc – a fresh, thinly to thickly bedded, finely crystalline, medium strong, stylolitic, argillaceous limestone.
- Lb – A thinly bedded, microcrystalline to finely crystalline thinly to thickly bedded limestone.
- Ls – A massive, microcrystalline, medium strong, very argillaceous limestone with sheet like weathering that causes 0.2 to 0.4 feet thick slabs to separate parallel to the exposed face. Localized joints, fractures, and seeps were not noted.
- Ld – A thin (1 to 3 ft thick) thinly bedded to massive, medium strong to strong, slightly argillaceous limestone that is almost continuously exposed in the quarry and overlain by a 2-inch thick fine-grained stratigraphic marker bed.
- Bx – A massive, brecciated, finely crystalline matrix, medium strong, limestone that ranges between 10 and 22 feet thick.
- Lx – A thinly to thickly bedded fine to medium crystalline, coarsening upward, medium strong, stylolitic, fossiliferous (brachiopods, gastropods, and crinoids), limestone with iron oxide concretions, argillaceous stringers, and chert nodules.

The top of bedrock surface generally dips westward toward the Missouri River with two dominant topographic features: the quarried areas associated with the former North and South quarry pit operations and the scour surface associated with the natural eastern edge of the Missouri River floodplain. Additional detail on the structural features and hydrogeologic properties of these units is provided below.

DRAFT

3.1.3.1.5 STRUCTURAL FEATURES

Joints, cavities, infilled collapsed features, and groundwater seeps were mapped on five different sectors of the exposed South Quarry pit walls (Golder 1996). Geologic features are shown in Appendix G. Joints were mapped as follows:

- 12 joints were oriented 60 degrees east of north;
- 4 joints were oriented at 20 degrees east of north;
- 3 joints were oriented 70 degrees east of north;
- 3 joints were oriented 80 degrees east of north; and
- 8 joints were oriented between 40 and 185 degrees east of north (40, 55, 62, 75, 98, 100, 120, 185).

Sectors 4 and 5 had the densest spacing of mapped joints with a total of 24. The face of Sector 1 was oriented at 60 degrees east of north, parallel to the most dominant set, and had only two joints mapped at an orientation of 20 degrees east of north. It is likely these joints were caused by regional structural geologic features including the Dupo Anticline

and Florissant Dome. Infilled collapsed features where voids collapsed and were infilled with fine-grained sediments were also mapped on the exposed walls of the South Quarry Pit. Sector 1 had none, Sector 2 had four, Sector 3 had two, Sector 4 had five, and Sector 5 had three. The base of smaller structures generally terminated at the Bx/Ld contact, with larger structures propagating to the base of the Ls (Golder 1996).

3.1.3.2 UNCONSOLIDATED SEDIMENTS AND MATERIALS

Unconsolidated sediments at the Site are primarily Missouri River Alluvium and aeolian loess. Missouri River Alluvium is present to the north and west of the edge of the alluvial valley (Figure 3-5). Loess forms the bluffs and hills to the east and south. An alluvium isopach map is included in Appendix H.

3.1.3.2.1 ALLUVIUM

Alluvium at the Site is variable in thickness ranging up to approximately 120 feet and is generally present above 330 ft bgs. Deposits consist primarily of sand and gravel interbedded with minor silt and clay present at shallower depths less than 25 ft bgs or above 430 ft msl and are interpreted to be deposited as glacial outwash, point bars, natural levees, filled channels, swamps, lakes, overbank deposits, and small channels. The depositional environment resulted in rapid termination of the alluvium both vertically and horizontally (B&M 1986). Fining upward sequences typical of fluvial depositional environments are present within an overall fining upward sequence. Historic cross sections are included in Appendix E.

Alluvial cross sections and interpretations were updated during preparation of this Work Plan based on EPA guidance on environmental sequence stratigraphy to identify preferential flow and flux pathways. These updated cross section locations are shown on Figure 3-2 and cross sections are shown on Figure 3-3 and Figure 3-4. Alluvium is more uniform and correlatable at elevations between 400 ft msl and bedrock due to channel scour and regrading of sediment after deposition (B&M 1986; NRC 1989). Alluvium has historically been divided into three separate units based on the hydrostratigraphy. These units are apparent on the cross sections and are described in the following subsections.

Deep alluvium is present from approximately 330 ft msl to 385 ft msl, is roughly 55 feet thick, and consists of fining upward sequences of coarse gravel to coarse sand likely deposited as point bars during the rapid channel infill of the Missouri River Valley. Color ranges from gray to brownish and greenish gray, which is consistent with mineralogic descriptions of predominantly quartz with feldspar and some mafic minerals. Deep alluvium was generally documented as subrounded with little to no presence of fines.

DRAFT

Intermediate alluvium is present from approximately 385 ft msl to 415 ft msl and averages about 30 feet thick. It is less uniform than the deep alluvium consisting of fining upward point bar sequences of coarse gravel through fine sand with some overbank flood plain type deposits of silt and clay present at the edge of the alluvial valley. Color is generally described as gray, brown, dark gray, or olive gray and mineralogic descriptions are consistent with the deep alluvium.

Shallow alluvium is present above the intermediate alluvium from approximately 415 ft msl with variable thickness up to the top of the alluvium or where it has been disturbed by landfilling. The water table is generally present in the shallow alluvium. Shallow alluvium ranges predominantly from medium-grained sand to clay with lenses of gravel and coarse-grained sand. Sand in the shallow alluvium is generally described as gray and mostly quartz with some mafic minerals present. Silty clay is present above 430 ft msl (~ upper 10 ft), which was deposited during Missouri River floods as overbank deposits.

3.1.3.2.2 LOESS

The upland loess consists of windblown silt, clayey silt, and silty loam. Surficial loess generated during Pleistocene glaciation was transported from glacial melt-out drainages by westerly winds and redeposited near the Site approximately 17,500 years ago (Heim 1961). The variable thickness is controlled by both surface erosion and bedrock topography and is generally thinner than floodplain alluvium. A soil profile of loess is included in Appendix I and is generally described as pure silt overlying clayey silt up to approximately 80 ft thick near the Site. Loess is encountered from 13 to 22 ft thick on the eastern side of the Bridgeton Landfill at an elevation of approximately 460 ft msl. Loess is not common above the alluvium on the western side of the Bridgeton Landfill but is occasionally interbedded with the underlying alluvium.

3.1.3.2.3 SOILS

Surficial soils along the floodplain of the Missouri River generally consist of Blake-Eudora-Waldron association while the surficial soils on the bluffs east of the river are the Urban Land-Harvester-Fishpot association. The floodplain materials are described as nearly level, somewhat poorly drained to well drained, deep soils formed in alluvial sediment. The upland materials are urban land and nearly level to moderately steep, moderately well drained to somewhat poorly drained, deep soils formed in silty fill material, loess and alluvium which are formed on uplands, terraces, and bottom lands (EMSI 2018a).

Soils in the area of the Site consist of the Freeburg-Ashton-Weller association, which are nearly level to gently sloping, somewhat poorly drained, deep soils formed in loess and alluvial sediment. The Freeburg silt loam is found on the

DRAFT

terrace adjacent to the eastern Site boundary, while the Ashton silt loam is found to the east and south of the South Quarry portion of the Bridgeton Landfill (including the landfill borrow area).

3.1.3.2.4 SOLID WASTE AND LANDFILL LINER

Solid waste is present above the alluvium west of the alluvial divide and in the North and South Quarry Pits of the Bridgeton Landfill. Solid waste was well characterized in the OU-1 RIA and primarily includes municipal refuse, C&D fill, and associated soil cover. The depth and configuration of the landfill deposits varies between each of the various areas of prior landfilling activities. The amount of variation depends in part upon the pre-landfill topography and the effects of pre-landfill disturbances (e.g., mining activities), the amount of above-grade disposal that took place, and the type of waste materials disposed. Landfill debris thickness is variable between 5 to 56 feet, with an average thickness of 36 ft in Area 1 and 30 feet in Area 2 (McLaren/Hart 1996). No liner is present beneath the northwestern portion of landfill and waste may have been placed directly on the ground surface. Areas 1 and 2 are both in this unlined above-ground former landfill. A layer of compacted clay was placed beneath the Inactive Sanitary Landfill as a liner to prevent downward movement of leachate (NRC 1989).

Solid waste materials encountered in OU-2 were described as common municipal wastes such as paper, plastics, clothing, and C&D debris. Older wastes were predominantly wood, construction debris, and other charred materials (Golder 1996; WMC 1997). Old mine spoils overlain with silt were also encountered in OU-2 (Golder 1996).

3.1.4 LOCAL HYDROLOGY AND CLIMATE

The major hydrological feature of importance near the Site is the Missouri River. The present Missouri River channel is approximately two miles west/northwest of the Site and has a surface slope of approximately 0.00018 ft per foot (Golder 1996). The USGS stream gauge 06935965 at St. Charles Missouri is located approximately 1.5 miles northwest of the northwest corner of Area 2, as shown on Figure 3-6, and has a surveyed elevation of 413.47 ft msl North American Vertical Datum 1988 (NAVD88) and a drainage area of approximately 524,000 square miles. Precipitation data from the National Oceanic and Atmospheric Administration (NOAA) gauge at Lambert Field (Figure 3-6) are also shown on Figure 3-7.

Daily Missouri River stage and flow data since October 1984 were downloaded from the USGS website. A hydrograph of the Missouri River elevation and daily precipitation is shown on Figure 3-7. Average flow in the Missouri River has been approximately 75,000 cubic feet per second (cfs) since October 1984 and generally ranges between approximately 25,000 cfs (420 ft msl) in December/January and 300,000 cfs (450 ft msl) in May/June. Peak flow occurred on August 1, 1993 with a stage of 452.91 ft msl. The Missouri River is in direct communication with the Missouri River

DRAFT

alluvium and the measured stage affects groundwater levels. The immediate impact of the Missouri River on regional and local horizontal and vertical groundwater gradients at the Site is not well understood and will be characterized during this RI/FS.

The Earth City Levee system ponds are to the west and northwest of the Site, as shown on Figure 1-2. A piezometer network pumps water into the ponds as needed to maintain the integrity of the levee during flooding. The Earth City Levee system is designed to exceed the 500-year flood level and ranges from 462.03 ft msl at the south end to 459.34 ft msl at the north end. Assuming a 500-year flood were to occur, the Missouri River would be three to seven feet below the top of the Earth City levee. Most of the landfill property boundary is outside the Missouri River 500-year floodplain, with the exception of low-lying areas, the Buffer Zone, and Lot 2A2 that are within the area protected by the Earth City Levee system. The interaction between the Earth City Levee system ponds and the Site (if any) are not well understood at this time and will be characterized during this RI/FS.

Climate at the Site is typical of the midwestern United States and has four distinct seasons ranging from mild winters to hot summers with high humidity (NRC 1989). Daily on-Site precipitation data were collected and compared to Lambert Field with good correlation (Golder 1996). Precipitation data for Lambert Field are shown on Figure 3-7 and are included in Appendix J. Precipitation directly affects the Missouri River stage, infiltration, and localized recharge due to runoff from bluffs. Beyond the covered Bridgeton Landfill, the only water available to leach through refuse is precipitation. Approximately half of the approximately 34 inches of precipitation that falls annually in the level northern portion of the landfill beyond the covered Bridgeton Landfill is estimated to infiltrate. Surface water drainage patterns are included in Appendix K.

DRAFT

3.1.5 LOCAL HYDROGEOLOGY

The Site-specific aquifers consist of the Missouri River Alluvial Aquifer and the Post-Maquoketa and Ozark bedrock aquifers. Given the location of the Site on the margin of the Missouri River Valley, a significant aquifer boundary occurs along the bedrock interface, between bedrock groundwater within St. Louis and Salem formations (east side of the Site and below the alluvium) and shallow groundwater within the Missouri River Alluvial Aquifer (west side of the Site).

The Missouri River Alluvial Aquifer is unconfined and occurs within highly-permeable alluvial sediments within the Missouri River Valley, which can be up to approximately 150 feet thick (MDNR 1997). The aquifer underlies the Missouri River floodplain, which is generally two to three miles wide in St. Louis County. The shallow aquifer is a very important and widely-used water source in Missouri and the hydraulic conductivity of the most permeable sand

and gravel zones is likely on the order of 1,000 feet per day (ft/day). In many places, the upper 20 to 30 feet of alluvium consist of low-permeability materials.

In much of the central, eastern and northern parts of St. Louis County, only the Mississippian-age limestones, including the St. Louis, Salem and Keokuk-Burlington limestones, produce usable quality water and are capable of yielding several gallons of water per minute (MDNR 1997). Collectively, these water-bearing units are referred to as the post-Maquoketa Aquifer, which is an independent, water-yielding unit on the northeast edge of the Ozark Plateau. The thick shale in the upper portion of the Warsaw Formation (up to 60 feet thick based on logging at nearby private well 005322, located approximately one mile southwest of the site) is generally impervious to groundwater flow and represents a lower confining unit within this portion of the post-Maquoketa Aquifer.

The underlying Ozark Aquifer generally occurs within Ordovician and older bedrock units within the Salem Plateau, which extends across central and southern Missouri (MDNR 1997). Though the Ozark Aquifer is undoubtedly the most important aquifer in the Salem Plateau and yields potable water in the southern and extreme western portion of St. Louis County, groundwater quality quickly deteriorates to the northeast and becomes too highly mineralized for use.

Over 130 monitoring wells and piezometers have previously been installed at, and near, the Site. Wells are screened in the Keokuk Formation, the lower portion of the Salem Formation, the upper portion of the Salem Formation/St. Louis Formation, or the Missouri River Alluvium. Wells and piezometers have been monitored since 1979 to evaluate the groundwater quality near the Site, and the local hydrogeology. Current status and construction documentation of wells installed during prior Site investigations is shown on Table 3-2 and Figure 3-8. The adequacy, usability, and status of existing and abandoned on-Site and perimeter monitoring wells and associated data will be evaluated during this RI/FS. Details of this evaluation are discussed in Section 4.1.

Local hydrogeologic descriptions are consistent with the terminology of the local geology and are separated by consolidated and unconsolidated deposits. Monitoring well zones were reviewed during development of the preliminary CSM. Hydrostratigraphic zones of monitoring wells were reclassified based on the environmental sequence stratigraphy evaluation conducted during development of the preliminary CSM and elevation of the screened interval (Table 3-2). Important features that affect the local hydrogeology are the local geologic boundaries, the North and South Quarry Pits, and the various sources of recharge and discharge. Important sources of recharge and discharge include precipitation, the Missouri River, quarry dewatering, the Bridgeton Landfill leachate extraction system, and quarry wall seeps.

DRAFT

3.1.5.1 GROUNDWATER OCCURRENCE

The bedrock aquifers of interest at the Site include the Salem Formation and the St. Louis Formation. The St. Louis and Salem Formations are both unconfined and the Warsaw Formation serves as a confining unit to the Keokuk Formation. The Keokuk Formation is isolated from the overlying St. Louis and Salem Formations as evidenced by water levels from wells screened in the different units and the lack of response in the Keokuk Formation to localized pumping in the overlying strata. Mississippian limestone at the Site has low intergranular permeability when undisturbed and groundwater flow predominantly occurs through secondary porosity (NRC 1989). Secondary porosity of the Salem Formation and St. Louis Formation was likely enhanced by quarrying activities. Connectivity of the secondary porosity is not well understood and will be characterized during this RI/FS.

In general, bedrock aquifers within the Salem Plateau (representing approximately 46 percent of Missouri's potable groundwater), which include the Ozark and post-Maquoketa aquifers, are recharged through precipitation. In addition, the surface and subsurface weathering of carbonates (limestones and dolostones) has created numerous karst groundwater-recharge features such as sinkholes and losing streams that allow very rapid movement of water from the surface into the subsurface. In areas where competent and unweathered bedrock (i.e., non-karst) is exposed at the surface (e.g., immediately east of the Site), recharge from precipitation is minimal and almost all precipitation becomes runoff. The annual average precipitation for the area is about 40 inches per year (in/yr) and yearly recharge rates vary depending on local geology, vegetation, and surface features, and are estimated to range from a few inches to 14 in/yr (MDNR 1997).

The deep, intermediate, and shallow alluvial aquifers are of particular importance to the OU-3 RI/FS. They are separated as defined above based on the hydrostratigraphic properties of each unit. Groundwater is generally encountered near or immediately below the landfill base in the underlying alluvium. The absence of continuous confining units and small vertical gradients in nested wells suggest groundwater in the alluvium is generally unconfined below fine-grained soils, but localized and temporary confining conditions occasionally exist when water levels rise above the base of fine-grained deposits in the shallow alluvium. In general, vertical gradients between wells screened in the shallow, intermediate and deep zones within the alluvium are negligible, indicating these zones are in hydraulic communication and are part of the same hydrostratigraphic zone. Based on previous characterization, the deep alluvium appears to behave as a single aquifer of relatively homogeneous high permeability that decreases near the bedrock valley walls and edge of the alluvium.

Recharge to the Missouri River Alluvial aquifer occurs by upward movement of groundwater from underlying bedrock near the margins of the alluvial floodplain, major river-aquifer interaction, gradual downward infiltration of water from precipitation, seepage from upland loess, and from downward infiltration of water from streams flowing across the

DRAFT

alluvium (Miller et al. 1974; USGS 1986; MDNR 1997). Streams and underflow are a major source of recharge and radial mounding is observed where they enter the floodplain. A filled oxbow lake is present in the alluvium along the southwest landfill boundary.

The potentiometric surface of bedrock aquifer units adjacent to the Missouri River is normally above the potentiometric surface of the alluvial aquifer. Therefore, under natural conditions, there is groundwater flow from bedrock into the alluvium. Water from the Missouri River generally recharges the alluvium under two conditions: (1) when the river is at flood stage and above the elevation of the potentiometric surface and (2) where high-yield pumping wells are constructed close enough to the river to induce direct recharge from the river to the well (Miller et al. 1974; MDNR 1997). The amount of recharge from precipitation and from streams flowing across the alluvium is largely dependent on the local permeability of the shallow alluvial materials, which can be variable.

There is a direct hydraulic communication between the stage of the Missouri River and groundwater levels in the alluvium, although there is a delayed response of several days between higher river stages and higher groundwater levels (MDNR 1997). Seasonal river stages are associated with the gradual rise in groundwater levels in early spring through summer and the gradual decline of water levels during the fall and winter months. Similarly, a strong correlation has been observed in site water levels in alluvial wells when compared with river stage and precipitation over time, as expected for an unconfined system. Increases in alluvial water levels are matched by increases in river stage and precipitation, as a result of recharge to the alluvium by river water and precipitation.

3.1.5.2 AQUIFER TESTING

Various aquifer tests have been conducted in select monitoring wells and boreholes at the Site during previous Site investigations. In-situ aquifer testing includes slug testing and packer testing. Available slug testing results are included as Table 3-3 and shown on Figure 3-7. Packer testing results are included as Table 3-4 and shown on Figure 3-10. Aquifer testing evaluations completed during previous Site characterization are included as Appendix L and include results of ex-situ laboratory testing results. Aquifer properties, including recharge/discharge rates and hydraulic conductivities, were identified as a data gap in the SOW. Additional characterization will be conducted during this RI/FS. Results of existing data are discussed below.

3.1.5.2.1 SLUG TESTING

Slug testing was conducted in completed monitoring wells installed in the Keokuk Formation, the Salem Formation, the Upper Salem Formation/St. Louis Formation, the deep alluvium, the intermediate alluvium, and the shallow alluvium during various stages of the OU-1 and OU-2 Site characterization. A total of 77 slug tests were conducted by Golder

DRAFT

and McLaren Hart. Slug testing procedures were discussed in the OU-1 and OU-2 RI and were generally conducted using a rising head test. A minimum, maximum, and geometric mean of slug tests by zone are presented on Table 3-3. Geometric means were calculated using one rising head slug test from each location; falling head slug tests were used if a rising head test was not available.

Hydraulic conductivity results for slug testing of the shallow alluvium ranges from 0.35 to 97 feet per day (ft/day) with a geometric mean of 8.9 ft/day; intermediate alluvium ranges from 0.39 to 189 ft/day with a geometric mean of 49 ft/day; and deep alluvium ranges from 4.6 to 251 ft/day with a geometric mean of 59 ft/day. Results of slug testing in the alluvium are consistent with grain size trends and increase with depth. As shown on Figure 3-9, the lowest hydraulic conductivities in the alluvium were measured adjacent to the edge of the alluvium and are likely influenced by overbank deposits.

Hydraulic conductivity results for slug testing of the bedrock units are generally orders of magnitude lower than those of the alluvium with the exception of PZ-202-SS and are therefore presented with scientific notation. Well PZ-202-SS is located near one of the seeps discussed in Section 3.1.5.7 and therefore could intersect a highly transmissive fracture. Hydraulic conductivity of the St. Louis Formation ranges from 6.5×10^{-5} ft/day to 7.8×10^{0} ft/day with a geometric mean of 3.7×10^{-3} ft/day; the Salem Formation ranges from 2.4×10^{-4} ft/day to 4.2×10^{-2} ft/day with a geometric mean of 1.9×10^{-3} ft/day; the Keokuk Formation ranges from 1.7×10^{-3} ft/day to 1.1×10^{-2} ft/day with a geometric mean of 5.8×10^{-3} ft/day. Results are consistent with a low intergranular permeability of the Mississippian limestone and suggest that flow in competent rock at the Site occurs primarily through secondary porosity such as fractures and solution cavities.

DRAFT

3.1.5.2.2 BOREHOLE PACKER TESTING

Single and straddle constant head injection packer testing was conducted as part of Site characterization activities in 1995 and 1996 prior to construction of piezometers (Golder 1996). Single packer testing was conducted on intervals ranging from 10 to 93 ft. Straddle packer tests were generally conducted on 5-foot intervals. Intervals were selected for packer testing based on degree of fracturing and degree of porosity and isolated to provide a range of hydraulic conductivities. Results of borehole packer testing are presented on Table 3-4 and are plotted with fractures per foot on Figure 3-8.

Hydraulic conductivity of the St. Louis Formation ranges from 1.0×10^{-3} ft/day to 1.2×10^{-2} ft/day with a geometric mean of 2.7×10^{-3} ft/day; the Salem Formation ranges from 1.6×10^{-4} ft/day to 7.2×10^{-2} ft/day with a geometric mean of 4.6×10^{-3} ft/day; the Warsaw Formation ranges from 7.3×10^{-4} ft/day to 1.6×10^{-1} ft/day with a geometric mean of 5.5×10^{-3} ft/day; the Keokuk Formation ranges from 2.2×10^{-3} ft/day to 1.2×10^{-1} ft/day with a geometric mean of

2.8 x 10^{-2} ft/day. Geometric means of packer tests are slightly higher than slug tests conducted in the same Formation. This is another line of evidence that flow in competent rock at the Site occurs primarily through secondary porosity such as fractures and solution cavities.

3.1.5.2.3 LABORATORY TESTING

Laboratory testing at the Site was historically conducted using a triaxial permeability test method. Results are shown on Table 3-5. The mean vertical permeability of the two rock cores from the Warsaw Formation (PZ-106-KS GTS-1 and PZ-106-KS GTS-2) was 6.4 x 10^{-7} ft/day suggesting it acts as a confining aquitard. Undisturbed samples near surface soils and loess had much higher conductivity values ranging from 5.7 x 10^{-4} ft /day to 8.5 x 10^{-1} ft /day.

3.1.5.2.4 AQUIFER PROPERTIES OF SOLID WASTE

The overburden depth of landfill materials in the North Quarry and South Quarry (about 180 feet and 275 feet, respectively) is much greater than landfill materials in OU-1 Area 1. Therefore, the hydraulic conductivities are expected to be much lower for landfill materials near the bottom of the former pits. Reported values of hydraulic conductivity of aged municipal waste vary with respect to overburden stress, such that an overburden stress of 500 kilopascals (kPa) is associated with a measured hydraulic conductivity in the range of 5x10-6 centimeters per second (cm/s) (Powrie et al. 2005; Reddy et al. 2009). The saturated landfill materials in the deepest portions of the Bridgeton Landfill may have approximately 500 to 600 kPa of overburden stress, which corresponds to an expected range of hydraulic conductivity on the order of 1x10-5 to 1x10-7 cm/s. Hydraulic properties of landfilled material remain a data gap to be addressed by this OU-3 RI/FS.

3.1.5.2.5 TRANSMISSIVITY

Transmissivity of the alluvium was calculated using the geometric mean of conductivity and the thickness of each hydrostratigraphic zone. Transmissivity of the shallow alluvium assumes an average ground surface elevation of 450 ft msl, resulting in a thickness of 35 feet and transmissivity of approximately 310 ft^2/day. Transmissivity of the intermediate alluvium is approximately 1,500 ft^2/day. Transmissivity of the deep alluvium is approximately 3,300 ft^2/day. These data confirm the deep alluvium is the most transmissive hydrostratigraphic zone at the Site.

3.1.5.3 GROUNDWATER ELEVATIONS AND GRADIENTS

Water levels/groundwater elevations have been measured at the Site since 1979. Historical data has been measured relative to several different datum, and thus required conversion to a single standard to make a meaningful evaluation of gradients at the Site. Measuring point elevations and groundwater elevations were converted to NAVD88 based on the conversion in the RIA and are included in Appendix M. Depth to water measurements or groundwater elevation

DRAFT

data used to populate the database are also included in Appendix M. Potentiometric surface maps from previous OU-1 and OU-2 reports are included as Appendix N. Potentiometric surface maps were prepared during preparation of this Work Plan for October 1984 and April 1985, which were among the first comprehensive Site-wide gauging events conducted post RIM placement to evaluate groundwater flow direction seasonally and are included as Figures 3-11 and 3-12, respectively. Potentiometric surface maps were also prepared for April 2013 and September 2013, which were among the most recent comprehensive Site-wide gauging events and are included as Figures 3-13 and 3-14, respectively. Groundwater elevations and gradients are discussed below.

3.1.5.3.1 GROUNDWATER ELEVATIONS

Depth to groundwater generally ranges from approximately 10 to 60 ft bgs and is dependent on the Site topography. The water table in floodplain deposits is generally within 10 ft of ground surface. Hydrographs are included in Appendix O. Groundwater elevations are generally highest during spring or summer and are influenced by topography, the Missouri River stage, precipitation, surface run-on, infiltration, and groundwater/leachate extraction. Groundwater elevation fluctuations in the alluvium mimic the Missouri River stage but are subdued and delayed. A groundwater mound is often observed near monitoring wells S-75, S-76, and I-73 where recharge occurs. Monitoring well I-50 is partially confined at times. Perched water has been observed in monitoring well S-80, two soil borings advanced in Area 1, and nine soil borings advanced in Area 2. Locations of perched water encountered during the RIA are included as Appendix P. The presence of perched water was not evaluated for OU-2 during preparation of this Work Plan. The temporal variability in groundwater levels and flow direction and effects of the Missouri River stage and precipitation were previously identified as data gaps and remain key objectives of the proposed RI/FS activities.

3.1.5.3.2 HYDRAULIC GRADIENTS

During normal flow conditions for the Missouri River, groundwater gradients in the Missouri River alluvium are towards the river with a vector of about 45 degrees in the downstream direction (MDNR 1997). Regionally observed gradients are typically gentle and on the order of 1 to 2 feet per mile. During temporary river flood stage, sustained high river stages or in the vicinity of high-yield alluvial pumping wells, groundwater gradient reversals can occur under losing conditions, where groundwater flow is away from the Missouri River (Miller et al. 1974). The average Missouri river stage is approximately 430 feet msl (2000 to present), and depending on the year and season, the river stage can fluctuate by as much as 10 vertical feet.

Groundwater in the alluvial aquifer in the vicinity of the Site generally flows to the northwest. The current leachate collection system discussed in Section 3.1.5.7.2 is of significant hydrogeologic importance as it directly affects groundwater levels, hydraulic gradients, groundwater flow directions, groundwater flux, and the overall water balance

DRAFT

between precipitation recharge and groundwater inflow and outflow from the Site area. Additional details regarding the hydrogeology of the Site and the effects of the leachate collection system on groundwater will be further evaluated as part of this RI/FS.

The water table across the Site has a low horizontal gradient that ranged between 0.0003 and 0.0005 feet per foot (ft/ft) in July 2013. This is consistent with the previously measured (1979) regional gradient of 0.0006 ft/ft (B&M 1986). Groundwater elevation fluctuates seasonally in direct response to the Missouri River stage and precipitation amounts. Variable hydraulic gradients are induced by the Missouri River Bedrock Channel and influenced by River stage with groundwater superimposed mounds and depressions influencing shallow water table gradients as shown on potentiometric surface figures in Appendix N. As documented in previous reports, small scale changes in water table gradient and flow direction are observed due to recharge and infiltration with macro effects towards the Missouri River. Water levels in the deep alluvium appear to respond more rapidly to the Missouri River stage. A horizontal gradient beneath Area 1 to the South toward the Bridgeton inactive sanitary landfill and to west-southwest beneath Area 2 towards the Earth City flood control channel was documented in the OU-1 RI (McLaren/Hart 1996). This can be observed on Figure 3-12.

Observations of downward vertical gradients have been made near the bedrock valley walls (B&M 1986). A downward component of flow has also been observed in southeast near wells D-81 and D-89. Monthly measurements appear to have been adequately spaced to detect significant changes in water table elevations. Therefore, monthly water level gauging will be conducted during implementation of this RI/FS. Contour patterns and flow patterns are generally the same seasonally. Localized shallow mounding has been observed due to pumping from the North and South Quarries to drainage ditches, surface water infiltration, and storage ponds nearby. Mounding is also affected by variable permeability.

The bedrock aquifers in the St. Louis area are confined and bedrock wells are often flowing artesian, where the hydrostatic pressure in these aquifers raises the water level in the well above the ground surface (Miller et. al. 1974). During periods of no or low groundwater extraction, groundwater in bedrock (including the St. Louis, Salem, and Keokuk formations) has a natural upward and horizontal gradient towards the alluvium and Missouri River, which is typical of a low valley groundwater discharge system. However, the effects of pumping in the landfill are evident in the St. Louis and upper Salem formations, where there is an observed strong correlation between bedrock water levels with groundwater pumping rates. Increased pumping results in lower water levels and greater downward gradients in the St. Louis and upper Salem formations; decreased pumping results in the recovery of water levels to regional water levels and a natural upward gradient. Water levels for the deeper Keokuk-Burlington Formation indicate minimal influence from pumping, likely as a result of upper confinement from the overlying Warsaw Shale. The water levels in

DRAFT

the Keokuk-Burlington Formation are significantly higher than the St. Louis and upper Salem formations with consistent upward vertical gradients for all historical events. However, regional and localized hydraulic gradients and flow directions between alluvial and shallow bedrock aquifers are a data gap and will be evaluated in more detail as part of this RI/FS. Previous summaries of vertical gradients are included in Appendix Q. Historic potentiometric surface maps will be revised based on the updated hydrostratigraphic zone classifications and presented in the updated and refined CSM. Temporal and seasonal trends will be discussed in more detail.

3.1.5.4 GROUNDWATER VELOCITY AND DISCHARGE

Horizontal groundwater velocities of the shallow, intermediate, and deep alluvium were approximated using the ranges of hydraulic conductivities from slug testing data, a regional hydraulic gradient of 0.0006 ft/ft, and an assumed effective porosity of 0.15 for the shallow alluvium and 0.2 for the intermediate and deep alluvium. Groundwater velocity results for groundwater velocities in the shallow alluvium ranges from 0.5 to 142 feet per year (ft/year) with a geometric mean of 13 ft/year; intermediate alluvium ranges from 0.43 to 208 ft/year with a geometric mean of 53 ft/year; and deep alluvium ranges from 5.0 to 274 ft/year with a geometric mean of 65 ft/year. Results suggest that horizontal flow in the alluvial aquifer is relatively uniform.

Horizontal groundwater velocities of the St. Louis Formation, Salem Formation, and Keokuk Formation were also approximated using the ranges of hydraulic conductivities from slug testing data, a regional hydraulic gradient of 0.003 ft/ft, and an assumed effective porosity of 0.008. Groundwater velocity results for groundwater velocities in the St Louis Formation ranges from 0.01 to 1,065 feet per year (ft/year) with a geometric mean of 0.505 ft/year; Salem Formation ranges from 0.034 to 5.7 ft/year with a geometric mean of 0.27 ft/year; and the Keokuk Formation ranges from 0.24 to 1.5 ft/year with a geometric mean of 0.80 ft/year. Groundwater velocities in the bedrock are generally lower than those in the alluvium. However, groundwater velocities in features such as fractures and solution cavities are likely much higher.

Groundwater discharge was estimated as part of the 1986 evaluation based on Darcy's law using average permeabilities and flow rates for the upper (shallow and intermediate alluvium) and lower aquifers (deep alluvium). Results across the cross-sectional area on the northern and western perimeters were 500 gallons per day (gpd) in the shallow aquifer and 400,000 gpd in the deep aquifer. Eastward flow estimated at 43,000 (gpd) was pumped from filled quarry leachate collection system, treated, and discharged to sanitary sewer (B&M 1986). Additional evaluation of groundwater velocity and discharge will be conducted during the RI/FS based on results of additional aquifer testing and hydraulic gradient evaluations as discussed in Section 5.4.13.

DRAFT

3.1.5.5 SURFACE WATER/GROUNDWATER INTERACTION

Staff gauges were previously installed at the Site as part of OU-1 and OU-2 Site characterization. Surface water elevations are shown on in Appendix K and locations are shown in Appendix B. The relationship between surface water and groundwater at the Site is not fully understood. Additional staff gauges will be installed, and further characterization will be conducted during the RI/FS to address this data gap and is discussed in Section 5.4.15.

3.1.5.6 GROUNDWATER GEOCHEMISTRY

Understanding groundwater geochemistry at the Site remains one of the most critical components of the CSM and was identified as a data gap by the USGS. Various factors can affect the oxidation-reduction (redox) conditions and groundwater pH, including the presence of landfill leachate and precipitation. The common geochemical redox conditions and species, and reactive minerals (Fe/Mn oxyhydroxides, clay minerals, and solid organic materials) typically associated with landfills, can influence radionuclide transport via exchange-adsorption/desorption and precipitation/co-precipitation or dissolution over time scales on the order of seconds to months.

High dissolved iron, low sulfate, and low uranium concentrations noted in prior Site investigation activities suggested anoxic groundwater that is iron and possibly sulfate reducing exists beneath the Site. Combined dissolved radium concentrations were significantly higher in wells impacted with leachate (USGS 2015). A preliminary evaluation of historical groundwater geochemistry parameters, redox couples, and organic content was completed prior to preparation of this proposed RI/FS scope of work. Upon gathering additional data during proposed field activities, a detailed evaluation will be completed and provided in the Annual Hydrogeologic Investigation and Site Characterization Report. It will include spatial and temporal evaluations of field parameters; stiff diagrams and piper diagrams; redox conditions; pH; leachate indicators including chloride, bromide, and iodine; and chemical equilibrium. Existing figures from the USGS report and RIA are included as Appendix R.

3.1.5.7 EFFECTS OF THE BRIDGETON LANDFILL

Quarrying in the North and South Quarry Pits of the Bridgeton Landfill began in 1939. Effects of quarry dewatering, the Bridgeton Landfill related infrastructure, and hydraulic characteristics of landfill material are also an important component of the CSM and are a data gap. Additional evaluation will be conducted during this RI/FS to address this data gap. A preliminary evaluation was, however, performed as part of this RI/FS Work Plan preparation, and effects of the quarry and the Bridgeton Landfill are discussed below.

DRAFT

3.1.5.7.1 QUARRY DEWATERING

Prior to landfilling in the North and South Quarry Pits, the open quarry required dewatering. Water would enter the quarry via direct precipitation, runoff, and through seeps. Seeps were mapped as part of a water balance conducted by Reitz & Jens, and a volumetric flow through the seeps were documented (Appendix E). Seeps were also mapped on the South Quarry Pit open faces during OU-2 Site characterization (Appendix E). Quarry faces had 88 seeps observed. Many seeps were observed above the Bx/Ld contact and then within the Ld unit. Seeps were generally observed above the Ls unit of the St. Louis Formation, suggesting it might be less transmissive (Golder 1996). Attempts were made to seal the cavities and seeps in 1990 but those efforts appeared to be unsuccessful (F&VD 1990).

Leachate was observed to be migrating vertically through the alluvium into the South Quarry through more than 98 feet of limestone and entering the quarry at approximately 220 ft msl. Blasting activities performed during quarrying may have propagated fractures in the walls up to 30 ft horizontally beyond the quarry face. It is, however, unlikely the fractures would have extended beyond this point. Although unlikely, the noted leachate inflow may suggest landfill-related impacts extending into the limestone aquifer. While transport of leachate through solution channels in the limestone is also possible, quarry operators maintained the limestone is intact. Evidence of karst (solution) activity was limited on quarry walls with minor widening of joints and bedding planes near the bedrock surface (NRC 1989).

3.1.5.7.2 LEACHATE COLLECTION SYSTEM

The Bridgeton Landfill leachate collection system is of significant hydrogeological importance, since it is designed to remove (capture) surface water and groundwater flowing into the landfill and thus could create a sink to surrounding aquifers. Evaluation of historical potentiometric data demonstrate it has exerted hydraulic control over a large portion of the landfill. During periods of low pumping, the groundwater divide moves east, closer to the western pit wall of the Permitted North and South Landfill, and groundwater levels return to regional conditions with flow toward the Missouri River on the west side of the divide. Conversely, during periods of heavy pumping, the groundwater divide moves west, where it eventually contacts the alluvium-bedrock interface, but does not extend into the alluvium due to the large contrast in hydraulic conductivity.

Leachate collection sumps are fitted with pumps designed to maintain a maximum of 30 ft leachate head. During operation, Bridgeton Landfill historically pumped and discharged approximately 200,000 gpd (approximately 6 million gallons per month) of leachate to a lined and aerated leachate retention pond (WMC 1997). Groundwater was observed to flow inward from all sides of the Bridgeton Landfill towards the leachate collection sumps and a resulting groundwater divide was created in the alluvium, west of the quarries (Golder 1996). This can be seen on the potentiometric surface maps included as Appendix N.

DRAFT

The current leachate collection system was constructed at Bridgeton Landfill between April 2013 and August 2014. The 316 Tank was built first in April 2013. The 1 million-gallon aeration tanks were started in September 2013, the building construction was started in December 2013, the start-up procedures began in June 2014, and the biological system startup/shakedown was August 2014. The system includes five (5) above ground storage tanks; a 316,000 gallon and four (4) 1 million-gallon tanks. The leachate system treatment train includes the following: solids removal, polymer addition/flocculation, pH adjustment, and biological treatment. Seven (7) leachate collection system extraction wells or LCS wells currently exist; the wells have flow meters which monitor the amount of leachate extracted from each individual wellhead.

One totalizer flow meter and discrete flows from operating extraction wells currently measure the aggregate volume pumped by the leachate collection system active at Bridgeton Landfill; note that not all of the leachate collection sumps are currently operational. The current monthly amount of leachate generated during 2018 ranged from 1.8 to 3.3 million gallons (approximately 60,000 to 110,000 gpd). Additional measures to better quantify and understand the effects of the leachate extraction system are proposed in Section 5.4.17, which outlines measures intended to address this data gap.

3.1.5.7.3 SUBSURFACE REACTION

An exothermic SSR started in December 2010 and is currently occurring in the South Quarry portion of the Bridgeton Landfill resulting in elevated temperatures and accelerated decomposition of waste. The reaction appears to be occurring approximately 80 to 150 feet below the South Quarry landfill surface. An ethylene vinyl alcohol (EVOH) cover, landfill gas extraction wells, and temperature monitoring probes have been installed to address the SSR. Recent temperature, gas quality, and settlement monitoring observations suggest the primary heat front of the currently appears to be most active in the southern portion of the South Quarry. The heat front of the SSR appears to have migrated from an initial location in the eastern portion of the South Quarry in a counterclockwise direction to the north, then to the west, and, most recently, to the southern portion of the South Quarry. A heat extraction system has been installed and is currently operating in the neck area between the North and South Quarry portions of the Bridgeton Landfill, and additional temperature monitoring probes have been installed in the North Quarry between the neck area and Area 1 (EMSI 2018a).

3.1.6 NATURE AND EXTENT OF IMPACTS

A clear understanding of background alluvial and shallow bedrock aquifer water quality in the vicinity of the Site remains undetermined and was identified as a significant data gap in the CSM. Analysis of available data relating to nature and extent of impacts is discussed below; this data will be substantially supplemented with the proposed RI/FS

DRAFT

investigation activities. Potential on-Site and off-Site health and environmental effects posed by groundwater impacts will be evaluated upon completion of the field data gathering outlined in Section 6.2 of this RI/FS Work Plan. Additionally, potential surface water, sediment, and biotic impacts from OU-3 will be further evaluated as the RI/FS progresses.

3.1.6.1 NATURE AND EXTENT OF RIM

Radionuclides have been identified in soil interspersed with solid waste materials in portions of the landfill deposits in Area 1 and Area 2. Radionuclides were also previously detected in soil on the Buffer Zone and Crossroads Lot 2A2. The specific screening criteria approved by EPA to define RIM at the Site are:

- **7.9 pCi/g or higher** of combined Radium-226 plus Radium-228;
- **7.9 pCi/g or higher** of combined Thorium-230 plus Thorium-232; or
- **54.5 pCi/g or higher** of combined uranium activity.

Leached barium sulfate residue (LBSR) generated by Mallinckrodt Chemical Works (Mallinckrodt) during uranium processing for the Manhattan Engineering District (MED) was moved from the St. Louis Airport Site (SLAPS) to nearby 9200 Latty Avenue in Hazelwood, Missouri in 1966 (EMSI 2018). An NRC investigation conducted in 1976 reported that approximately 8,700 tons of leached barium sulfate residues, together with approximately 39,000 tons of soil removed from the top 12 to 18 inches of the Latty Avenue site, were transported to the West Lake Landfill over a three-month period from July 16 through October 9, 1973 (EPA 2008a; NRC 1976; NRC 1988; RMC 1982).

The data and evaluations presented in the RIA identified RIM in multiple irregular volumes, some of which are partially at or near the surface, while others are located in the deeper portions of Area 1 and Area 2. The current distribution of RIM within the landfilled areas has been impacted by both natural and anthropogenic processes after the initial placement of the radiological materials. This includes more than 40 years of decomposition, consolidation, and differential settlement of the MSW. As a result, these irregular volumes of RIM consist of soils, putrescible wastes, and demolition wastes, which are often visually indistinguishable from the surrounding materials in the landfill, including both MSW and previously placed intermediate or final cover. RIM is irregularly interspersed within the overall larger matrix of MSW, not found in a thin, continuous layer as the NRC assumed. Additional detail on the nature and extent of RIM was provided in the RIA and is included as Appendix T.

DRAFT

3.1.6.2 NATURE AND EXTENT OF GROUNDWATER IMPACTS

As summarized in the RIA, groundwater samples have been analyzed for radionuclides as part of the various OU-1 investigations. Most recently (2012-2013), groundwater samples intended for radionuclide analysis were collected at 85 monitoring wells. Radionuclides in the groundwater are discussed in terms of the isotopes of three elements: radium, thorium, and uranium. A detailed discussion of the nature and extent of these constituents was presented in the RIA. Figures showing their distribution are included as Appendix U. Radium has been detected in groundwater monitoring wells in most portions of the Site, in both the bedrock and the alluvium. The USGS (2014) identified four general hypotheses for the origin of dissolved combined radium above the MCL in the groundwater including:

- Leaching of radium from the RIM;
- Radium values are within the range found in natural groundwater;
- Leaching of radium from non-RIM wastes disposed at the Site; and
- Mobilization of naturally occurring radium from aquifer solids by some component of landfill leachate.

The USGS further stated that other than the radium in groundwater samples being from the natural variation in groundwater, no single hypothesis can be invoked to explain all the occurrences of radium above the MCL. Furthermore, the available groundwater data are not adequate to provide definitive conclusions regarding the validity of any hypotheses. The fate and transport of radium is complicated by its natural occurrence and association with redox sensitive iron oxides (USGS 2015). Combined total radium-226 and radium-228 was detected above the MCL for all sampling dates between August 2012 and February 2014 in deep alluvial wells D-83, D-6, PZ-113-AD, and D-3, and Upper Salem/St. Louis Formation wells PZ-107-SS, PZ-115-SS, PZ-101-SS, PZ-102-SS and MW-1204. Ratios of radium-228/radium-226 are variable in these wells. Dissolved levels of thorium have not been detected at levels above the Gross Alpha MCL.

VOCS and trace metals have also been detected in groundwater (Appendix U). Benzene has been detected in groundwater monitoring wells located near the South Quarry, the Inactive Sanitary Landfill and Area 1 (but not Area 2) at concentrations above its MCL of 5 µg/L. Chlorobenzene was detected in one well near the Inactive Sanitary Landfill and one well near Area 1 at concentrations above its MCL of 100 µg/L. Vinyl chloride has been detected during some, but not all sampling events in some wells near the Inactive Sanitary Landfill and Area 2. Arsenic has been detected in most of the Site monitoring wells at concentrations above its MCL of 10 µg/L. Iron and manganese have been detected at concentrations above their respective secondary MCLs (300 and 50 µg/L, respectively) in most of the Site monitoring wells. Chloride has also been detected in most of the Site monitoring wells at concentrations above its MCL of 250 mg/L.

DRAFT

Occurrence and extent of groundwater contamination and landfill gas migration is not delineated and is a data gap. Additional evaluation of radionuclide and chemical occurrences in groundwater will be conducted as part of this OU-3 RI/FS.

3.1.7 POTENTIAL PATHWAYS OF CONTAMINANT MIGRATION/PRELIMINARY PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS

A Baseline Risk Assessment was prepared during each of the OU-1 and OU-2 RIs to evaluate the potential receptors, exposure routes, and potential risks that the Site could pose to potential current and future workers at the Site and the general public, including off-Site residential areas. Potential receptors and pathways are presented below.

3.1.7.1 POTENTIAL RECEPTORS

Potential receptors associated with the Site primarily include humans ingesting groundwater and/or ecological receptors ingesting sediment or surface water. A key exposure pathway for potential groundwater at the Site is via nearby potable or production water wells. A partial inventory of existing and abandoned wells (e.g., public water supply wells, monitoring wells, private wells, industrial wells, or commercial wells) and intake structures was completed during the OU-3 planning phase. Receptors identified previously are included in Appendix V. The RIA identified wells in close proximity to the Site – none of which are used for domestic or community supplies. An inventory of existing and abandoned wells within 2 miles of the Site will be conducted during this RI/FS. Information summarizing pertinent OU-3 area boundary features, general Site physiography, hydrogeology, geology, and hydrology were summarized in Sections 2 and 3.

Number and type of ecological receptors has been greatly reduced by development of the surrounding area (WMC 1997). No threatened and endangered (T&E) species are present in project area. Signs of wildlife noted during historic and recent Site/vicinity inspections included deer tracks, rabbits, red-winged black birds, robins, crows, a great blue heron, and stool pellets containing fur suggesting a coyote or red fox (EMSI 1997).

3.1.7.2 EXPOSURE ROUTES AND PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS

Potential exposure routes include ingestion of groundwater, sediment, or surface water containing COCs. Vapor intrusion was identified as a data gap in the SOW and is another potential exposure route for inhalation of radon gas or VOCs. Exposure routes and public health and environmental impacts will be further evaluated in this RI/FS when the nature and extent of off-Site impacts are defined.

DRAFT

3.2 PRELIMINARY OU-3 BOUNDARY

A preliminary boundary estimate of the OU-3 study area that encompasses groundwater at and in the vicinity of the Site is shown on Figure 3-15 and discussed in Section 5.3 with relevant Site features. This will be used to define areas requiring additional efforts, such as access agreements, Site control, and Site security. This initial estimate of the study area will be refined after Phase I Site characterization and as the OU-3 RI/FS progresses.

3.3 PRELIMINARY IDENTIFICATION OF RESPONSE OBJECTIVES AND GROUNDWATER REMEDIAL ACTION ALTERNATIVES

Preliminary response objectives are to prevent human and ecological receptors from ingesting groundwater or surface water with COC concentrations in exceedance of chemical-specific ARARs. The following is a preliminary list of potential remedial action alternatives that may be considered, consistent with applicable Superfund/CERCLA protocols, after data has been collected and analyzed sufficiently.

3.3.1 NO ACTION

The No Action alternatives are normally included and evaluated to determine what the threat would be, based on risk assessment, to human health and the environment. The No Action risk assessment provides a baseline for the comparison of other alternatives. The No Action alternative would not reduce or eliminate exposure to groundwater impacted by COCs, therefore the response objectives would not be met if the groundwater is determined to be impacted. Regardless of the effectiveness of the No Action alternative, the NCP requires the alternative be carried out through the detailed analysis of alternatives.

3.3.2 INSTITUTIONAL CONTROLS

Institutional controls provide limited action consisting of maintaining the existing exiting perimeter Site fencing/warning signs, regular maintenance, deed restrictions, deed notices, covenants, groundwater use restrictions, Site activity use limitations, groundwater monitoring, and five-year reviews.

3.3.3 MONITORED NATURAL ATTENUATION

Monitored Natural Attenuation (MNA) generally consists of monitoring the rate at which natural processes are degrading COCs. The monitoring typically includes a multiple lines of evidence type of approach that supplements COC concentration data with geochemical and other data. Routine quarterly groundwater sampling of OU-3 will collect many useful data that will allow assessment of MNA under current Site conditions. Geochemical conditions will be evaluated during quarterly sampling as well. This will include dissolved oxygen (DO), nitrate, and sulfate

DRAFT

concentration, and also oxidation-reduction potential (ORP). Each of these can be used to determine the potential for oxidative or reductive biological and abiotic attenuation of certain COCs.

3.3.4 GROUNDWATER EXTRACTION (HYDRAULIC CONTROL)/TREATMENT/DISPOSAL

Groundwater control can be achieved via pumping and pre-treatment on-Site for off-Site disposal to a POTW or other treatment facility. Depending upon the COCs determined to be present, groundwater treatment alternatives may include air stripping (volatile organics), carbon adsorption (organics), chemical oxidation (organics), aerobic biodegradation (organics), chemical precipitation (metals), ion exchange (metals) or a combination of the above. Options preliminarily identified for disposal of treated groundwater include discharge to the sanitary sewer system which serves the Site, and/or reinjection after treatment.

3.3.5 GROUNDWATER CONTAINMENT

A groundwater containment scenario would involve capping of the landfilled areas and potentially pumping of groundwater/leachate as necessary to create an inward groundwater gradient to prevent off-Site migration of impacted groundwater. In addition, the effects of the OU-1 remedial action will need to be considered in the short and long term if a containment strategy is implemented.

3.3.6 IN-SITU TREATMENT

Groundwater can be treated in situ to facilitate the attenuation or degradation of dissolved COCs in groundwater. Treatment of dissolved contaminants in situ requires an assessment of groundwater flow, COC concentrations, and Site geochemistry in order to develop a treatment method to break down the contaminants or reduce contaminant mobility. Depending on the COCs present, options for in-situ treatment may include reactive barrier to attenuate the movement of COCs in groundwater and/or injection of chemicals or other amendments to stabilize or enhance degradation of dissolved COCs.

3.4 DATA NEEDS FOR EVALUATION OF REMEDIAL ALTERNATIVES

The investigation will identify existing wells and propose new borings/groundwater monitoring wells to define the physical and geochemical characteristics of the hydrogeologic system, including bedrock units. Sampling and analysis of COCs and other relevant parameters will be performed to assess background groundwater quality and potential downgradient landfill impacts (e.g., geochemical redox indicators, landfill leachate indicators, trace anions, tritium, wastewater organic compounds, and radionuclide isotopic analysis) upon groundwater quality. These data are required to evaluate the identified preliminary remedial alternatives. The specific data needs and data gaps were based upon an

DRAFT

evaluation of previous investigations and were considered when developing the work plan rationale and the additional data acquisition program. Data needs are discussed in detail throughout Section 5.0.

3.5 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section provides the preliminary identification of potential OU-3 ARARs and other relevant guidance and criteria "to be considered" (TBC) for the Site. The preliminary identification of potential ARARs and TBCs will continue throughout the OU-3 RI/FS process as more information is developed. In addition to the ARARs and TBCs described below, the work described in this RI/FS Work Plan will be completed in general accordance with the NCP (40 CFR Part 300).

The detailed discussion of ARARs was included in the OU-1 Final Feasibility Study (FFS) (EMSI 2018b) and modifications and an addendum to the approved FFS per the EPA letter dated February 5, 2018, and the OU-1 ROD Amendment (EPA 2018c). Since OU-3 consists of the landfill complex which includes OU-1 and OU-2, the previously identified ARARs were utilized as a starting point for identifying OU-3 ARARs. Potential chemical-specific and location-specific ARARs and TBCs were also identified based upon review of available Site data. Potential action-specific ARARs and TBCs will be based on the remedial action alternatives to be developed in the OU-3 FS.

The ARARs and TBCs are divided into three categories: chemical-specific, action-specific, and location specific standards as described below:

- Chemical-Specific ARARs are typically health- or risk-based numerical values or methodologies which, when applied to Site-specific conditions, are expressed as numerical values. The values represent cleanup standards (e.g., the acceptable concentration of a chemical at the Site). A list of preliminary Chemical Specific ARARs for OU-3 is presented in Table 3-6.
- Action-Specific ARARs are generally technology- or activity-based requirements or limitations on actions or conditions taken with respect to hazardous substances on the Site. Action-specific ARARs do not typically determine the remedial alternative; however, the ARARs indicate how a selected alternative must be implemented or achieved. A list of preliminary Action Specific ARARs for OU-3 is presented in Table 3-7.
- Location-Specific ARARs are restrictions on the concentrations of hazardous substances or the conduct of activities in certain locations. A list of preliminary Location Specific ARARs is presented in Table 3-8.

DRAFT

4.0 RI/FS WORK PLAN RATIONALE

The remedial investigation will refine the current understanding of the hydrogeologic system and characterize the extent of impacts to groundwater. The collection of data will be prioritized to refine the CSM. These efforts will support an evaluation of risks posed to human health and the environment by releases of contamination to groundwater. Investigation activities will focus on collection of data to adequately update the CSM, and the evaluation of potential risks that support the development of remedial alternatives and their compliance with ARARs.

4.1 DATA QUALITY OBJECTIVES

The OU-3 RI/FS Scope of Work was developed consistent with EPA's "Guidance on Systematic Planning Using the Data Quality Objective Process" (EPA 2006). The data quality objective (DQO) process is designed to clarify the objectives of data collection and maximize efficiency during data collection. It consists of a multi-step, iterative process that ensures that the type, quantity, and quality of environmental data used in the decision-making process are appropriate for the intended application. The following steps were completed as part of the DQO process in accordance with the EPA guidance:

- Define the problem
- Identify the Goals/Decisions of the Study
- Identify Information Inputs
- Define the Study Boundaries
- Develop the Analytical Approach
- Specify Performance or Acceptance Criteria
- Develop the Plan for Obtaining Data

A summary of the step-by-step DQO process followed to develop the scope of work for the OU-3 RI/FS is provided in the QAPP, which is included as part of the SAP (Volume 2). The following sections describe the specific types of information (data) required to achieve the overall goals and objectives of the RI/FS, and the phased approach that will be followed to obtain the data.

DRAFT

4.1.1 DATA QUALITY OBJECTIVES

The DQOs are used to develop the design for data collection. They provide specificity to the framework in which data will be collected and the requirements that data needs to meet in order to meet the general objectives of the OU-3 RI/FS:

- Identify and characterize sources of COCs
- Determine the nature and extent of impacts to groundwater and surface water
- Develop a preliminary OU-3 boundary
- Develop an appropriate groundwater model
- Identify exposure pathways, evaluate current and future human health and ecological risks posed by the COCs present at the Site, and complete a risk assessment in accordance with EPA guidance
- Determine the potential for vapor intrusion
- Develop and evaluate remedial alternatives for the Site

The data needs are described with respect to source area characterization, hydrogeology, groundwater, and surface water. The OU-3 RI/FS is designed to address those data gaps. DQOs are discussed below.

4.1.1.1 STATEMENT OF THE PROBLEM

Elevated concentrations of COCs including petroleum hydrocarbons, VOCs, trace metals, trace anions, and various radionuclides have been found in groundwater. Groundwater samples will be analyzed for these constituents under the OU-3 RI. Data gaps which were identified that will be addressed by the OU-3 RI sample data to characterize the nature and extent of impacts in groundwater and evaluate current and future human health and ecological risks. Data gaps, including the type of data needed to understand each potential issue, are:

- Adequacy, usability, and status of existing and abandoned on-Site and near-Site monitoring wells
- Aquifer properties, including recharge/discharge rates and hydraulic conductivities
- Regional and localized hydraulic gradients and flow directions between alluvial and shallow bedrock aquifers
- Background groundwater quality of alluvial and shallow bedrock aquifers near the Site
- Occurrence and extent of groundwater contamination and landfill gas migration
- Groundwater geochemistry parameters, redox couples, and organic content

DRAFT

- Effects of the Bridgeton Landfill, related infrastructure, and hydraulic characteristics of landfill material on the groundwater system
- Vapor intrusion
- Temporal variability in groundwater levels and flow direction
- Temporal and spatial water elevation effects from nearby surface water features (Missouri River) and storm events

4.1.1.2 IDENTIFY THE GOALS OF THE INVESTIGATION

The goal of the study is to collect sufficient data to address the data gaps, characterize the nature and extent of groundwater impacts for OU-3, and evaluate current and future human health and ecological risks. The goals outlined below pertain to determining the nature and extent of contamination; however, some of these same objectives will also provide valuable fate and transport parameters for evaluation. Goals of this study are to:

1. Refine the current understanding of the Site hydrogeologic system
2. Evaluate background groundwater quality near the Site
3. Determine the extent of groundwater impacts occurring at, and near, the Site
4. Assess the need and efficacy of predictive tools to evaluate potential future impacts
5. Evaluate current and future human health and ecological risks
6. Identify potential groundwater remedies that may be considered at the Site

4.1.1.3 IDENTIFY INPUTS TO THE DECISIONS

Information that will be used in the study includes:

- Previous investigative findings and sampling pertaining to existing surface water features, geology, hydrogeology, and geochemistry. Previous investigation findings and results will be used to the extent possible.
- An adequate and reliable data set for surface water, groundwater, and soil gas collected as needed as part of this RI.
- Static water level measurements and aquifer hydraulic conductivity data from newly installed and accessible existing monitoring wells and piezometers.
- Hydrostratigraphic data from boreholes and newly installed monitoring wells collected as part of this RI.
- Hydraulic and water quality data related to the evaluation of potential impacts to the alluvial and shallow bedrock aquifers

DRAFT

- Media-specific and analyte-specific screening criteria, including:
  - EPA MCLs
  - MDNR and Site-specific Groundwater Protection Standard (GWPS)
- Formation specific aquifer matrix data including total organic carbon and soil bulk density that may be used in the evaluation of contaminant migration.
- Exposure pathways.

A BRA will be conducted to evaluate risk of exposure when the nature and extent of impacts have been defined. DQOs are similar to groundwater. DQOs are discussed below.

4.1.1.4 DEFINE THE BOUNDARIES OF THE STUDY

The initial boundaries of the OU-3 study are shown on Figure 3-15 (discussed in Sections 4.1.2 and 5.0, below). The boundaries of the study will be refined as the nature and extent of impacts are defined. The vertical extent of the study includes the Missouri River alluvium, the St. Louis Formation, and the Salem Formation. The degree to which the alluvial and shallow bedrock aquifers may be evaluated is contingent on a more complete understanding of the nature and extent of impacts. Temporal boundaries include data collected since 1976 and extend through the period of performance of this investigation.

4.1.2 DEVELOP THE ANALYTIC APPROACH (DECISION RULES)

The OU-3 RI/FS will be implemented using a phased approach. Phase I Site characterization will focus on characterizing background conditions, delineating the nature and extent of off-Site impacts, and identifying potential exposure pathways. If the initial Phase I Site characterization activities do not meet those objectives, additional phases of characterization will be conducted until objectives are met. The major decision rules for the Site include:

- The background investigation will be considered complete if data are sufficient statistically to establish background groundwater quality near the Site.
- The nature and extent investigation will be considered complete if the extent of groundwater impacts above analyte-specific screening criteria or background is defined at, and near, the Site.
- Groundwater-surface water interactions will be considered complete if horizontal and vertical hydraulic gradients are characterized near surface water bodies.
- Modeling will be considered complete if predictive tools are sufficient to evaluate potential future impacts.

DRAFT

- The need for vapor intrusion studies will be evaluated once the nature and extent of impacts have been defined and receptors have been identified.
- The risk assessment will be considered complete if current and future human health and ecological risks are understood.
- The need for, and viability of, potential groundwater remedies that may be implemented at the Site will be evaluated when the above bullets are complete.

In the case any of the above are deemed incomplete, additional sampling or information needs will be identified and discussed with EPA for additional Site characterization. Possible Phase II Site characterization activities could include:

- Installation of additional background monitoring wells if data are insufficient to establish background groundwater quality near the Site.
- Installation of additional off-Site monitoring wells if the extent of groundwater impacts is not defined.
- Installation of additional staff gauges if the nature and extent of impacts is not defined and horizontal and vertical hydraulic gradients are not characterized near additional surface water bodies.
- Collection of sediment and surface water samples if impacted groundwater is discharging to surface water.
- Developing additional predictive tools to evaluate potential future impacts.
- Conducting a vapor intrusion investigation if potential receptors are identified within the extent of groundwater impacts.

DRAFT

4.1.2.1 SPECIFY PERFORMANCE CRITERIA

Sampling error and measurement error are associated with environmental data collection and may lead to decision errors. Sampling error occurs when the sample is not representative of the true condition of the environment at a site. Measurement error occurs because of random and systematic errors associated with sample collection, handling, preparation, analysis, data reduction, and data handling. Decision errors are controlled by adopting a scientific approach which uses hypothesis testing to minimize the potential for error.

Site-specific sampling objectives and the inconsistent and unknown pattern of contaminant release over time limit the usefulness of statistical methods to eliminate sampling error. Instead, sampling locations are based on knowledge of Site history, existence of historical infrastructure, and previous sampling data. Limits on sampling decision errors will be minimized by evaluating all known and potential source and surrounding areas. Decision errors based on analytical

data will be minimized by the use of EPA-approved analytical methods and laboratory reporting limits (RLs) that are sufficiently low.

4.1.2.2 DEVELOP THE PLAN FOR DATA COLLECTION

Data will be collected in areas that will yield representative and quality data suitable for decision-making and that meet regulatory agency requirements. The groundwater sampling program uses existing on-Site and near-Site wells and proposes wells in downgradient areas to the extent possible. New wells are required to establish background conditions and to define the downgradient extent of impacts.

The groundwater monitoring design has been optimized by locating proposed monitoring wells offsite and downgradient of suspected sources and/or contaminated areas to evaluate the potential migration of COCs in groundwater. In a limited number of cases, proposed locations for monitoring wells are to provide representative background conditions. Locations of selected monitoring wells are based on strategic review of previous investigative findings and a database report review (ERIS 2019).

DRAFT

5.0 PHASE I SITE CHARACTERIZATION

OU-3 Phase I Site Characterization activities are designed to supplement the existing dataset through the collection of additional data to sufficiently characterize the nature and extent of hazardous substance impacts to groundwater and their potential risk posed to human health and the environment. The resulting data will be used to address data gaps, refine the current understanding of the hydrogeologic system at the Site, evaluate background groundwater quality, determine the extent of groundwater impacts, provide predictive tools/models to evaluate potential future impacts, and identify potential remedies as needed. Ten data gaps identified by the Respondents, EPA, MDNR, and USGS, which are listed in the SOW and RIA, are as follows:

- Adequacy, usability, and status of existing and abandoned on-Site and near-Site monitoring wells and associated data;
- Aquifer properties, including recharge/discharge rates and hydraulic conductivities;
- Regional and localized hydraulic gradients and flow directions within and between the alluvial aquifers and shallow and deep units (upper and lower intervals) of the bedrock aquifer system (Mississippian age);
- Background groundwater quality of aquifers located at and near the Site;
- Occurrence and extent of groundwater contamination;
- Groundwater geochemistry parameters, redox couples, and organic content;
- Effects of the Bridgeton Landfill, related infrastructure (leachate extraction system, EVOH cover, etc.) and hydraulic characteristics of landfill material on the groundwater system;
- Vapor intrusion;
- Temporal variability in groundwater levels and flow direction; and
- Temporal and spatial water elevation effects from nearby surface water features (Missouri River) and storm events.

The following tasks have been initiated and/or will be completed to meet the objectives of the RI/FS process:

- Compile quantitative data and information pertaining to existing surface water features, geology, hydrogeology, geochemistry, property access conditions, and the proximity of potential receptors to known or potential contaminants;
- Determine adequacy, usability and status of existing and abandoned Site-associated monitoring wells and associated data. Install additional monitoring wells/piezometers, as needed;

DRAFT

- Continuous core at select locations (grain size, minerology, organic carbon content);
- Apply geophysical methods for characterization of the alluvial aquifer and bedrock formations as necessary;
- Conduct aquifer testing;
- Gauge/sample wells periodically and measure certain water levels continuously;
- Collect and analyze field data to assist in the evaluation of reasonable groundwater remedies;
- Determine background radionuclide and other contaminant concentrations in aquifers located at, and near, the Site; and
- Prepare a geologic modeling database and perform groundwater modeling, when appropriate.

Site characterization will follow best management practices (BMPs) including the EPA Triad Approach, Interstate Technology Regulatory Council (ITRC) guidance on integrated Site characterization, and ITRC guidance on characterization and remediation of fractured rock. These BMPs will be used to evaluate fate and transport processes and to develop a robust updated version of the CSM. Integrated Site characterization will use systematic planning and dynamic work strategies under the Triad approach to evaluate real-time data and update the CSM for optimizing and streamlining additional characterization, monitoring, and Specific, Measurable, Attainable, Relevant, and Timely (SMART) remedy selection. This approach will be phased, iterative, and flexible to allow for changes in scope as new data become available, and adaptive characterization progresses. Samples will be collected and analyzed in accordance with this Work Plan, related documents, and appropriate EPA methods and test procedures unless otherwise noted based on actual field conditions. Site characterization will be conducted in accordance with the SAP. Tasks are summarized below.

DRAFT

5.1 SAMPLING AND ANALYSIS PLAN

The SAP consisting of the FSP and a QAPP has been prepared for the OU-3 RI/FS. It is included in this submittal as Volume 2. Work conducted as part of the Phase I Site characterization will follow the SAP. The SAP will include standard operating procedures (SOPs) and other relevant information needed to properly document and conduct the work in a safe and efficient manner to reach the goals of the project. Elements of the SAP are as follows:

5.1.1 FIELD SAMPLING PLAN

The FSP specifies and outlines necessary activities to collect and obtain additional field data. The plan explains the additional data required to adequately characterize subsurface conditions including, but not limited to, vertical/lateral flow, extent of COCs, background levels of contaminants and naturally occurring materials to support evaluations

conducted in the OU-3 BRA, and as warranted to support the evaluation of remedial technologies. The FSP states sampling objectives; sampling methods and necessary equipment; anticipated sample types, locations, and frequency; a field events schedule; and when deliverables will be submitted to the EPA. General requirements regarding Site access and related Site control measures are clearly defined in the FSP.

5.1.2 QUALITY ASSURANCE PROJECT PLAN

The QAPP addresses the types of investigations and analysis to be conducted and includes the following discussions:

1. A project description summary (duplicated from this Work Plan);
2. A project organization chart illustrating the lines of responsibility of the personnel involved in the sampling and testing phases of the project;
3. Quality assurance objectives for data such as the required precision and accuracy, completeness of data, representativeness of data, comparability of data, and the intended use of collected data;
4. The type and frequency of calibration procedures for both field and laboratory instruments, internal quality control checks, and supporting quality assurance performance audits and system audits;
5. Preventative maintenance procedures and schedule, and corrective action procedures for field and laboratory instruments;
6. Specific procedures to assess data precision, representativeness, comparability, accuracy, and completeness of specific measurement parameters; and
7. Data documentation, reporting, and tracking procedures.

5.2 COMPILE EXISTING DATA

Publicly available records on the EPA website and databases maintained by the OU-1 and OU-2 consultants that included historic groundwater data, reports, and correspondence pertinent to OU-3 were searched and reviewed during the RI/FS planning phase as outlined in Section 2. Existing spatial and temporal hydrogeologic, geochemical, and analytical data were digitized as needed and data were compiled to refine the current understanding of the hydrogeologic system, prepare the preliminary CSM, and scope the RI/FS. Digitized data included alluvial and bedrock borehole logs for monitoring wells; bedrock discontinuity data; monitoring well construction diagrams; aquifer testing results; stabilized groundwater monitoring field parameters; groundwater elevations; and surface water elevations. This information was incorporated into a three-dimensional (3-D) data visualization tool and an EPA-accessible database. Data will be managed in accordance with the SAP.

DRAFT

Additional records will be reviewed to refine the CSM as needed during Phase I Site characterization and as the RI/FS progresses. Additional records include historic local and regional studies on OU-1, OU-2, and groundwater by local, state, federal, and private parties. The EPA-accessible database will be updated as new data become available and are incorporated. Data management and evaluation are discussed in more detail in Section 6 of this Work Plan.

5.3 EVALUATE EXISTING MONITORING WELL NETWORK

Existing and new on-Site groundwater data will be used to support this RI/FS. A preliminary well inventory was conducted to confirm the status of existing monitoring wells. This information was incorporated into the 3-D Site visualization to evaluate which alluvial zones on-Site monitoring wells are screened in, where groundwater impacts exist, and understand where additional monitoring wells are needed. The regional and local wells listed in the preliminary CSM were utilized to propose on-Site, off-Site, and background monitoring well locations.

5.3.1 PRELIMINARY MONITORING WELL INVENTORY

A preliminary monitoring well inventory was conducted on inactive monitoring wells during a Site walkover on April 17, 2018. The purpose of the preliminary monitoring well inventory was to update the monitoring well status and understand the available, existing monitoring well network. Inactive monitoring wells visited were photographed, and depth to water, well construction, and total depth were recorded as shown on Table 5-1. Photo-documentation is included in Appendix X. During the preliminary well inventory, a discrepancy was discovered between total depths for I-9 and D-93 and it was noted that these wells had been mislabeled. Labels on these wells appeared to pre-date field sampling forms from 2004, which indicate the correct depth, so it is unclear at what time samples may have been swapped at these wells. This will be evaluated as part of Section 6 in the Work Plan. Monitoring well I-4 has a pinched casing at 35.90 ft below measuring point. Current monitoring well status is shown on Figure 5-1. A complete monitoring well inventory will be conducted as described in Section 9.1.

5.3.2 PROPOSED MONITORING WELL DESIGNATIONS

Monitoring well nests and clusters are proposed to be installed to address the data gaps identified in the SOW. In general, the proposed well network embodies a more regional evaluation of groundwater in the vicinity of the Site. Historic investigations focused almost entirely on areas situated within the Site property boundary, but have not defined the potential horizontal, and vertical extent of impacts on groundwater quality. Additionally, the existing network did not provide adequate data to make a clear determination of background groundwater conditions upgradient or laterally away from the Site. All but two of the proposed well nests are positioned at strategic off-Site locations designed to maximize the quality and value of data gathered at each point. The overall objective of these wells is either to fill a

DRAFT

critical on-Site data gap, or to identify a nearby location not exhibiting impacts related to historical operations at the Site.

Monitoring well nomenclature is generally consistent with that used in the past and consists of a series and monitoring zone. New monitoring wells will be identified using the "MW" prefix. Series will be designated based on proximity to Site features as described below:

- 300 Series – adjacent to the inactive sanitary landfill
- 400 Series – within 500 feet of Area 2
- 500 Series – offsite and generally downgradient
- 600 Series – background

The groundwater monitoring zone is dependent on hydrogeologic characteristics of the alluvium or bedrock and the vertical location the screened interval intersects. Alluvial monitoring zones are:

- AS – Shallow Alluvium; screened across or near the water table above 415 ft msl in the finer grained shallow alluvium.
- AI – Intermediate Alluvium; generally screened within elevations of approximately 385 to 415 ft msl across intermediate alluvial fine to coarse sand between the shallow alluvium and deep alluvium.
- AD – Deep Alluvium; generally screened within elevations of approximately 330 to 370 ft msl across alluvial coarse sand to coarse gravel at the alluvium bedrock interface.

Bedrock monitoring zones are:

- SS – Upper Salem Formation/St. Louis Formation.
- SD – The base of the Salem Formation.

No Keokuk Formation monitoring wells are proposed during Phase I Site characterization. Four Keokuk Formation monitoring wells surrounding the South Quarry portion of the Bridgeton Landfill are part of the current MDNR groundwater monitoring program and impacts do not appear to have migrated through the Warsaw Formation aquitard. Monitoring well locations, screened intervals, and rationale are discussed below.

DRAFT

5.3.3 PROPOSED ON-SITE / NEAR-SITE MONITORING WELL LOCATIONS AND RATIONALE

Proposed on-Site nested and clustered monitoring wells (MW-304, MW-400, MW-401, and MW-402) are shown with existing wells and proposed staff gauges SG-400 and SG-500 on Figure 5-2. The rationale behind the location and depth of screened intervals is presented in Table 5-2. The existing on-Site monitoring well network is generally sufficient to capture the spatial and temporal variability of groundwater levels in the alluvium. However, additional wells are proposed to evaluate: (a) aquifer properties; (b) localized hydraulic gradients and flow directions within and between the alluvial aquifer and bedrock aquifer system; (c) the occurrence and extent of groundwater impacts; (d) groundwater geochemistry; (e) effects of the Bridgeton Landfill-related infrastructure; (f) temporal variability in groundwater levels and flow direction; (g) and effects of nearby surface water features and storm events.

Combined total radium-226 and radium-228 are considered drivers for the OU-3 Site investigation and were detected above the MCL in groundwater for all sampling dates between August 2012 and February 2014 in deep alluvial wells D-83, D-6, PZ-113-AD, and D-3, and Upper Salem/St. Louis Formation wells PZ-107-SS, PZ-115-SS, PZ-101-SS, PZ-102-SS and MW-1204. Additional detections of combined total radium-226 and radium-228 and the ratio of radium-228/radium-226 are variable in these wells across the Site. Chloride is considered a landfill leachate indicator and has also been detected in most of the on-Site monitoring wells at concentrations above its MCL of 250 mg/L, with elevated concentrations near the Inactive Sanitary Landfill. Impacts to groundwater at the Site are variable with a variety of potential sources and wells were therefore placed in strategic locations to fill data gaps. A brief discussion of each proposed on-Site and near-Site monitoring well cluster is provided below.

DRAFT

MW-304 Cluster – This cluster includes deep alluvial, Upper Salem/St. Louis Formation (if encountered), and Salem Formation wells. The MW-304 cluster is proposed to be installed adjacent to existing wells PZ-304-AS and PZ-304-AI. No deep alluvial or bedrock wells currently exist at this location. Combined total radium-226 and radium-228 impacts were documented above the MCL in all samples collected from deep alluvial wells D-83 and D-6 and some samples collected from deep alluvial well D-93 located near the northern/western property boundaries during the 2012 to 2014 comprehensive groundwater monitoring event, but currently no deep alluvial wells are present to the south. Elevated chloride concentrations are also present in deep alluvial well D-93. An evaluation of existing potentiometric data suggests this MW-304 cluster is occasionally downgradient of Area 1 in the deep alluvium. Wells installed at this location will provide additional information to evaluate impacts related to the Inactive Sanitary Landfill, evaluate the effects of the Bridgeton Landfill, and address the data gaps outlined above.

MW-400 Cluster – This cluster includes shallow alluvial, intermediate alluvial, deep alluvial, Upper Salem/St. Louis Formation (if encountered), and Salem Formation wells. The MW-400 cluster is proposed in close proximity to deep alluvial well D-6, which is may be abandoned during OU-1 remedy implementation. Combined total radium-226 and

radium-228 impacts were documented above the MCL in all samples collected from well D-6 during the 1995 to 1997 OU-1 RI, the 2004 FS groundwater sampling, and 2012 to 2014 comprehensive groundwater monitoring event. Shallow alluvial wells S-61 and MW-102 were abandoned after they were sampled in 2014. Shallow alluvial well S-1 and intermediate alluvial well I-2 were destroyed by grading work performed by AAA Trailer. An evaluation of existing potentiometric data suggests the proposed MW-400 cluster location is downgradient of well D-6 and Area 2. Potentiometric and water quality data for bedrock are not currently available at this location. Alluvial and bedrock wells at this location will help evaluate the near-Site response to influences of the Missouri River and Bridgeton Landfill. Installation of the MW-400 cluster remains subject to access agreements with AAA Trailer.

MW-401 Cluster – This cluster includes shallow alluvial, intermediate alluvial, deep alluvial, Upper Salem/St. Louis Formation (if encountered), and Salem Formation wells. The MW-401 cluster is proposed to be installed in close proximity to alluvial wells S-8, I-62, and D-83, which will likely be abandoned during OU-1 remedy implementation. Combined total radium-226 and radium-228 impacts were documented above the MCL in all samples collected from well D-83 and some samples collected from well I-62 during the 2012 to 2014 comprehensive groundwater monitoring event. No bedrock wells have been installed at this location. An evaluation of existing potentiometric data suggests the proposed location of the MW-401 cluster is downgradient of Area 2 in the alluvium. Potentiometric and water quality data for bedrock are not currently available at this location. Alluvial and bedrock wells at this location will help evaluate the near-Site response to influences of the Missouri River and Bridgeton Landfill. Installation of the MW-401 cluster remains subject to access agreements with AAA Trailer.

MW-402 Cluster – This cluster includes shallow alluvial, intermediate alluvial, deep alluvial, Upper Salem/St. Louis Formation (if encountered), and Salem Formation wells. The MW-402 cluster is proposed to be installed in close proximity to alluvial wells D-13 and I-66, which will likely be abandoned during OU-1 remedy implementation. Combined total radium-226 and radium-228 impacts were documented above the MCL in some samples collected from well D-13 during the 2012 to 2014 comprehensive groundwater monitoring event. No bedrock wells have been installed at this location. An evaluation of existing potentiometric data suggests that the proposed MW-402 cluster location is downgradient of Area 2 in the alluvium. Potentiometric data for bedrock is not available at this location. Alluvial and bedrock wells at this location will help evaluate the near-Site response to influences of the Missouri River and Bridgeton Landfill.

5.3.4 PROPOSED OFF-SITE MONITORING WELL LOCATIONS AND RATIONALE

As of this writing, there are no off-Site monitoring wells beyond 350 feet of the property boundary. Regional groundwater velocity calculations and 50-year advective travel distances for the various on-Site formations are shown

DRAFT

on Table 5-3 and were used to approximate a possible downgradient extent of radionuclide impacts between the Site and the Missouri River. Groundwater velocities were calculated for the shallow, intermediate, and deep alluvium based on the geometric means of on-Site slug testing, an average regional hydraulic gradient, and assumed effective porosities. These were used to calculate the geometric means for 50-year advective travel distances of 654 ft, 2,666 ft, and 3,243 ft, for the shallow, intermediate, and deep alluvium, respectively. Proposed off-Site downgradient monitoring wells (MW-500 through MW-502) are shown with existing wells on Figure 5-3 and are positioned slightly beyond (west) the mean calculated downgradient extent of potential 50-year advective transport distance for the intermediate alluvium. The overall objective of these three clusters is to identify areas exhibiting no landfill or RIM-related impacts; thereby defining horizontal extent downgradient of the Site. Specific rationale behind the location and selected screen intervals is presented in Table 5-2.

In addition to the objectives outlined above, proposed off-Site well locations were selected based on the ability to physically access the areas with drilling equipment, and the likely success in securing access agreements with the current property owner(s). Off-Site monitoring well locations are currently proposed in Earth City right-of-way (ROW), City of Bridgeton ROW, and Earth City Levee District property and remain subject to access agreements. In addition to defining downgradient extent of impacts, off-Site monitoring wells are proposed to evaluate aquifer properties; regional and localized hydraulic gradients and flow directions within and between the alluvial aquifer and bedrock aquifer system; groundwater geochemistry; temporal variability in groundwater levels and flow direction; and effects of nearby surface water features and storm events.

Proposed monitoring well clusters MW-500, MW-501, and MW-502 include shallow alluvial, intermediate alluvial, deep alluvial, Upper Salem/St. Louis Formation (if encountered), and Salem Formation wells. An evaluation of existing potentiometric data and groundwater velocities suggests the areas are downgradient of radionuclide and landfill related impacts at the approximate 50-year mean advective travel distance. Alluvial and bedrock wells at these locations will help to evaluate the extent of off-Site impacts and response to influence of the Missouri River in addition to the data gaps outlined above.

5.3.5 PROPOSED BACKGROUND MONITORING WELL LOCATIONS AND RATIONALE

An understanding of background groundwater conditions is a necessary component of the OU-3 groundwater study. The USGS attempted to establish background groundwater quality using available Site data but concluded that the data set of 17 alluvial radionuclide samples from 14 wells and 11 bedrock radionuclide samples from 6 wells was not sufficient. As previously discussed, radionuclide contribution from alluvium and bedrock underlying the Site may be indiscernible from potential impacts originating from the historical landfill operations. Historic regional potentiometric

DRAFT

data for both the alluvium and the bedrock at the Site shows a generally northwest groundwater flow direction in the area, supporting the determination that newly-installed background wells should be situated southwest to northeast of the Site.

Establishing background groundwater quality requires that the collection of "near-Site" data are representative of aquifer background conditions. Locations of wells used by the USGS along with regional groundwater flow in the alluvial and bedrock aquifers were evaluated to determine additional background monitoring well locations which will supplement the existing dataset. Proposed background monitoring wells (MW-600 through MW-603) are shown with the wells used by USGS on Figure 5-4 and rationale behind the proposed background well locations and depth of screened intervals is shown on Table 5-2. Information collected from the proposed background monitoring wells will be used to evaluate: (a) aquifer properties; (b) regional and localized hydraulic gradients and flow directions within and between the alluvial aquifer and bedrock aquifer system; (c) background groundwater quality of aquifers located at and near the Site; (d) the occurrence and extent of groundwater impacts; (e) groundwater geochemistry; (f) temporal variability in groundwater levels and flow direction; and (g) effects of nearby surface water features and storm events.

An evaluation of existing on-Site radium-228 data was completed during Work Plan preparation and is included as Appendix Y. This evaluation was conducted to assess the number of results required to provide a statistically valid background data set. The proposed total of 6 additional alluvial wells and 6 additional bedrock background wells will result in an additional 24 samples of each horizon each year, assuming quarterly monitoring. A nonparametric comparison will be completed on the current and new datasets, and they will be combined if possible. This should result in 65 alluvial samples and 59 bedrock samples after two years of quarterly monitoring and provide a 95 percent confidence of the 95 percent upper prediction limit (UPL).

Proposed monitoring well clusters MW-600 and MW-603 include shallow alluvial, intermediate alluvial, deep alluvial (if encountered), Upper Salem/St. Louis Formation (if encountered), and Salem Formation wells. An evaluation of existing potentiometric data suggests these locations are side-gradient of potential radionuclide and landfill-related impacts. Alluvial and bedrock wells at these locations will help to establish background conditions and evaluate regional groundwater flow directions.

Proposed monitoring well clusters MW-601 and MW-602 include Upper Salem/St. Louis Formation and Salem Formation wells. An evaluation of existing potentiometric data suggest these locations are upgradient of the Site. Bedrock wells at these locations will help establish background conditions and evaluate regional groundwater flow directions.

DRAFT

5.3.6 PROPOSED MONITORING WELL NETWORK AND STAFF GAUGE LOCATIONS

Proposed and existing monitoring wells, and proposed staff gauges are shown on Figure 5-5 and a description of the preliminary monitoring well network is included as Table 5-4. The network will monitor Site conditions (including, but not limited to, groundwater analytical results, geochemical parameters, natural attenuation processes, and leachate/RIM impacts) under a routine frequency discussed in Section 5.4.13 until the investigation is complete and, as warranted, until a remedial action is selected and implemented at the Site.

The proposed network is preliminary and subject to access agreements from the City of Bridgeton, Earth City, and the Earth City Levee District. It is understood that additional monitoring wells may be warranted at a future date if the proposed monitoring network does not fully address the data gaps listed in the SOW. It is also possible that several existing monitoring wells can be removed from the monitoring network in the future. Thus, the monitoring network will be reevaluated after Phase I Site characterization.

5.4 FIELD INVESTIGATION

Field investigation activities have been designed to determine, in part, if Site contaminants have migrated in groundwater beyond the Site boundaries at concentrations exceeding risk-based screening levels and/or MCLs or, if naturally-occurring background concentrations exceed MCLs, Alternate Concentration Levels (ACLs) (if approved at the discretion of EPA). Appropriate field data will also be collected and analyzed to assist in the evaluation of viable groundwater remedies. Field investigation activities will include Site reconnaissance; monitoring well inventory and repair; borehole advancement; continuous coring and field logging; soil and aquifer matrix sampling; borehole logging using downhole geophysical methods; packer testing; monitoring well installation; new and existing monitoring well development; staff gauge installation; surveying; aquifer testing; quarterly groundwater monitoring; monthly monitoring well gauging; and pressure transducer deployment. Relevant techniques including real-time analysis/determinations have also been evaluated for use. Additional information related to well construction diagrams, boring logs, field sampling sheets, field books, scanning, etc., will be retained and, as appropriate, included with other data to provide a holistic summary of pertinent field activities. Details on the field investigation activities are included in the FSP (Volume 2). They are summarized below.

5.4.1 PREPARATORY ACTIVITIES

A field schedule detailing proposed investigative work such as new monitoring well installations or routine groundwater monitoring will be provided to EPA and MDNR 10 business days in advance of those activities occurring. Soil boring permits and access agreements will be obtained from the property owners. Well inspections will be requested by MDNR as-needed during monitoring well construction. The drilling subcontractor will create a Missouri

DRAFT

One Call System (MOCS) ticket at least 72 working hours before the start of field activities. This will notify public utilities of the excavation activities in the area. Additionally, a private utility locator will be used to check for other subsurface anomalies at all the drilling locations.

5.4.2 SITE RECONNAISSANCE

Reconnaissance activities will be conducted to document the current conditions of the Site and proposed drilling locations. Field personnel and subcontractors will inspect and photo-document the Site and proposed monitoring well locations to identify any potential issues with access or utilities. A handheld global positioning system (GPS) will be used to survey proposed locations.

5.4.3 ECOLOGICAL SURVEY

An ecological survey will occur in two steps and include the baseline characterization of existing ecological and biological conditions within and adjacent to the Site. A desktop assessment (DA) will be conducted first to characterize current habitat types, overall quality, and regional/landscape position by evaluating the existing OU-1 and OU-2 data, and best publicly available information at the regional, local, and Site-specific scale. The DA will identify the anticipated ecological communities and habitat types, and biota likely to occur within those habitats. Potential exposure of ecological receptors to groundwater that is potentially discharging to surface water bodies within and/or adjacent to the Site will be the primary emphasis. As such, surface water bodies (e.g., streams, rivers, and ponds) and wetlands will be the primary focus during Phase 1. Biota identified in these areas that may come in contact with surface expressed groundwater (e.g., potentially complete exposure pathway) will be considered potential ecological receptors that may be considered in subsequent phases.

Following the DA, an ecological survey of the flora and fauna on-Site and near-Site will be conducted by a biologist. The survey will evaluate the findings of the DA, by reviewing the existing vegetation communities, the nature, location, and extent of aquatic resources described above, and the identification of potential ecological receptors relative to potential exposure to groundwater and/or groundwater/surface water interface. Data collection will include photographs, field notes, and GPS coordinates delineating notable points or boundaries. If subsequent ERA Phases are necessary, and data gaps resulting from Phase 1 prevent adequate analysis and risk characterization, additional Site-specific information may be obtained through the design and implementation of potential targeted sampling events. (e.g. vegetation surveys, wildlife inventories, characterization of benthic macroinvertebrate assemblages, plant or animal tissue sampling, etc.).

DRAFT

5.4.4 WELL INVENTORY AND WELL REPAIR

A full monitoring well inventory will be conducted during Phase I Site Characterization to review the existing monitoring well network and re-survey existing well locations. The inventory will document each well's current condition and will include surveying and recording construction details on the existing and new wells. This will be compared to the existing well construction summary table (Table 3-2) to evaluate monitoring well integrity. Nearby residential wells, industrial wells, municipal wells, and water intake structures within 2 miles of the Site will also be located as necessary during the well inventory to identify any potential receptors. Locations will be surveyed using a handheld GPS, recorded on field forms, and photo-documented. A review of previous/historic data sets associated with the existing wells will be reviewed to determine if data quality issues may be present. Recommendations for well redevelopment, repair, replacement, or abandonment will be provided in the Well Inventory Summary Report. Following the EPA review and approval of this report, wells deemed non-beneficial, damaged or inoperative will be repaired, replaced, and/or abandoned per applicable MDNR requirements. The well inventory will also identify wells at the Site that may potentially be removed due to remedy implementation for OU-1, as well as other potential future Site-related work that could impact the overall existing groundwater monitoring well network.

5.4.5 BOREHOLE ADVANCEMENT

Boreholes will be drilled using a sonic drilling rig(s). The deepest borehole for each proposed well cluster will be advanced to total depth first at each location. The deepest borehole at each location will be continuous cored, logged by a field geologist, field screened, sampled, and logged using geophysical techniques. Borehole advancement will be performed by a MDNR certified well installation contractor and drilling company with appropriate asbestos certifications, as needed.

5.4.6 CONTINUOUS CORING AND FIELD LOGGING

The soil and bedrock horizons in each logged boring will be continuous cored during advancement. Recovered cores will be inspected by a field geologist. Alluvial descriptions will include the Unified Soil Classification System (USCS), color, grain size, stiffness or density, moisture content, sorting, angularity, mineralogy, and plasticity as applicable. Bedrock descriptions will include weathering, bedding, color, grain/crystal size, strength, lithologic description, geologic formation, and geologic formation. Bedrock borehole logs will also include core recovery, RQD, fractures per foot, weathering index, strength index, and discontinuity data. Bedrock cores will be placed in core boxes, labeled, and stored onsite for future reference as needed. Cores will be field screened using a hand-held scintillator and PID.

DRAFT

5.4.7 ALLUVIUM AND BEDROCK AQUIFER MATRIX SAMPLING

Alluvium (unconsolidated) and bedrock samples will be collected from the water-bearing zone in the pilot boreholes. The purpose of collecting theses solid samples is to analyze the matrix for the parameters necessary to evaluate transport and fate modeling (if required by the Groundwater Modeling Plan). The sample results will be compared to similar work conducted previously in OU-1 for RIM and non-RIM sample matrices from the solid waste mass. They will be evaluated specifically for the following:

- Obtain site-specific data for use in the fate and transport evaluations requested by EPA.
- Identify and distinguish the chemical composition of materials containing radionuclides and the speciation of the radionuclides in these materials.
- Provide data to parameterize the geochemical fate and transport model.

The following is a list of the analyses provided for the alluvium/bedrock matrix samples along with a brief description of the analytical objectives:

- Uranium, thorium, and radium isotopes. The results of these analyses can be used to determine the magnitude of the radiological isotopes present in the background and downgradient location samples.
- Major cations and anions (including calcium, magnesium, manganese, sodium, potassium, barium, carbonate, sulfate, fluoride and phosphate). The results of these analyses (conducted on background and downgradient samples) can be used to quantify the presence of cations and anions, assist in determining solid phase mineralogy, and allow for the comparison with radiological isotopes.
- pH: Used as baseline condition data for comparison with subsequent leaching tests.
- Fe(II) and Fe(III): Examination of contents of ferrous (Fe(II)) and ferric (Fe(III)) iron to total iron in a sample can be used as an indicator of the oxidizing-reducing conditions to which the solid phase materials have been exposed or under which were formed. The presence of Fe(III), as measured by amorphous-iron results, is an indicator presence of ferric iron oxides, which are strong sorbents/coprecipitates for radiological constituents. Also, microbial degradation of organic matter in a landfill can result in reduction of ferric iron to ferrous iron and dissolution of ferric iron minerals and their sorbed radionuclides. Ferric iron reduces before sulfate; therefore, if abundant ferric iron phases are present, it would indicate that sulfate minerals and phases may be more stable.
- Sulfides: The presence of sulfides also can be used as indicator of the oxidizing-reducing conditions to which the solid phase materials have been exposed or under which they were formed. The presence of sulfide is a possible indicator of the stability of sulfate compounds (e.g., if not present, this indicates limited sulfate reduction and that

DRAFT

sulfate minerals phases may be more stable; conversely, if present, sulfate reduction and therefore dissolution of solid sulfate salts, such as radium-bearing barium sulfate (barite), is possible).

- U(VI): The presence of uranium in the more oxidized state [U(VI)], as measured by bicarbonate extractable uranium results, compared to total uranium results in a sample provides information on the relative abundance of oxidized uranium U(VI) to reduced uranium U(IV) [or less commonly found U(V)] in the sample.
- Total organic carbon (TOC): TOC results can be used to assess the levels of humic and fulvic acids that affect partitioning and mobility of radionuclides (as well as the longevity of potentially-reducing conditions within the landfill).
- X-Ray Diffraction (XRD): XRD results and are used to quantify the abundance of the major minerals in a sample (e.g., barite and/or calcite in RIM) that potentially affect leachate composition and radionuclide speciation by their dissolution. The XRD results also provide a semi-quantitative description of the primary crystalline minerals present in a sample and corroborate the mineralogy based on comparisons with the cation and anion analyses. The limitation is the technique cannot detect minerals present in trace amounts (meaning about 3-5% or less) and has limited capability in detecting amorphous substances.
- Scanning Electron Microscope with Energy Dispersive x-ray Spectrometry (SEM/EDS): The SEM/EDS analyses provide a semi-quantitative method for elemental mapping and determining the composition of selected grains in a sample (e.g., barite, gypsum, calcite, oxides, or even amorphous non-crystalline materials). The SEM/EDS results can be used to correlate and corroborate the mineralogy based on comparisons with XRD and cation and anion analyses or provide information on the possible nature of amorphous material, and potentially pinpoint the sources of the more abundant trace elements.
- Sequential extraction analysis. The sequential extraction analysis consists of sample digestion in a series of sequential extraction steps, each using a different solvent, designed to dissolve specific solid or mineral phases (see Table 3 for sequential steps, targeted mineral phases, and associated extraction method for details). Following each extraction process, anion/cation indicator analyses (e.g., barium, calcium, manganese, and sulfur) and radionuclide analyses (uranium, thorium, and radium) were conducted so that results obtained could be used to access the presence of radionuclides in the various phases targeted by the specific extraction procedure, and the results were compared to mineralogical (XRD) and SEM/EDS analysis to determine solid-phase association of radionuclides.
- Cation-Exchange-Capacity (CEC). CEC results can be used to provide estimates of the potential capacity of the alluvium/bedrock to adsorb/exchange charged cations and charged radionuclides from solution to the solid-phase surfaces.

DRAFT

Samples of matrices will be selected from those zones proposed for monitoring screened intervals and will include alluvial materials and limestone bedrock. The approximate sample location depths are identified in Table 5-2. Samples will be collected in accordance with procedures in the FSP, labeled, properly preserved, and submitted for laboratory analysis to MCL, Inc. Additional information regarding the field sampling procedures for alluvium and bedrock aquifer matrix is described in the FSP.

5.4.8 BOREHOLE GEOPHYSICAL LOGGING

Downhole geophysical logging will be conducted after the borehole is advanced to total depth in the cased portion of the alluvium and the open borehole in bedrock to evaluate well placement and hydrogeologic properties. Geophysical tools include some or all of the following 1) an acoustic televiewer, 2) spontaneous potential (SP)/resistivity, 3) induction/conductivity, 4) heat pulse flow meter, 5) fluid temperature and resistivity, 6) gamma-gamma-density, 7) natural gamma, and 8) caliper as applicable for open and cased holes. Additional detail on each of these methods is provided in the FSP.

5.4.9 PACKER TESTING

Packer testing will be conducted on all deep bedrock boreholes to evaluate aquifer properties of the bedrock and identify higher transmissivity zones for screen placement. Constant head injection packer tests will be conducted in all open bedrock holes on select intervals identified during continuous coring based on based on fracture frequency and porosity, and intervals identified during borehole geophysical logging. Double (straddle) and/or single downhole packer assemblies will be lowered to the desired depth using the sonic drilling rig based on the presence or absence of fractures and the porosity. Straddle packer tests will generally isolate 5 to 10 feet of borehole length using pneumatic straddle packers. Downhole packer testing equipment will be connected via the drilling rods to a surface assembly consisting of a variable rate water pump, a flow meter manifold, a pressure gauge, valving, and hoses. Step tests will be conducted where possible. Additional detail on packer testing methods is provided in the FSP.

5.4.10 MONITORING WELL INSTALLATION

Results of continuous coring, grab groundwater sampling, soil and aquifer matrix sampling, geophysical testing, and packer testing will be used to select screened intervals of the 11 new monitoring well clusters (44 new wells total), which will generally target more transmissive and/or impacted zones. Preliminary target depths identified in Table 5-2 are based on aquifer modeling performed prior to preparing the RI/FS Work Plan. Collection of select field parameters in conjunction with well installation will be used to refine those proposed construction details and provide the best chance to achieve specific assessment objectives for each well location. The first deep borehole installed at each location will be completed as a bedrock monitoring well in the most transmissive zone identified during packer testing.

DRAFT

Example monitoring well construction is shown on Figure 5-6. Bedrock monitoring wells will be double cased to prevent downward migration of alluvial impacts and will be constructed using a 10-foot Schedule (Sch.) 80 polyvinyl chloride (PVC) 0.005-inch factory slotted screen and Sch. 80 PVC blank riser. A 40/60 silica sand pack or similar will be placed around the well screen.

It is anticipated that many of the off-Site monitoring well clusters will be installed within public right-of-way. Well clusters may be completed as nested wells based on spatial limitations. Shallow, intermediate, and deep alluvial wells will either be nested within a 12-inch borehole or installed as individual discrete wells within a cluster adjacent to bedrock wells. Surface completions for the wells will be selected based on individual proposed well location requirements.

5.4.11 MONITORING WELL DEVELOPMENT

The objectives of the well development are to:

- Allow groundwater to enter the well screen freely, thus yielding a representative groundwater sample and water level measurements.
- Remove any water that may have been introduced or disturbed during drilling and well installation.
- Remove very fine-grained sediment in the filter pack to minimize groundwater sample turbidity and silting of the well.
- Maximize the efficiency of the filter pack.

The monitoring wells will be developed, no sooner than 48 hours after grouting is completed, by mechanically surging the well, followed by pumping. Surging will consist of forcing water into and out of the formation using a surge block. The surging action will be relatively gentle to avoid slumping formation material into the screen. Surging will be concentrated over 5-foot intervals, starting at the top of the screen, to avoid sand locking the surge block. In addition to the newly installed monitoring wells, existing wells included as part of the groundwater quality monitoring network will also be redeveloped in a similar manner.

Immediately following surging activities, groundwater and any sediment in the bottom of the well will be evacuated using a bailer or pump. The volume evacuated from each well, and physical characteristics of the purge water (color, relative turbidity, sediments, etc.) will be recorded during regular intervals during development activities. If natural recharge rates are adequate, development activities will continue until the extracted water is visibly free of sediment and/or until parameters (pH, temperature, and turbidity) are stable. Water levels and total depths will be measured

DRAFT

before and after well development and documented on the monitoring well development form. IDW is discussed in Section 5.4.18.

5.4.12 AQUIFER TESTING

Aquifer testing to determine the hydraulic conductivity of the formation materials near each well will be conducted on new and existing inactive monitoring wells not previously tested after the monitoring wells are developed. Aquifer testing will be conducted using pneumatic slug testing where possible and traditional slug testing if the screened interval intersects the water table. Rising head tests will be performed on all monitoring wells. Aquifer tests will be evaluated to calculated hydraulic conductivity in AQTESOLV software.

5.4.13 GROUNDWATER MONITORING

The proposed groundwater monitoring network was presented in Section 5.3.5. Quarterly groundwater monitoring is proposed for a minimum of eight quarters, and as warranted, will likely continue at a reduced frequency (e.g., annual) from selected wells. Thus, on-Site monitoring will continue until the investigation is complete, or until a remedial action is selected and implemented at the Site. The purpose of monitoring is to determine background radionuclide and other constituent concentrations in aquifers located at and near the Site. The groundwater monitoring program will be sufficiently robust to measure for radiological and non-radiological constituents that have historically been detected at the Site (e.g., dissolved radium and total radium, benzene, chlorobenzene, dissolved lead, total lead, dissolved arsenic, and total arsenic), geochemical indicators (e.g., redox couples – iron, manganese, nitrate, sulfate species, DO and ORP), major ion suite, landfill leachate indicators (e.g., bromide, iodide, tritium, and select human-waste indicators), and stable isotopes (e.g., oxygen, hydrogen, carbon, sulfur, strontium, and lead).

5.4.13.1 WATER-LEVEL MEASUREMENTS

A depth to static groundwater measurement will be collected at each groundwater monitoring well on a monthly basis, as well as prior to purging groundwater during sampling events. The monthly well gauging will be completed for a period of 24 consecutive months. An electronic water level probe, accurate to the nearest +/- 0.01 ft, will be used to measure depth to water in each well. Total well depth will be sounded from the surveyed top of casing by lowering the weighted probe to the bottom of the well and recording the depth to the nearest 0.1 ft. For wells with dedicated pumps installed, a depth to top of pump measurement may be performed in lieu of a total well depth measurement.

DRAFT

5.4.13.2 PURGING

Purging of monitoring wells prior to sampling is necessary to remove stagnant or thermally stratified groundwater from the well casing and sand pack that may not be representative of groundwater within the aquifer. If possible, purging will be performed at a flow rate at or below the well's recovery rate to minimize the migration of groundwater above the well screen. Purged water will be containerized and disposed of in the Bridgeton Landfill leachate pre-treatment system.

All wells will be purged prior to sampling utilizing a dedicated bladder pump. Pumps will be placed 2 to 3 ft from the bottom of the well to permit reasonable draw down while preventing cascading conditions. For most of the monitored groundwater zones, the pump will be set within the well's screened interval. The exception is within wells with very deep screened intervals (e.g., the Keokuk Zone wells) where drop tubes are set within the screened interval. Pumping rates will be regulated or controlled to minimize turbulent flow, prevent damage to the monitoring well components, and minimize the introduction of sediment into the well.

Throughout the purging process, groundwater will be monitored for the following field parameters: pH, specific conductance, temperature, turbidity, DO and ORP. A flow-through cell will be used for field parameter measurements to ensure that the water quality meter's sensors are in contact with flowing water. Purging will continue until field parameter equilibrium is achieved. Equilibrium is achieved when parameters exhibit variation equal to or less than the EPA prescribed tolerances for low flow sampling, with special attention paid to turbidity, an important parameter for radionuclides.

5.4.13.3 MONITORING WELL SAMPLING

A groundwater monitoring well may be sampled as soon as the field parameters have stabilized, or if purged to dry, as soon as it has recovered sufficiently, but typically no more than 24-hours after purging. The same methods used for well purging will be utilized for sample collection. Sample bottles will be filled directly from the pump's discharge tube to minimize agitation and aeration. The final set of parameter values will be used for the sampling. If the well is sampled later, a new set of parameter values will be measured and recorded concurrently with sampling.

Individual sample containers will be filled in order of decreasing sensitivity to potential volatilization of the analytical constituents. Groundwater samples will be transferred directly into the appropriate sample containers with preservative, if required, chilled if appropriate, and processed for shipment to the laboratory.

DRAFT

If the turbidity of the groundwater from a well is above 5 Nephelometric Turbidity Units (NTUs), both a filtered and unfiltered sample will be collected for metals and radium analyses. An in-line filter will be used to remove particles that have been entrained in the water sample. The size of the in-line water filter will be determined based on groundwater conditions and which filter will provide the most optimal results. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers with a preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. Depending on the viability of the proposed filtration process, this methodology may be altered as necessary in the field. Proposed alterations will be discussed with the OU-3 Respondents and EPA prior to implementation.

5.4.14 STAFF GAUGE INSTALLATION

Staff gauges will be located in on-Site and off-Site surface water bodies near existing and newly installed shallow alluvial monitoring wells. The staff gauges will be installed in the locations shown on Figure 5-5. The purpose of collecting water levels from staff gauges is to study the relationship between surface water and groundwater levels as it relates to precipitation, water levels maintained in flood control basins in Earth City, and fluctuating Missouri River levels. The surface water/groundwater interface will be considered in developing the CSM and during the human health and ecological risk assessment analysis.

The newly installed gauges will be measured monthly, concurrent with the monthly water level gauging events so that interconnection of the surface water and groundwater can be evaluated. Rain events (duration, rate, and totals) will also be noted in the logbook for the project. Staff gauges will consist of 2-inch diameter, coupled, galvanized pipe. The staff gauges will be securely driven into the base so that water levels can be read easily. The gauges will be clearly labeled in 0.01-foot increments. Final installed locations and top of pipe elevations will be surveyed. Surface water elevations will be recorded on field forms and/or logbooks to the nearest 0.01-foot. Additional details are provided in the FSP.

5.4.15 PRESSURE TRANSDUCERS

After completing the initial round of water level measurements and groundwater sampling, absolute pressure transducers/data loggers (DLs) will be placed in 32 select wells. One barometric barologger (BL) will be placed on-Site. Table 5-5 identifies the proposed wells where DLs are used. The DLs measure groundwater levels and temperature. These DLs and BL will remain within the wells for approximately 2 years, while the quarterly groundwater monitoring and monthly water level gauging occur. The DLs will be programmed to collect synchronized

DRAFT

readings every hour. During each quarterly groundwater monitoring event, the data will be downloaded from the transducers and saved within the project files.

5.4.16 CURRENT LEACHATE COLLECTION SYSTEM

The RI report will include a discussion of the current leachate collection system operational status (e.g., number and location of leachate risers, construction, operational history, frequency of use, pumping rates and pump configuration, and influent and effluent concentrations) and its effect on groundwater flow shall also be determined using the existing well configuration existing on-Site and new on-Site perimeter wells; and off-Site well clusters.. The Phase I Site Characterization results may warrant additional data acquisition from the leachate collection system to aid in future evaluation of effects of pumping on groundwater movement locally. The individual leachate wells may also be sampled for chemical analyses based upon the results of the Phase I RI characterization.

5.4.17 SURVEYING AND MAPPING OF THE INVESTIGATION AREAS

A Site-wide monitoring well survey will be performed after new wells are installed and repairs are completed on existing wells. The OU-3 Respondents will develop relevant maps of the area that include topographic information and physical features on and near the Site. Aerial photographs will be used along with information gathered during previous investigations to identify physical features of the investigation area. Sample locations (wells, piezometers, sample points, etc.) will be surveyed by a State of Missouri licensed land surveyor and the geospatial information will be summarized and provided to the EPA in specified/acceptable formats.

5.4.18 INVESTIGATION DERIVED WASTE

In the process of collecting environmental samples, the sampling team will generate different types of potentially contaminated IDW that include the following:

- Used personal protective equipment (PPE)
- Disposable sampling equipment
- Decontamination fluids
- Soil cuttings from soil
- Purged groundwater and excess groundwater collected for sample container filling

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will

DRAFT

follow the *Office of Emergency and Remedial Response (OERR) Directive 9345.3-02* (May 1991), which provides the guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

- Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in the refuse dumpster. Any PPE generated within OU-1 Areas 1 and 2 will be managed per site protocols.
- Decontamination fluids that will be generated in the sampling event will consist of distilled water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be containerized and either stored on-site within a temporary tank pending analytical data, or transferred to the on-site leachate water treatment system
- Soil cuttings generated during the subsurface sampling will be characterized and disposed of in an appropriate manner.
- Purged groundwater will be containerized and either stored on-site within a temporary tank pending analytical data or transferred to the on-site leachate water treatment systems leachate

5.5 FATE AND TRANSPORT

Groundwater fate and transport modeling will be conducted at the appropriate time during this phased investigation. An example process flow diagram of the modeling approach is included as Figure 5-7. Additional spatial and temporal geologic, hydrogeologic, geochemical, and analytical data will be collected as discussed to support a fate and transport evaluation during the Phase I Site characterization. Geologic data important for fate and transport evaluations include grain size, total organic carbon, cation exchange capacity, bulk density, and mineralogy. Hydrogeologic data important for fate and transport evaluations include aquifer properties, groundwater elevations, surface water elevations, and hydraulic gradients. Geochemical data important for fate and transport evaluations include pH, DO, ORP, and temperature. Analytical data include COC distribution and phase associations. Existing and new data will be used to update and refine the CSM the investigation progresses. The database will be updated, and the data will be incorporated into maps and cross sections, potentiometric surface contours, geochemical diagrams, and COC distribution figures.

The common geochemical redox conditions and species and reactive minerals associated with landfills can affect radionuclide transport via exchange-adsorption/desorption and precipitation/co-precipitation or dissolution over time

DRAFT

scales on the order of seconds to months. Radioactive decay occurs over much longer time scales. Other radionuclides exhibit similar behavior. Therefore, it is important that both of these mechanisms are characterized and understood.

The nature and extent of impacts, surface water-groundwater interactions, and fate and transport will be used to support the BRA and define modeling objectives. A mathematical groundwater modeling code will be selected based on the objectives. Possible uses of models include hydraulic simulation and geochemical fate or reactive transport. The mathematical groundwater model could be a simplified analytical solution or multi-dimensional numerical flow and transport model. Where appropriate, these will be developed and calibrated to support the CSM, predict the nature and extent of impacts in the future, and understand potential future risk.

5.6 VAPOR INTRUSION INVESTIGATION

As part of the RI investigation, a preliminary investigation will be performed to determine the potential for contaminant vapors to emanate from impacted vadose zone material and/or the partitioning of COCs from groundwater beneath the Site and adjacent study area. An assessment will be performed to determine the potential for completion of vapor intrusion pathways in on-Site or off-Site occupied structures. A vapor intrusion pathway is considered complete when the following conditions are met:

- A subsurface source of vapor-forming chemicals is present underneath or near the buildings;
- Vapors form and have a route along which to migrate toward the building;
- The buildings are susceptible to soil gas entry, which means openings exist for the vapors to enter the building and driving forces exist to draw the vapors from the subsurface through the openings of the buildings;
- One or more vapor-forming chemicals, comprising the subsurface vapor sources, is present in the indoor environment; and
- The buildings are occupied by one or more individuals when the vapor forming chemicals are present indoors.

Once review of historical vapor intrusion activities has been performed, Trihydro will determine the path forward for future activities that may include, but are not limited to, passive soil gas vapor sampling, installation of soil gas vapor wells, soil gas vapor sampling, sub-slab vapor sampling, indoor air quality sampling, and installation of mitigation systems. During future characterization activities, a separate Work Plan will be submitted for the vapor intrusion investigation.

DRAFT

5.7 ENGINEERING AND INSTITUTIONAL CONTROLS

As characterization proceeds, existing mechanisms, engineering controls, and other existing legal instruments will be reviewed to ensure appropriate actions are implemented in accordance with federal, state, and local regulatory requirements that mitigate human health exposures. The engineering/institutional controls will be determined based upon results of the initial investigation results where potential exposures exceed risk-based cleanup objectives.

5.8 HEALTH AND SAFETY PLAN

A HASP, which includes a RSP for work conducted within the boundaries of OU-1 Areas 1 and 2, is included as Volume 3. The HASP provides a summary of personnel responsibilities, protective equipment, health and safety procedures and protocols, decontamination procedures, personnel training, and type and extent of medical surveillance. The plan identifies problems or hazards that may be encountered during performance of the RI and how these are to be addressed. Additionally, procedures for protecting third parties, such as Site visitors, vehicular or pedestrian near sampling crews, and for the surrounding community, in general, is also described in the HASP.

DRAFT

6.0 DATA MANAGEMENT AND EVALUATION

The RI/FS will generate and compile an extensive amount of information requiring proper documentation and management to support risk assessment and remedy selection decisions. Data management procedures will be followed to ensure the quality, validity, and security of the data as detailed in the following sections regarding recordkeeping and the project database. Additional details and SOPs are included in the SAP. Proper chain-of-custody procedures will be followed, and sample locations/depths will be geospatially rendered and properly identified on maps and supporting tables and figures. Data will also be evaluated and compiled in to text, tables, figures, and 3-D visualizations to help assist with evaluations and to identify any remaining data gaps. Data management and evaluation are discussed further below.

6.1 DATA MANAGEMENT

An inclusive data management system, Project Direct (proprietary to Trihydro), is already being utilized to manage existing data. The data management system can track and organize the project data sets including: field log data, boring log data, field scans, GPS/survey data, sample management and tracking procedures, document control procedures, laboratory data, field measurements, and other relevant items to ensure that the data collected during the investigation are of adequate quality and quantity to support the investigation, the risk assessment, and remedial alternatives. Data can be exported directly from Project Direct as needed to accommodate various output formats.

6.1.1 DATA VALIDATION

Collected data will be reviewed and validated at the appropriate quality control (QC) level(s) to determine whether it is adequate for its intended use. Task management objectives and QC procedures and related findings will be provided, consistent with the project planning documents (e.g., FSP and QAPP). Information from this task will be incorporated into the RI and FS reports, appendices, and other related project deliverables, as appropriate.

6.1.2 PROJECT DATABASE

The project database will be provided for EPA review and routinely updated as new reviewed and validated data becomes available. The EPA will be notified in writing whenever new data has been uploaded to the Site-wide OU-3 database. In general, the OU-3 database will include groundwater data and supporting information related to the Site including, but not be limited to: well construction details, well completion information, geospatial/survey information, geochemistry data, field data, laboratory results and field parameters, fluid levels, laboratory qualifiers, additional qualifiers, and summary information relevant to OU-3. Uploading sampling, monitoring, and spatial data to the EPA-

DRAFT

accessible Site-wide OU-3 database in the appropriate formats will be considered a submittal once EPA is notified of its availability.

6.1.3 SPATIAL DATA

Sampling and monitoring data will be submitted in an appropriate Electronic Data Deliverable (EDD) format. Spatial data including spatially-referenced data and geospatial data will be submitted: in the ESRI File Geodatabase format; and (b) as un-projected geographic coordinates in decimal degree format using North American Datum 1983 (NAD83). Spatial data will be accompanied by metadata, and such metadata will be compliant with the Federal Geographic Data Committee (FGDC), Content Standard for Digital Geospatial Metadata and its EPA profile, the EPA Geospatial Metadata Technical Specification. An add-on metadata editor for ESRI software, the EPA Metadata Editor (EME), will be used as needed. Each file will include an attribute name for each site unit or sub-unit submitted. Spatial data that will be submitted related to this work does not and is not intended to define the boundaries of the Site.

6.1.4 FIELD RECORD KEEPING

Field logbooks and field datasheets will provide the means of recording the data collection activities. All field logbooks and field datasheets will be scanned to create PDF files for electronic archiving with the central project file. A SOP for field recordkeeping is provided in the FSP.

6.1.4.1 FIELD LOGBOOKS

Field logbooks will be used to document field observations and activities. The field notes will be clear, with sufficient detail so that events can be reconstructed later if necessary. Field logbooks will document any deviations from the RI/FS WP and/or FSP, as well as the reason for the changes. Requirements for logbook entries are detailed in the FSP.

6.1.4.2 FIELD DATASHEETS

Field datasheets/forms will be utilized when appropriate to achieve efficient and standardized recording of field measurements and observations. The type of field data sheet and the information recorded on it may vary by activity. Information from the field datasheets will be entered into the database as needed. A reference date and activity will be entered in the field logbook to refer to the field datasheets being generated. The field datasheets will be scanned into a PDF and become a permanent record within the project file. Details regarding field datasheets that may be used, and example field datasheets are included in the FSP.

DRAFT

6.2 DATA EVALUATION

Data evaluation will be conducted once it is verified that the data are of acceptable accuracy and precision. The investigation data will be reviewed and analyzed, and the results of the analyses will be presented to the EPA. Summaries of the data shall include: (1) descriptions of the locations, quantities, and concentrations of specific chemicals at the study area; (2) a discussion of background conditions/levels for the study area; (3) descriptions of the number, locations and types of nearby populations and activities; and (4) evaluations of the potential transport mechanism and the expected fate of the contaminant in the environment (modeling). Laboratory and independent data evaluation and validation processes will be performed and properly documented in accordance with the approved QAPP.

6.2.1 GEOLOGIC DATABASE AND GROUNDWATER MODELING

A geologic database incorporating available and relevant data is currently under development and near completion. The database will be used to support the groundwater modeling efforts including the modeling work plan and report. An objective for the modeling work plan will be to develop an appropriate and representative groundwater model that properly simulates the groundwater flow and contaminant migration within the alluvial aquifer, interaction between it and the bedrock aquifer, and evaluates the influence and effects of the landfill leachate collection system on groundwater flow.

The preliminary modeling work plan will identify the proposed groundwater modeling software, the general hydrogeologic framework, the anticipated hydrologic budget and stresses, and the geochemical framework anticipated to be incorporated into the model. Components of the modeling plan will include model discretization and boundary conditions, hydrogeology and hydraulic properties, important groundwater sources and sinks, and a description of the future scenarios to be evaluated using the model. The modeling work plan will also include a discussion of the anticipated calibration goals, uncertainty analyses, and model archival.

6.2.2 DATA EVALUATION METHODS IDENTIFIED DURING SCOPING

Applicable data will be reviewed and compared to: MCLs, ARARs, GWPS, and/or health-based standards; values indicative of assessment monitoring performance standards for natural attenuation/geochemical parameters; and/or the background levels and concentrations of COCs. Additionally, laboratory testing, contaminant modeling, and other relevant sources of Site-specific or Site-related data will be evaluated to develop a more in-depth understanding of the landfill's reducing conditions. Furthermore, the evaluation of the Site conditions will specify how these conditions may affect RIM located in Area 1 and Area 2, landfill waste in general, and naturally occurring materials located in the bedrock and alluvial deposits beneath the Site.

DRAFT

6.2.3 PRELIMINARY DETERMINATION OF TASKS TO BE CONDUCTED AFTER SITE CHARACTERIZATION

Tasks will be conducted during and after Site characterization to refine the CSM. Data will be evaluated and compiled into text, tables, figures, and 3-D visualizations to help identify and address data gaps, refine the current understanding of the hydrogeologic system, calculate a water balance for the hydrogeologic system, evaluate background groundwater quality, determine the extent of groundwater impacts, provide predictive tools/models to evaluate potential future impacts, and identify potential remedies as needed. Fate and transport processes will be evaluated to develop a robust and current CSM. Examples of potential figures and diagrams used to convey information include but are not limited to: potentiometric surface figures, hydrogeologic cross-sections, isopach diagrams, Stiff diagrams, Piper diagrams, modified Stiff diagrams, and 3-D Site visualizations. Data will be updated and evaluated iteratively to refine the CSM and database as new information becomes available.

DRAFT

7.0 BASELINE RISK ASSESSMENT AND RI REPORT

Results of Site characterization and CSM development will be used to determine if Site-related constituents have migrated in groundwater beyond Site boundaries at concentrations above risk-based screening levels/MCLs or ACLs to evaluate human health and environmental risks posed by groundwater at and near the Site. Potential exposure of receptors in comparison to background groundwater conditions will be incorporated into the BRA. The BRA will be comprised of the Human Health Risk Assessment (HHRA) and the Ecological Risk Assessment (ERA). Information from this task will be incorporated into the RI/FS Report(s) and applicable appendices.

7.1 BASELINE RISK ASSESSMENT

A BRA will be conducted to assess the potential human health and environmental risks posed by groundwater at and near the Site in the absence of any remedial action. This effort will involve four components: data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization. These components are briefly summarized as follows.

7.1.1 DATA COLLECTION AND EVALUATION

Site data will be analyzed relevant to the human health evaluation. Substances present at the Site that are the focus of the risk assessment process will be identified. COCs will be selected based on intrinsic toxicological properties because they are present at the Site and because they are currently in, or potentially may migrate into critical exposure pathways (e.g., drinking water and surface water). Previous studies and investigations conducted for the Site will be used in conjunction with data from the OU-3 investigation to determine the specific COCs in groundwater.

7.1.2 EXPOSURE ASSESSMENT

The magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways by which humans are potentially exposed will be estimated. The existing and predicted nature and extent of impacts will be evaluated. This will be compared to potential exposure pathways identified during the OU-3 well inventory and RI/FS process.

7.1.3 TOXICITY ASSESSMENT

A toxicity assessment of those chemicals found to be of concern for the Site will be conducted. The toxicity assessment component of the BRA will consider: (1) the types of adverse health effects associated with chemical exposures; (2)

DRAFT

the relationship between magnitude of exposure and adverse effects; and (3) related uncertainties such as the weight of evidence of a particular chemical's carcinogenicity in humans.

7.1.4 RISK CHARACTERIZATION

Outputs of the exposure and toxicity assessments will be summarized and combined to characterize baseline risk, both in quantitative expressions and qualitative statements. During risk characterization, chemical-specific toxicity information will be compared against both measured contaminant exposure levels and those levels predicted through appropriate modeling to determine whether current or future levels at and/or near the Site are of potential concern. Further, the BRA shall be separated into two components: (1) HHRA; and (2) ERA.

7.1.5 HUMAN HEALTH RISK ASSESSMENT

The HHRA shall address the following:

- Hazard identification;
- Dose-response assessment;
- Exposure assessment;
- Risk characterization; and
- Limitations/uncertainties.

7.1.6 ECOLOGICAL RISK ASSESSMENT

The ERA shall address the following:

- Definition of objectives;
- Characterization of Site and potential receptors;
- Selection of chemicals, species and end points for risk evaluation;
- Exposure assessment;
- Toxicity assessment;
- Risk characterization; and
- Limitations/uncertainties.

DRAFT

The BRA will be submitted to the EPA as part of the RI Report. Additionally, the methods used to evaluate risks in this assessment will be consistent with current EPA guidelines for HHRA at Superfund sites.

7.2 RI REPORT

The RI Report will summarize the findings of the RI process and provide information to assess risks to human health and the environment and, as warranted, support the development, evaluation, and selection of appropriate response alternatives. This task will be completed once sufficient data has been collected and fully evaluated and the CSM has been updated. The task includes all draft and final reports. The RI Report at a minimum will include the following sections.

7.2.1 INTRODUCTION AND SITE BACKGROUND

The RI Report will include an introduction and Site background section that presents a brief description of the Site, including the location, an overview of past and current operations, a summary of previous investigations, and a discussion of activities occurring adjacent to the Site. A summary of pertinent information, that will expand upon Section 2 of this Work Plan, as needed, will be provided.

7.2.2 STUDY AREA INVESTIGATION

Phase I and additional Site characterization activities will be summarized in this section. The field investigation and technical approach/rationale will be presented. Surface features, contaminant sources, surface water, geological, soil and vadose zone, groundwater, and ecological investigations will be compiled, and the results of chemical and analytical analyses will be provided.

7.2.3 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

An updated CSM will be presented in this section of the RI Report. Site characteristics will include geology, hydrogeology, geochemistry, meteorology, ecology, demographics, land use, and a reuse assessment.

7.2.4 NATURE AND EXTENT OF CONTAMINATION

The results of the Phase I and additional Site characterization will be presented in this section of the RI Report. Both natural chemical components and contaminants of some, but not necessarily all, of the following media will be discussed: sources, soil and vadose zone, groundwater, surface water, and air. Contaminant distribution and trends, and background groundwater quality will be included.

DRAFT

7.2.5 CONTAMINANT FATE AND TRANSPORT

Potential routes of migration, contaminant persistence, and contaminant migration will be reported in this section of the RI Report. If applicable, the estimated persistence of the COCs in the study area environment and physical, chemical, and/or biological factors of importance for the media of interest will be reviewed; factors affecting contaminant migration for the affected media of importance will be reviewed; and modeling methods and results will be discussed.

7.2.6 BASELINE RISK ASSESSMENT

Results of the BRA, including the HHRA and ERA, will be included in this section of the RI Report.

7.2.7 SUMMARY AND CONCLUSIONS

A summary of the nature and extent of contamination, fate and transport and risk assessment will be presented in this section of the RI Report. Conclusions will include data limitations and recommendations for future investigations as well as recommended remedial action objectives or the need for a FS.

DRAFT

8.0 FEASIBILITY STUDY

An FS may be conducted based upon the findings of the RI, once the investigation is agreed to be complete. This work element includes the preparation and presentation of findings for potential remedial alternatives that have been screened and evaluated. If required, the FS will be completed using SMART remedial objectives. The FS Report for OU-3 shall include, but is not limited to, a discussion of the following:

8.1 INTRODUCTION AND BACKGROUND INFORMATION

This section will present the purpose and organization of the report and summarize the background information presented in the RI Report. Feasibility Study Objectives will also be presented.

8.2 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section will present the remedial action objectives for each medium of interest (e.g., groundwater, surface water, etc.). For each medium, the contaminants of interest, the allowable exposure based on risk assessment (including ARARs), and the development of remediation goals will be discussed. General response actions will be presented and for each medium of interest, and an estimation of areas or volumes will be described to which treatment, containment, or exposure technologies may be applied. For each medium of interest, an identification and screening of technologies will be discussed, and an evaluation will be performed for a selection of technologies.

8.3 DEVELOPMENT AND SCREENING OF ALTERNATIVES

This section will describe the rationale for the combination of technologies/media into alternatives. The screening of alternatives will present each option, provide a description, and discuss the evaluation.

8.4 DETAILED ANALYSIS OF ALTERNATIVES

Individual analysis of alternatives will be presented in this section, including, but not limited to, the presentation of the alternative, a description, and an assessment of the alternative. A comparative analysis will be presented for all of the alternatives, including institutional controls and screenings. This will include a summary and conclusions.

DRAFT

9.0 RI/FS REPORTING

The following sections summarize the deliverables that will document the results of the OU-3 RI/FS at the Site. Additional submittals may be added to those detailed below based upon the scoping process that will continue throughout the project. Deliverables listed below, as well as any additional deliverables required during the course of the project, will be initially submitted to the EPA as draft documents. Following receipt of EPA comments, the documents will be revised as needed and submitted in final form for approval by EPA. A summary of the submittals, including a schedule for each submittal, is provided in Section 10.3.

9.1 WELL INVENTORY SUMMARY REPORT

The Well Inventory Summary Report will provide a narrative summary of each well's current condition. The summary will include survey and GPS coordinates, construction details on the existing Site wells, and recommendations/reports of performed or proposed redevelopment, repair, replacement, or abandonment of existing wells to support the OU-3 RI. The report will also include a review of previous/historic data sets associated with the existing wells in accordance with the QAPP to determine if data quality issues may be present for any of the existing monitoring wells and evaluate the adequacy and usability of data from Site-associated former/abandoned wells. Following the EPA review and approval of this report, the unsuitable, damaged or inoperative wells will be repaired, replaced, and/or abandoned per applicable state requirements. Recommendations will be provided to address identified data gaps at the former/abandoned well locations, if they exist.

9.2 ANNUAL HYDROGEOLOGIC INVESTIGATION AND GROUNDWATER CHARACTERIZATION REPORT

An Annual Hydrogeologic Investigation and Groundwater Characterization Report will be submitted on March 1 of each calendar year to summarize the prior year's results of the hydrogeologic investigation and groundwater characterization activities necessary to support the CSM, groundwater model, and other remedial investigation tasks at and near the Site. Development of groundwater recharge/flow and evaluation of natural attenuation processes will be performed in accordance with approved planning documents. Results from the sampling program will provide a detailed estimate of the horizontal and vertical distribution of contaminants, the mobility of contaminants, estimates of attenuation rates from well transects, and prediction of long-term disposition of contaminants. This will include the collection of sufficient data in and near the Site to produce a statistically valid background range and a statistically valid baseline range of contaminant concentrations and geochemistry parameters. This effort may provide a means to potentially differentiate leachate-induced and/or landfill gas effects from background concentrations onsite and/or near the Site.

DRAFT

9.3 GROUNDWATER MODELING WORK PLAN

The Groundwater Modeling Work Plan will establish the base parameters for a groundwater modeling plan that incorporates relevant Site data contained within the OU-3 geologic/hydrogeologic database and identifies existing data gaps. A groundwater modeling plan will be based on the CSM that incorporates existing data and Site information to support a groundwater model. The database and modeling plan will provide the basis for filling data gaps, the development of a groundwater flow model with simulation of the alluvial and bedrock aquifers, and effects of the leachate collection system on groundwater flow.

The modeling plan will include the modeling software to be used, the conceptual model of the flow system and how it will be represented in the modeling software to include: the extent of the model area, model discretization (number of model layers, cell size, stress period lengths), model boundaries and boundary conditions (recharge, faults, streams, springs, lakes, no flow, head dependent, etc.), model calibration (manual and/or parameter estimation, closure criteria, rules for comparison of simulated and measured head and flow targets), model stresses (historic and future pumping, recharge, river stage changes, lake stage changes, impervious surface changes, etc.), model aquifer and confining unit hydraulic properties, and predictive scenarios to be evaluated. The plan, once finalized and approved as appropriate, will also detail how the model will be used to simulate contaminant transport, describe the methods of determining calibration and predictive uncertainty in the model, and model archival processes. The groundwater model will be used to update the CSM and to evaluate current Site conditions, provide future prediction simulations on potential long-term groundwater impacts, and assist with the placement of additional monitoring wells for long-term understanding of groundwater.

9.4 GROUNDWATER MODELING REPORT

The Groundwater Modeling Report will document the groundwater modeling approach and outputs. It will include the modeling software(s) used, the conceptual model of the flow system and how it was represented in the modeling software based on model extent, model discretization, model boundaries and boundary conditions, model calibration, model stresses, model aquifer and confining unit hydraulic properties, and predictive scenarios which were evaluated. The report will also detail how the model(s) was used to simulate contaminant transport, describe the methods of determining calibration and predictive uncertainty in the model, and model archival processes. The report will provide an updated CSM, evaluate current Site conditions, provide future prediction simulations on potential long-term groundwater impacts, and assist with the placement of additional monitoring wells for long-term understanding of groundwater.

DRAFT

9.5 VAPOR INTRUSION INVESTIGATION REPORT

The potential for contaminant vapors to emanate from impacted vadose zone material and/or the partitioning of contaminants of concern from groundwater located beneath the Site and adjacent study area will be investigated and results will be incorporated into a Vapor Intrusion Investigation Report. This effort will assess the potential for completion of the vapor intrusion pathway in on-Site or off-Site occupied structures. When determining potential off-Site actions, this investigation will consider the results of the background data and take into consideration appropriate EPA guidance, data evaluation, and, if warranted by sampling results, installation of mitigation systems.

9.6 BASELINE RISK ASSESSMENT WORK PLAN

A Baseline Risk Assessment Work Plan (BRAWP) will be prepared following the completion of the Annual Hydrogeologic Investigation and Groundwater Characterization Reports, the Groundwater Modeling Report, and the Vapor Intrusion Investigation Report. Data gaps relevant to the risk assessment that are identified following the review of the groundwater characterization, modeling and vapor intrusion investigation, if any, will be identified and discussed in the BRAWP.

9.7 RI REPORT

After completion of all phases of the RI, a comprehensive RI report will be prepared to present and evaluate the data for meeting all the stated RI objectives. The RI report will include the Site background, investigation, Site characteristics, nature and extent of contamination, fate and transport evaluation, and the results of the BRA. The RI Report will be prepared in accordance with the Work Plan and SOW.

9.8 FEASIBILITY STUDY REPORT

A FS Report will be prepared to document the process if a FS is deemed appropriate. The FS Report will be consistent with the most recent EPA guidelines. The FS Report will include detailed evaluation of alternatives as discussed in Section 8.0.

DRAFT

10.0 PROJECT MANAGEMENT PLAN

A project management plan (PMP) was developed for use by the OU-3 RI/FS project team. The PMP includes the work breakdown structure, personnel resources loading, project team roles and responsibilities, project communication, document distribution, subcontracted services, materials, and equipment; which will be implemented to assist the OU-3 Respondents and EPA with the RI/FS process. A proposed project schedule is also included in this section.

10.1 PROJECT PERSONNEL

OU-3 respondents designated Trihydro Corporation as the contractor for overall support of the RI/FS process. A team of individuals and subcontractors will provide additional support and be involved in the collection, management, and evaluation of data. Project team members will have designated responsibilities throughout the RI/FS process. Personnel with designated responsibilities are shown on Figure 10-1 and listed below:

- Project Director
- Project Manager
- Assistant Project Manager
- Trihydro Health and Safety Systems
- Project Site Health and Safety Officer
- Radiation Safety Officer
- Certified Health Physicist
- Radiological Control Supervisor
- Field Team Leader
- Field Team Members
- Site Quality Control Officer
- Laboratory Specific Project Management and Quality Assurance Officers
- Quality Assurance Director

DRAFT

10.2 COORDINATION WITH EPA

Community involvement activities in support of the EPA will be provided by the OU-3 Respondents, as necessary. This communication program will be integrated closely with the remedial investigation activities to help ensure community understanding of the actions being taken and to obtain community input on the OU-3 RI/FS process. The EPA will provide additional information and direction regarding this item as the OU-3 investigation progresses and will largely focus on communications with community members and other stakeholders as OU-3 related milestones and associated submittals/information become available. This task may include conducting community interviews, preparing a community relations plan, preparing fact sheets, providing public meeting support, providing technical support for community relations, implementing community relations, managing tasks, and conducting quality control.

10.3 PROJECT SCHEDULE

The OU-3 Respondents will provide a field schedule in Microsoft Project format that details proposed investigative work such as new well installations, direct push sampling locations, and/or piezometer installations upon approval of the RI/FS Work Plan. The schedule will be updated monthly during the project. Details regarding planned sampling events and/or supplemental sampling events will be included with the FSP or included with other appropriate project documentation.

The tentative project schedule is the following:

- Deliver Draft RI/FS Work Plan to EPA for review: June 6, 2019
- EPA provides comments on Work Plan: August 6, 2019
- OU-3 Respondents reply to comments/submit revised Work Plan: September 6, 2019
- EPA Work Plan approval: September 20, 2019
- Fieldwork mobilization Phase I Site Characterization October 7, 2019
- Well construction activities completed/begin monitoring December 2019
- 1st Annual Hydrogeological/GW Characterization Report March 1, 2020
- Well Inventory Summary Report March 1, 2020
- Additional Site Characterization (as necessary) October 2020
- 2nd Annual Hydrogeological/GW Characterization Report March 1, 2021
- Modeling Work Plan March 1, 2021

DRAFT

- Baseline Risk Assessment Work Plan — December 2021
- Groundwater Modeling Report — December 2021
- RI Report and Baseline Risk Assessment — April 2022

DRAFT

11.0 REFERENCES

Auxier & Associates, Incorporated (Auxier). 2018. Updated Baseline Risk Assessment, West Lake Landfill, Operable Unit 1. January.

Burns & McDonnell (B&M). 1986. Hydrogeologic Investigation, West Lake Landfill, Primary Phase Report, Project No. 84-075-4-004. Kansas City, Missouri. October 1986.

City of St. Louis. 2005. Negative Easement and Declaration of Restrictive Covenants Agreement. April 6.

City of St. Louis Airport Authority. 2010. Letter to Dan Gravatt re: West Lake Landfill Comments on Work Plan for Supplemental Feasibility Study. September 20.

Dames & Moore. 1991. Phase II Radiological Site Assessment, Earth City Industrial Park.

Engineering Management Support, Inc. (EMSI). 1997. Site Characterization Summary Report: West Lake Landfill Operable Unit 1. August 1997.

EMSI. 2000. Remedial Investigation Report. West Lake Landfill, Operable Unit 1. April 10, 2000.

EMSI. 2006. Feasibility Study. West Lake Landfill Operable Unit 1. May 8, 2006.

EMSI. 2011. Supplemental Feasibility Study, Radiological-Impacted Material, Excavation Alternatives Analysis, West Lake Landfill Operable Unit-1. December 28, 2011.

EMSI. 2012. Groundwater Monitoring Report, 2012 Additional Groundwater Sampling Event, West Lake Landfill Operable Unit -1. December 14.

EMSI. 2013a. Groundwater Monitoring Report, April 2013 Additional Groundwater Sampling Event, West Lake Landfill Operable Unit -1. July 8.

EMSI. 2013b. Groundwater Monitoring Report, July 2013 Additional Groundwater Sampling Event, West Lake Landfill Operable Unit -1. December 1.

DRAFT

EMSI. 2014. Groundwater Monitoring Report, October 2013 Additional Groundwater Sampling Event, West Lake Landfill Operable Unit 1, Bridgeton, Missouri. February 21, 2014.

EMSI. 2016. Work Plan for Installation of a Non-Combustible Cover over Radiologically-Impacted Material at or Near the Ground Surface in Radiological Areas 1 and 2. West Lake Landfill Operable Unit-1. February 12, 2016 (Revised).

EMSI. 2018a. Remedial Investigation Addendum, West Lake Landfill, Operable Unit 1. January 25, 2018.

EMSI. 2018b. Final Feasibility Study. West Lake Landfill Operable Unit -1. January 26.

ERIS. 2019. Database Report, West Lake Landfill. March 5.

Feezor Engineering, Inc. (Feezor). 2016. Groundwater Technical Report, Bridgeton Landfill, Bridgeton, Missouri. November 28, 2016.

Foth & Van Dyke (F&VD). 1990. Laidlaw Waste Systems, Inc., Bridgeton Landfill, Pressure Grouting. April 12.

Gentile, R.J., Thompson, T.L. 2004. Paleozoic Succession in Missouri, Part 5 – Pennsylvanian System. Missouri Department of Natural Resources, Division of Geology and Land Survey. Report of Investigations 70 Part 5. Rolla, Missouri.

Golder Associates, Inc. (Golder). 1996. Physical Characterization Technical Memorandum for the West Lake Landfill Operable Unit 2, Bridgeton, Missouri. August 15, 1996.

Harrison, R.W. 1997. Bedrock Geologic Map of the St. Louis 30' x 60' Quadrangle, Missouri and Illinois. United States Geological Survey – Miscellaneous Investigations Series, Map I-2533.

Heim, G.E. 1961. The Stratigraphic Succession in Missouri – The Quaternary System. Vol. XL, Second Series. Division of Geologic Survey and Water Resources. Rolla, Missouri. September 1961.

Herst & Associates, Inc. 2005. Remedial Investigation Report, West Lake Landfill Operable Unit 2, Bridgeton, Missouri. September 2005.

DRAFT

Herst & Associates, Inc. 2006. Feasibility Study Report, West Lake Landfill Operable Unit 2, Bridgeton, Missouri, Revision 1. June 2006.

Howe, W.B. 1961. The Stratigraphic Succession in Missouri. Vol. XL, Second Series. Division of Geologic Survey and Water Resources. Rolla, Missouri. September 1961.

Lutzen, E.E., and Rockaway, J.D. Jr. 1971. Engineering Geologic Map of St. Louis County, Missouri. Geological Survey and Water Resources Engineering Geology Series No. 4. 1971.

McCracken, M.H. 1965. Structural Features of St. Louis County and Vicinity. Report of Investigations Number 34, Middle Ordovician and Mississippian Strata, St. Louis and St. Charles Counties, Missouri. American Association of Petroleum Geologists.

McCracken, M.H. 1966. Major Structural Features of Missouri. Missouri Department of Natural Resources Division of Geology and Land Survey. Rolla, MO.

McLaren/Hart Environmental Engineering Corporation. 1996. Groundwater Conditions Report West Lake Landfill Areas 1 & 2. Bridgeton, Missouri. November 26, 1996.

Miller, D.E., Emmett, J.F., Skelton, J., Jeffery, H.G., Barks, J.H. 1974. Water Resources of the St. Louis Area, Missouri: Missouri Geological Survey and Water Resources, WR30. 1974.

Missouri Department of Natural Resources (MDNR). 1997. Groundwater Resources of Missouri. Water Resources Report Number 46, Missouri State Water Plan Series Volume II.

Office of Nuclear Material Safety and Safeguards – United States Nuclear Regulatory Commission (NRC). 1976. Office of Inspection and Enforcement Region III, IE Investigation Report No. 76-01, Subject: Cotter Corporation, Hazelwood, Missouri, License No. SUB-1022 (Terminated).

NRC. 1988. Office of Nuclear Material Safety and Safeguards, Radioactive Material in the Westlake Landfill, Summary Report, NUREG-1308-Rev. 1, T188 012946. June.

NRC. 1989. Site Characterization and Remedial Action Concepts for the West Lake Landfill. Docket No. 40-8801. Washington, DC 20555. July 1989.

DRAFT

Powrie, W., R.P.Beaven, A.P.Hudson. 2005. Factors Affecting the Hydraulic Conductivity of Waste. International Workshop "Hydro-Physico-Mechanics of Landfills" LIRIGM, Grenoble 1 University, France, March.

Radiation Management Corporation (RMC). 1982. Radiological Survey of the West Lake Landfill, St. Louis County, Missouri.

Reddy, Hettiarachchi, Parakalla, Gangathulasi, Bogner, and Lagier. 2009. Hydraulic Conductivity of MSW in Landfills. Journal of Environmental Engineering, ASCE, August 2009.

S. S. Papadopulos & Associates, Inc. (SSP&A). 2018. Laboratory Data Report for Fate and Transport Evaluation Samples, West Lake Landfill Operable Unit 1, Bridgeton, Missouri. January 29.

Searight, W.V., Howe, W.B. 1961. The Stratigraphic Succession in Missouri – The Pennsylvanian System. Vol. XL, Second Series. Division of Geologic Survey and Water Resources. Rolla, Missouri. September 1961.

Spreng, A.C. 1961. The Stratigraphic Succession in Missouri – The Mississippian System. Vol. XL, Second Series. Division of Geologic Survey and Water Resources. Rolla, Missouri. September 1961.

Thompson, T.L. 1986. Paleozoic Succession in Missouri, Part 4 – Mississippian System. Missouri Department of Natural Resources, Division of Geology and Land Survey. Report of Investigations 70 Part 4. Rolla, Missouri.

U.S. Army Corp of Engineers (USACE). 1998. Record of Decision for the St. Louis Downtown Site, St. Louise, MO. U.S. Geological Survey. October.

United States Environmental Protection Agency (EPA). 1988. Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Office of Solid Waste and Emergency Response (OSWER) Directive No. 9355.3-01. October 1988.

EPA. 1989. Aerial Photographic Analysis of the Westlake Landfill Site. October 1989.

EPA. 1992. Guidance for Data Usability in Risk Assessment, OSWER Directive No. 9285.7-09A. April 1992.

DRAFT

EPA. 1997a. Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination, OSWER Directive No. 9200.4-18. August 1997.

EPA. 1997b. Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA, OSWER Directive No. 9200.4-23. August 1997b.

EPA. 2000. Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criteria in 10 CFR Part 40 Appendix A, I, Criterion 6(6)," OSWER Directive No. 9200.4-35P. April 2000.

EPA. 2001. Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites, OSWER Directive No. 9283.1-14. November 2001.

EPA. 2006. Guidance on Systematic Planning Using the Data Quality Objective Process, EPA QA/G-4. February.

EPA. 2008a. Record of Decision, West Lake Landfill Site, Bridgeton, Missouri, Operable Unit 1. EPA Region 7. Kansas City, Kansas. May 2008.

EPA. 2008b. Record of Decision, West Lake Landfill Site, Bridgeton, Missouri, Operable Unit 2. EPA Region 7. Kansas City, Kansas. July 2008.

EPA. 2010. Monitored Natural Attenuation of Inorganic Contaminants in Ground Water, Volume 3, Assessment for Radionuclides Including Tritium, Radon, Strontium, Technetium, Uranium, Iodine, Radium, Thorium, Cesium, and Plutonium-Americium, EPA/600/R-10/093. September 2010.

EPA. 2011a. Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model. EPA 542-F-11-011. July 2011.

EPA. 2011b. National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Regulations (CFR) Part 300. July 1, 2011.

EPA. 2014a. Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well. August 2014.

EPA. 2014b. Groundwater Statistics Tool, OSWER 9283.1-46. August 2014.

DRAFT

EPA. 2015a. OSWER Technical Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air, OSWER Publication No. 9200.2-154. June.

EPA. 2015b. Technical Guidance For Addressing Petroleum Vapor Intrusion At Leaking Underground Storage Tank Sites, EPA 510-R-15-001. June.

EPA. 2015c. Letter from Alyse Stoy (EPA) to William Beck, Esq. and Jessica Merrigan, Esq., John McGahren, Esq., Steven Miller, Esq., and Phil Dupre, Esq. RE: In the Matter of Cotter Corporation (NSL), and Laidlaw Waste Systems (Bridgeton), Inc. and Rock Road Industries, Inc., and the U.S. Department of Energy, Administrative Order on Consent, EPA Docket No. VII-93-F-0005, December 9.

EPA. 2018a. Regional Screening Levels (RSLs). November.

EPA. 2018b. Statement of Work, Remedial Investigation and Feasibility Study, Site Wide Groundwater (Operable Unit 3), West Lake Landfill Site, Bridgeton, Missouri. September 21, 2018.

EPA. 2018c. Record of Decision Amendment, West Lake Landfill Site, Bridgeton, Missouri, Operable Unit 1 (OU-1). September.

United States Geological Survey (USGS). 1986. U.S. Geological Survey Water-Supply Paper 2325, *Missouri Ground-Water Quality*.

USGS. 2015. Background Groundwater Quality, Review of 2012-14 Groundwater Data, and Potential Origin of Radium at the West Lake Landfill Site, St. Louis County, Missouri. Administrative Report Prepared by the USGS Water Science Center for the EPA, Region 7. Interagency Agreement DW-14-92380501. December 17, 2014 – Revised June 10, 2015.

Water Management Consultants (WMC). 1997. West Lake Landfill Operable Unit 2 RI/FS Site Characterization Summary Report. December 1997.

DRAFT

TABLES

DRAFT

TABLE 2-1. SITE HISTORY SUMMARY
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Year(s)	Investigation Conducted for:	Description
1973	West Lake Landfill	Four wells at unknown locations were sampled for five sampling rounds; samples were analyzed for general inorganic parameters, metals, and phenol.
1976	West Lake Quarry	Three wells along the western property boundary were sampled in one sampling round; samples were analyzed for general inorganic parameters, metals, and phenol.
1976-1984	West Lake Quarry	Wells around the perimeter of the inactive landfill on the western portion of the site, and after 1981 near the leachate retention pond, were sampled intermittently. Samples were analyzed for a varying list of parameters which included general inorganic parameters, ions, metals, and radionuclides.
1979-1982	Missouri Department of Natural Resources	Wells around the perimeter of the inactive landfill and the perimeter of the site, as well as site surface water bodies and off-site private wells, were sample intermittently. The samples were analyzed for a varying list of general inorganic parameters, ions, metals, and radionuclides.
1982	Nuclear Regulatory Commission	The Radiological Survey of the West Lake Landfill, St, Louis County, Missouri identified two areas of radiological contamination on-site, and concluded that there is no indication of off-site migration of the contaminants.
1983	College of Engineering, University of Missouri-Columbia	The Engineering Evaluation of Options for Disposition of Radioactively Contaminated Residues Presently in the West Lake Landfill, St. Louis County, Missouri, Draft identified radiological contamination and concluded that radon gas release from the site would increase.
1984	Nuclear Regulatory Commission	The perimeter berm around the northern extent of the site was surveyed for radiological contamination and inspected for erosion. Migration of contamination and slope failure were observed on selected portions of the berm west of OU-2 Area 2.
1986	West Lake Landfill	Existing and new wells around the inactive landfill on the western portion of the site, and the leachate retention pond, were included in a thorough hydrogeologic investigation. The hydrogeologic characterization concluded that three levels of the alluvial aquifer (shallow, intermediate, and deep) were in complete communication, and that groundwater flow was generally towards the northwest. Groundwater samples were collected and analyzed for volatile organic compounds, acid-base neutral extractables, pesticides and polychlorinated biphenyls, phenol, cyanide, and metals. Concentrations of certain parameters exceeded applicable standards, but the distribution was erratic and generally could not be attributed specifically to site activities. Concentrations of parameters which exceeded standards were likely to be diluted below standards prior to exposure to any downgradient uses.
1986	Nuclear Regulatory Commission	Eighteen groundwater monitoring wells were sampled and analyzed for radionuclides.
1989 and 1991	Environmental Protection Agency	A review of historical aerial photographs, from 1941 through 1991, was conducted to identify areas of potential environmental concern. Solid waste and mine spoils areas were identified.
1989 to Present	Laidlaw Waste Systems	Groundwater samples were collected from wells throughout the site on an intermittent basis, focusing specifically on wells around the active landfill area in recent years. Samples were analyzed for a variable list of parameters, including general inorganics, metals, radionuclides, volatile organic compounds, pesticides, herbicides, polychlorinated biphenyls, cyanide, and phenol.
1990-1991	Earth City Industrial Park	An investigation of potential radiological impacts to neighboring properties was conducted in three phases. Radiological contamination reportedly originating from OU-1 Area 2 was identified in soils at two hot spots near the property boundary.
1991	Agency for Toxic Substances and Disease Registry	A review of available information concluded that the site presented no apparent health hazard, although exposure could occur if groundwater contamination increased and migrated off-site.
1991	Laidlaw Waste Systems	A subsurface soil gas survey conducted in the vicinity of MW-F2 identified BTEX and TPH impacts to subsurface soils in an area extending 150 feet north and 300 feet south of MW-F2.
1992	Laidlaw Waste Systems	An environmental investigation for the development of a site Health and Safety Plan identified radon in the landfill gas collection system.
1992	Laidlaw Waste Systems	The slope of the berm along the western portion of the inactive landfill was reworked to 3H:1V slope, recovered, and revegetated.
1993	Laidlaw Waste Systems	A health impact assessment concluded that radiological contaminants from site sources were not a threat to site workers, the general public, or the environment.
1994	Laidlaw Waste Systems	A health assessment analyzed chemical constituents of the landfill gas collection system and concluded that landfill gas composition was similar to EPA-reported averages, and that exposures to site workers were below analytical detection limits.
1994	OU-1 Respondent Group	An overland gamma survey conducted in and in the immediate vicinity of OU-1 identified radiologically-contaminated hot spots both inside and outside of OU-1 boundaries, and recommended alteration of those boundaries.
1996	Laidlaw Waste Systems	A hydrogeology study of the West Lake Landfill site and proposed sampling locations for groundwater, leachate, surface water and sediments.
1996	West Lake Respondent Group	A study of the installation of groundwater monitoring wells, collection of groundwater samples, groundwater elevation monitoring, and aquifer testing in and adjacent to Radiological Areas 1 and 2 at the West Lake Landfill.

DRAFT

TABLE 2-1. SITE HISTORY SUMMARY
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Year(s)	Investigation Conducted for:	Description
1997	West Lake OU-1 Respondents Group	A summary to present the various site characterization activities for use in completing the RI, BRA and FS for OU-1. Summarized investigative activities that have taken place, description and display of the data documenting the location and characteristics of subsurface and surface features, description and display of the data documenting contamination at the Site including the affected media, location, types, physical state, contaminant concentrations and quantities, and documentation of the location, dimensions, physical condition, and varying concentration of each contaminant throughout each source and the extent of contaminant migration through each of the affected media.
1997	Allied Waste Industries, Inc.	Results of site characterization activities conducted as par of the West Lake Landfill OU-2 RI/FS. A review of investigative activities that have taken place, a description of data collected to document the location and characteristics of surface and subsurface features and contamination including affected media, location, types, physical state, concentration of the contamination, and quantity, and the location, dimensions, physical condition and varying concentrations of each contaminant throughout each source and the extent of contaminant migration through each of the affected media.
2000	West Lake OU-1 Respondents Group	Presents the results of the various site cauterization activities for OU-1 at the West Lake Landfill. The report summarizes the results of field activities conducted to characterize the conditions at the Site, the sources of contaminants, the nature and extent of contaminants and associated impacts, and the fate and transport of the contaminants.
2005	Allied Waste Industries, Inc.	Present the results of the various site characterization activities for OU-2 at the West Lake Landfill and summarize the results of the activities being conducted to characterize site physical and biological characteristics, sources of contamination, site hydrogeologic conditions, quality of groundwater, surface water and sediments, and prepare a conceptual site model that identifies contaminant migration pathways and potential receptors.
2006	West Lake OU-1 Respondents Group	Feasibility study for OU-1 at West Lake Landfill to develop an appropriate range of waste management options that ensure the protection of human health and the environment and to assess each alternative.
2008	West Lake OU-1 Respondents Group	ROD for OU-1 at West Lake Landfill. Presents the selected remedy from the EPA, and accepted by the MDNR. The major components are installation of a landfill cover, consolidation of radiologically contaminated surface soil from the Buffer Zone/Crossroad Property to the containment area, apply groundwater monitoring and protection standards, surface water runoff control, gas monitoring and control, institutional controls to prevent land and resource uses that are inconsistent with a closed sanitary landfill containing long-lived radionuclides, and long term surveillance and maintenance of the remedy.
2008	Allied Waste Industries, Inc.	ROD for OU-2 at West Lake Landfill. Presents the selected remedy from the EPA, and accepted by the MDNR. Major components for the Inactive Sanitary Landfill are install landfill cover, apply groundwater monitoring and protection standards, surface water runoff control, gas monitoring and control, institutional controls to prevent land uses, and long term surveillance and maintenance of the remedy.
2011	West Lake Landfill OU-1 Respondents	The SFS was performed to provide additional evaluation of a select group of potential remedial alternatives for OU-1 at the West Lake Landfill. The EPA requested the SFS consisting of an engineering cost and analysis of the ROD selected remedy, and two remedial alternatives that would remove all material containing radionuclides at levels greater than those that would allow for unrestricted use of the radiologically contaminated areas in OU-1.
2015	USEPA, Region 7	Administrative report prepared by the USGS for the groundwater quality and potential origin of radium at the West Lake Landfill.
2016	Bridgeton Landfill, LLC	Technical report regarding the West Lake Landfill's groundwater monitoring network that evaluates groundwater quality at monitoring wells that are located near the North and South Quarry, but are not currently sampled as part of the facility's detection or assessment monitoring programs and an evaluation of the facility's current groundwater monitoring well network.
2018	West Lake OU-1 Respondents Group	OU-1 ROD Amendment that provided an Amended Remedy based on a better understanding of the volume, concentration and location of RIM that may present an unacceptable risk, new information regarding the potential for RIM to leach under certain circumstances, concern that should a subsurface heating event occur, the heat could dry and desiccate a cap providing a conduit for increased release of radon from the subsurface and potentially for the leaching of RIM, and a determination that implementation of the 2008 ROD could not be accomplished without disturbance of both putrescible waste and RIM.
2018	West Lake OU-1 Respondents Group	RI Addendum to update discussion of the Site conditions, nature and extent of radionuclide and chemical occurrences, and other evaluations presented in the original RI for OU-1.
2018	West Lake Landfill OU-1 Respondents	Final FS for OU-1 which incorporates four additional measures or performance standards from the EPA, which are: the proposed landfill cover should meet UMTRCA guidance for a 1,000-year design period including additional thickness as necessary to prevent radiation emissions, air monitoring station for radioactive materials should be installed on-site and off-site, groundwater monitoring should be implemented at the waste management unit boundary and also at off-site locations, and flood control measures should meet or exceed design standards for a 500-year storm event under the assumption that the existing levee system is breached.

Notes:
BRA - Baseline Risk Assessment
BTEX - Benzene, Toluene, Ethylbenzene, and Xylene
EPA - Environmental Protection Agency
FS - Feasibility Study
MDNR - Missouri Department of Natural Resources
MW - Monitoring Well
OU - Inoperable Unit
RI - Remedial Investigation
ROD - Record of Decision
SFS - Supplemental Feasibility Study
TPH - Total Petroleum Hydrocarbons
UMTRCA - Uranium Mill Tailings Radiation Control Act
USGS - United States Geological Survey

DRAFT

TABLE 2-2. DATA SUMMARY
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Date Ranges	Groundwater Elevations	Analytical Data	Surface Water Elevations	St. Charles USGS River Gauge Elevations	Field Parameters	Slug Tests	Packer Tests	Borehole Logs and Well Construction Diagrams	Report ID Pertinent to Date Ranges
1976-1986	1,053	8,113	-	728	496	-	-	21	1979, Reitz & Jens Inc., Historic Fluid Levels
									1986, Burns & McDonnell, Hydrogeologic Investigation Report
1987-1996	2,053	13,847	28	3,410	94	77	49	86	1989, NRC, Site Characterization and Remedial Action Concepts
									1996, Golder, Physical Characterization Technical Memorandum
									1996, McLaren Hart, Groundwater Conditions Report West Lake Landfill (WLL) Areas 1 and 2
1997	277	17,536	109	360	353	-	-	-	1997, EMSI, Site Characterization Summary Report OU-1
									1997, Water Management Consultants, WLL OU-2 RI/FS Site Characterization Summary Report
1998-2011	1,502	46,257	-	5,005	2,188	-	-	-	2000, EMSI, OU-1 RI
									2005, Herst & Associates, OU-2 RI
									2006, EMSI, OU-1 FS
									2008, OU-1 & OU-2 ROD
									2011, EMSI, Supplemental FS
2012-2018	1,927	137,011	-	2,459	4,325	-	-	14	2015, USGS, Background Study
									2016, Feezor Engineering, Groundwater Technical Report
									2018, EMSI, OU-1 RI Addendum
									2018, EMSI, OU-1 Final FS
									2018, USGS St. Charles Stream Gauge Historical Records
Totals:	**6,812**	**222,764**	**137**	**11,962**	**7,456**	**77**	**49**	**121**	

Notes:
EMSI - Engineering Management Support, Inc
FS - Feasibility Study
NRC - Nuclear Regulatory Commission
OU - Inoperable Unit
RI - Remedial Investigation
USGS - United States Geological Survey
WLL - West Lake Landfill

DRAFT

TABLE 3-1a. GENERALIZED STATIGRAPHIC COLUMN
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

System	Series	Group	Symbol	Formation	Thickness (ft)	Description	Dominant Lithology	Water-Bearing Character
Quaternary	Holocene		Qal	Alluvium	10-215	Sand, gravel, silt, and clay on floodplains of major rivers and smaller streams	Sand, gravel, silt, and clay	Some wells yield over 2,000 gpm.
	Pleistocene			Loess	1-110		Silt	Not water yielding.
				Glacial Till	0-55		Pebbly clay and silt	
			Qt	Terrace Deposits		Sand, gravel, and silt	Sand, gravel, and silt	
Tertiary	Pliocene or Miocene		Tg	Grover Gravel		High level deposits of gravel, sand, and clay	Rounded, polished, light-brown chert pebbles	
Pennsylvanian	Missourian	Pleasanton	Pp	Undivided	0-100	Shale and sandstone	Shales, siltstones, "dirty" sandstones, coal beds, and thin limestone beds.	Generally yields very small quantities of water to wells between 0 to 10 gpm.
	Desmoinesian	Marmaton	Pm	Undivided	80	Intercalated shale, limestone, clay, and coal		
		Cherokee	Pc	Undivided	0-100	Cycles of sandstone, siltstone, shale, clay, and coal		
		Atokan		Cheltenham Formation	Unknown			
Mississippian	Meramecian		Msg	Ste. Genevieve Limestone	0-150	White, massive, coarsely crystaline, sandy, clastic limestone with oolitic beds and gray, black, or red chert. Some fine grained calcaerous sandstones separated by argillaceous limestone present in the upper part of the formation.	Argillaceous to arenaceous limestone	Yields small to moderate quantities of water to wells ranging between 5 to 50 gpm. Higher yields are reported locally.
			Msl	St. Louis Limestone	100-250	Dark-gray, finely crystalline to lithographic, thin- to medium-bedded to massive limestone with thin beds of bluish gray shale. Also contains dolomite, cherty limestone, fossiliferous limestone, and evaporites. Some beds are sandy and cross laminated		
			Ms	Salem Formation	70-180	Fossiliferous calcarenite consisting of broken fossil fragments and small fossils set in a matrix that ranges from micrite to sparite with common banded overgrowths around fossils. Also contains minor lithologies including fine-grained limestone, sandstone, chert, and evaporites.		
			Mw	Warsaw Formation	60-100	Dark, fissile shale and intercalated argillaceous and silty dolomite or dolomitic limestone in upper half; shaly to argillaceous, cherty, very fossiliferous, finely crystalline, dolomitic limestone in the lower half. Contains abundance of corkscrew byrozoan *Archimedes* .	Shales and silty dolomite in upper half, dolomitic limestone in lower half	
	Osagean		Mkbf	Keokuk and Burlington Limestones	175-200	Keokuk Limestone - Medium crystalline limestone and lesser finely and coarsely crystalline limestone with common crinoidal fossil horizons and light-gray, nodular chert. Keokuk contains greater heterogeneity of fossils with more abundant bryozoans, corals, and brachiopods. Burlington Limestone - Light-colored, medium to coarsely crystalline limestone with abundant large crinoid stems. Medium to thick beds are commonly cross stratified and occasionally glauconitic. Erratic occurrence of 1-10 ft chert zones separated by 30-50 ft of chert free zones.	Cherty limestone	
			Mkbf	Fern Glen Formation	30-60	Red and green calcareous shale, shaly limestone, and a basal bed of massive, dolomitic limestone.	Red limestone and shale	
	Kinderhookian		Mc	Chouteau Limestone	3-70	Gray, argillaceous limestone in irregular beds less than 1 ft thick that have wavy bedding planes and shale partings. Beds are fossiliferous with crinoids dominant.	Argillaceous limestone	
Devonian	Upper	Sulphur Springs	Du	Bushberg Sandstone	0-60	Limestone, sandstone, calcareous siltstone, and hard fissile, carbonaceous shale. Uppermost beds are non-calcareous friable sandstone or very sandy limestone. Lower beds are massive well-indurated, very fossiliferous, crystalline limestone and fine-grained, poorly indurated, cherty, moderately fossiliferous sandy limestone.	Limestone and sandstone	
			Du	Glen Park Limestone				
			Du	Grassy Creek Shale	0-50		Fissile, carbonaceous shale	
Silurian			Sou	Undivided	0-200	Dolomite containing sparse fossils and oolitic limestone.	Cherty limestone	
Ordovician	Cincinnation		Om	Maquoketa Shale	0-150	Massive platy mudstone to fissile claystone or shale with basal argillaceous dolomite and calcareous mudstone. Thin layers in lowermost beds contain small phosphatic grains and microscopic fossils.	Silty, calcareous or dolomititc shale	Probably constitutes an confining influence of water movement
			-	Cape Limestone	0-5		Argillaceous limestone	Yields small to moderate quantities of water to wells ranging between 3 to 50 gpm.
	Champlainian		Ok	Kimmswick Formation	60-120	Coarsely crystalline, light-colored, medium-bedded to massive fossiliferous limestone. *Receptaculites* is an index fossil	Massive limestone	
			Od	Decorah Formation	30-60	Guttenberg Limestone - light-gray, thick-bedded, sublithographic limestone and intercalated red to reddish-brown shale. Kings Lake Limestone - thinly bedded, silty and dolomitic, fossiliferous, finely crystalline to coquinoidal limestone with shale partings. Spechts Ferry Formation - green to brown shale and minor calcarenite, argillaceous limestone, and limestone over massive bed of fine-grained, slightly argillaceous limestone with basal shale.	Shale with interbedded limestone	Probably acts as a confining bed locally.
			Op	Plattin Formation	80-300	Gray mudstone interbedded with thin, laminated to cross-laminated grainstone	Finely crystalline limestone	
			-	Rock Levee Formation	0-93		Dolomite and limestone, some shale	
			Oj	Joachim Dolomite	60-160	Consists of five members: Metz, Matson, Defiance, Boles, and Augusta. Metz Member - Yellow-brown, laminated, shaly dolomite with algal stromatolies, mud cracks, scour surfaces, and birdseye structures. Matson Member - Dense, dark-brown, fetid, algal dolomite. Defiance Member - Silty, shaly dolomite Boles Member - Silty, shaly dolomite containing seven discontinuous layers of white to black chert Augusta Member - Alternating layers of shale, siltstone, and dolomitic sandstone.	Primarily argillaceous dolomite	
			Osp	St. Peter Sandstone	60-165	Well-sorted, medium- to fine-grained quartzose sandstone and orthoquartzite with rounded spherical grains	Silty sandstone, cherty limestone grading upward into quartzose	Yields moderate quantities of water to wells ranging between 10 to 140 gpm.
			-	Everton Formation	0-130			
	Canadian		Opow	Powell Dolomite	30-150	Medium to finely crystalline dolomite containing thin beds of green shale and fine-grained sandstone.	Sandy and cherty dolomites and sandstone	Yields small to large quantities of water to wells ranging between 10 to 300 gm. Upper part of aquifer group yields only small amounts of water to wells.
			Oc	Cotter Dolomite	180-330	Brown to gray, medium to finely crystalline dolomite containing localized thin beds of green shale and sandstone and highly variable chert content.		
			Ojc	Jefferson City Dolomite	140-275	Brown, medium to finely crystalline dolomite and agrillaceous dolomite and localized lenses of orthoquartzite, conglomerate, and shale.		
			Or	Roubidoux Formation	110-170	Interbedded sandstone, sandy dolomite, chert, sandy chert, and cherty dolomite		
			Og	Gasconade Dolomite Gunter Sandstone Member	230-290	Thin- to medium-beded, medium to finely crystalline dolomite with varying amounts of chert and minor sandstone lenses. Gunter Sandstone Member - 25 to 30 feet of medium-grained quartzose sandstone and sandy dolomite.		
Cambrian	Upper		O€e	Eminence Dolomite	110-285	Sandy, fine- to medium-grained dolomitized oolitic to coquinoidal calcarenite.	Cherty dolomites, siltstones, sandstone, and shale	Yields moderate to large quantities to wells ranging between 10 to 400 gpm.
			€p	Potosi Dolomite	100-550	Slightly argillaceous, medium to finely crystalline dolomite.		
		Elvins	€dd	Derby-Doerun Dolomite	120-155	Dense, medium to finely crystalline dolomite over irregularly bedded, shaly to silty, glauconitic dolomititzed cacarenite.		
			€d	Davis Formation	30-240	Repeating sequences of shale, siltstone, and silty dolomite or limestone.		
Precambrian			Yi	Igneous Crystalline Basement		Gabbro, norite, and diorite intruded by granitic dikes and leucogranite.	Igneous and metamorphic rocks	Does not yield water to wells in this area

Notes:
Highlighted formations are regional aquifers
Descriptions and Thickness adapted from Harrison 1997
Dominant Lithology and Water-Bearing Character from Miller et al. 1974
ft - feet
gpm - gallons per minute

DRAFT

TABLE 3-1b. SITE-SPECIFIC STATIGRAPHIC COLUMN
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Era	System	Series	Formation	Thickness (ft.)	Dominant Lithology	Regional Aquifer Unit
Cenozoic	Quaternary	Holocene	Alluvium	10-215	Missouri River deposits consisting primarily of sand and gravel with minor silt interbeds.	Missouri River Alluvial Aquifer
			Terrace Deposit		Sand, gravel and silt deposited during fluvial events; minor lacustrine clay.	
		Pleistocene	Loess		Windblown silt, clayey silt and silty loam.	Not Classified
Unconformity						
Paleozoic	Mississippian	Meramecian	St. Louis Limestone	100-250	Thin to medium-bedded limestone, containing minor dolomite, cherty limestone, fossiliferous limestone, and evaporite lithologies. Thin beds of shale are present throughout the formation.	Post-Maquoketa Aquifer
			Salem	70-180	Fossiliferous calcarenite, characterized by a distinct chert zone near the top of the formation in the St. Louis area. Numerous minor lithologies are present, including fine-grained limestone, sandstone, chert, and evaporites.	
			Warsaw	60-100	Upper half of the formation is comprised of fissile shale and intercalated argillaceous and silty dolomite or dolomitic limestone. Lower half is composed of fossiliferous, dolomitic limestone that is shaly and argillaceous.	
		Osagean	Keokuk-Burlington Limestones (undivided)	175-200	Keokuk limestone is characterized by medium crystalline limestone with an abundance of fossils. Nodular chert is common in the lowermost and uppermost thirds of the formation. The Burlington limestone is similar limestone in composition to the Keokuk into which it grades. Beds are medium to thick and commonly cross-stratified with some glauconite. Chert occurs erratically, in high concentrated zones 1-10 feet thick, separated by chert-free zones 30-50 feet thick.	

Note:
ft. - feet

DRAFT

TABLE 3-2. MONITORING WELL SURVEY AND CONSTRUCTION DATA
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Borehole ID	Env. Control Prefix	Env. Control Point Number	Hydro Zone	Monitoring Status	Alias	Install Date	Northing (ft)	Easting (ft)	MPE (ft msl)	GSE (ft msl)	Survey Source	2012 Cap Ht. Above Grade	Borehole diameter (in)
D-3	D	3	AD	I	WL-105A	34912	1069177.97	836047	468.338	465.118	EMSI 2012 Survey	3.22	8.25
D-6	D	6	AD	I	WL-206	34912	1070235.1	834723.492	447.623	444.332	EMSI 2012 Survey	3.291	8.25
D-12	D	12	AD	I	WL-216A	34973	1069877.227	835110.755	479.736	477.157	EMSI 2012 Survey	2.579	8.25
D-13	D	13	AD	I	WL-224	34973	1070527.015	835776.5617	470.2467	467.7344	EMSI 2012 Survey	2.5123	8.25
D-14	D	14	LR	X	WL-109B	34973	1068988.873	836700.023	482.9692	480.7088	EMSI 2012 Survey	2.2604	8.25
D-81	D	81	AD	I		30907	1067378.728	834638.553	450.654	448.074	EMSI 2012 Survey	2.58	5" (0 - 15 ft), 4 1/2" (15 - 61.5 ft)
D-83	D	83	AD	I		30910	1070970.858	834807.7922	448.2116	444.8426	EMSI 2012 Survey	3.369	5" (0-15 ft) 4 1/2" (15-115.3 ft)
D-85	D	85	AD	A		30895	1069667.265	836605.173	457.264	454.257	EMSI 2012 Survey	3.007	5" (0-10 ft) 4 1/2" (10-84.1 ft)
D-87	D	87	AD	I		30895	1069252.38	835579.372	464.472	461.221	EMSI 2012 Survey	3.251	5" (0 - 30 ft) 4 1/2" (30-111.7 ft)
D-89	D	89	AI	I		30921	1067010.97	835274.7	456.698	453.698	EMSI 2018 - Calculated	n/a	5" (0-25 ft) 4 1/2" (25-49 ft)
D-90	D	90	AI	X		31266	1066200.97	834474.7	450.198	445.598	EMSI 2018 - Calculated	n/a	4", 3 7/8"
D-91	D	91	AI	X		31260	1065260.97	833944.7	452.968	447.598	EMSI 2018 - Calculated	n/a	4", 3 7/8"
D-92	D	92	AD	X		31146	1069800.97	835264.7	474.968	475.098	EMSI 2018 - Calculated	n/a	4" (0 - 40 ft), 3 7/8" (40 -143.6 ft)
D-93	D	93	AD	I		31155	1069369.757	834443.556	450.839	448.283	EMSI 2012 Survey	2.556	6" (0-8 ft) 4 7/8" (8-119.2ft)
D-94	D	94	AD	X		31138	1070685.97	835994.7	442.278	438.098	EMSI 2018 - Calculated	n/a	3 7/8"
D-95	D	95	AD	X		31138	1070861.545	836524.5192	452.688	449.598	Georeferenced/Calculated	n/a	3 7/8"
F-1-D	F	1	AD	X		33086	1068649.65	836034.74	461.228	458.378	McLaren Hart 1996	n/a	8"
F-1-S	F	1	AS	X		33086	1068643.97	836040.05	460.948	458.698	McLaren Hart 1996	n/a	8"
F-2	F	2	AS	X		33095	1067725.97	834591.7	449.698	447.498	EMSI 2018	n/a	8"
F-3	F	3	AS	X		33086	1070530.77	835994.53	468.828	466.528	McLaren Hart 1996	n/a	8"
I-2	I	2	AI	X		Unknown	1069739.23	834386.88	446.008	442.798	McLaren Hart 1996	n/a	8.25
I-4	I	4	AI	I	WL-105B	34912	1069189.97	836064.6	465.74	462.951	EMSI 2012 Survey	2.789	8.25
I-7	I	7	AI	U	WL-207	Unknown	1070784.02	834474.57	446.568	444.098	McLaren Hart 1996	n/a	8.25
I-9	I	9	AI	I	WL-229	34943	1069358.403	834444.232	449.879	447.915	EMSI 2012 Survey	1.964	8.25
I-11	I	11	AI	I	WL-216C	34912	1069860.187	835099.736	480.108	477.582	EMSI 2012 Survey	2.526	8.25
I-50	I	50	AI	X	N-1	30590	1065231.29	834006.66	453.258	448.598	McLaren Hart 1996	n/a	n/a
I-55	I	55	AI	X	35	28667	1067827.97	834649.7	n/a	471.498	EMSI 2018	n/a	6"
I-56	I	56	AI	X	34	28668	1068097.97	834661.7	n/a	474.698	EMSI 2018	n/a	6"
I-58	I	58	AI	X	40	28669	1068914.97	834632.7	n/a	477.098	EMSI 2018	n/a	6"
I-59	I	59	AI	X	N-2	30590	1069372.97	834463.7	n/a	444.498	EMSI 2018	n/a	n/a
I-62	I	62	AI	I	N-3	30590	1070979.147	834821.3336	446.1413	444.3429	EMSI 2012 Survey	1.7984	n/a
I-65	I	65	AI	I	N-4	30590	1070994.104	835507.9937	441.257	438.9301	EMSI 2012 Survey	2.3269	n/a
I-66	I	66	AI	I	N-5	30590	1070645.385	836025.9553	441.696	438.9587	EMSI 2012 Survey	2.7373	n/a
I-67	I	67	AI	I	N-6	30590	1070142.391	836418.549	441.683	439.341	EMSI 2012 Survey	2.342	n/a
I-68	I	68	AI	A	N-7	30590	1069612.97	836861.2	450.199	447.405	EMSI 2012 Survey	2.794	n/a
I-72	I	72	AI	X	39	28642	1067930.97	835519.7	464.998	462.298	EMSI 2018 - Calculated	n/a	n/a
I-73	I	73	AI	A	38	28642	1067735.843	835745.2921	461.0784	457.9765	EMSI 2012 Survey	3.1019	n/a
LR-100	LR	100	LR	I		34976	1067334.448	835068.653	468.113	465.343	EMSI 2012 Survey	2.77	8 1/4"
LR-101	LR	101	LR	X		34982	1068443.22	834893.11	NA	NA	Golder 1996	n/a	n/a
LR-102	LR	102	LR	X		34980	1068978.18	834962.83	513.118	511.598	Golder 1996	n/a	8 1/4"
LR-103	LR	103	LR	I		34992	1068567.541	835392.1821	470.2369	466.8659	EMSI 2012 Survey	3.371	8 1/4"
LR-104	LR	104	LR	I		34990	1068105.763	835808.4902	459.6505	457.7914	EMSI 2012 Survey	1.8591	8 1/4"
LR-105	LR	105	LR	I		34975	1067750.35	834699.951	485.205	482.362	EMSI 2012 Survey	2.843	8 1/4"
MW-41	MW	41		X		28642	1069327.97	834551.7	n/a	n/a	EMSI 2018	n/a	n/a
MW-101	MW	101	AS	X		32964	1070871.45	834598.7	446.428	444.958	McLaren Hart 1996	n/a	8
MW-102	MW	102	AS	X		32964	1070135.676	834707.412	447.833	445.66	EMSI 2012 Survey	2.173	8
MW-103	MW	103	AS	I		32964	1068668.893	834508.8	438.915	437.065	EMSI 2012 Survey	1.85	8
MW-104	MW	104	AS	I		32964	1067565.651	834513.706	440.812	437.809	EMSI 2012 Survey	3.003	8
MW-105	MW	105	AS	X		4/12/1990	1067565.651	833405.95	439.768	442.068	McLaren Hart 1996*	n/a	8

DRAFT

TABLE 3-2. MONITORING WELL SURVEY AND CONSTRUCTION DATA
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Borehole ID	Pipe Size (in)	Pipe Type	Perforation detail	Surface Casing	Total Pipe Length (ft)	Boring Depth (ft)	Bottom Elev (ft MSL)	Cap Ht. Above Grade (ft)	Solid Length[1] (ft)	Screen Length (ft)	Screen From	Screen To	Top Screen Elevation (msl)	Bottom Screen Elevation (msl)	Total Pipe Length (ft)	Construction Source
D-3	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	109.62	106.5	357.798	3.12	96.5	10	96.5	106.5	370.298	360.298	109.62	As-built
D-6	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	109.7	106.5	334.998	3.2	96.5	10	96.5	106.5	347.498	337.498	109.7	As-built
D-12	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	146.21	143.7	330.798	2.51	133.7	10	133.7	143.7	343.298	333.298	146.21	As-built
D-13	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	135.7	133	334.998	2.7	123	10	123	133	344.998	334.998	135.7	As-built
D-14	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	61.77	58.5	425.098	3.27	53.5	5	53.5	58.5	430.598	425.598	61.77	As-built
D-81	2	PVC	0.01 inch machine slot	n/a		61.5	385.898	3	48	15	45	60	402.398	387.398	60	RIA
D-83	2	PVC	0.01 inch machine slot	n/a		115.3	328.698	3.2	80.2	20	77	97	366.998	346.998	97	RIA
D-85	2	PVC	0.01 inch machine slot	n/a		84.1	372.648	3	65	20	62	82	390.698	370.698	82	RIA
D-87	2	PVC	0.01 inch machine slot	n/a		111.7	347.898	3	94	20	91	111	368.598	348.598	111	RIA
D-89	2	PVC	0.01 inch machine slot	n/a		49	404.698	3	36	15	33	48	420.698	405.698	48	RIA
D-90	2	PVC	0.01 inch machine slot	n/a		47	398.598	n/a	n/a	n/a	37	47	408.598	398.598	47	RIA
D-91	2	Sch 50 PVC Riser, Sch 20 PVC Screen	200 slots	n/a		45	402.598	5	40	10	35	45	412.598	402.598	45	RIA
D-92	2	PVC	0.01 inch machine slot	n/a		143.6	331.498	-0.2	122.8	20	123	143	352.098	332.098	143	RIA
D-93	2	PVC	0.01 inch machine slot	n/a		119.2	337.798	3.3	95.3	20	92	112	358.298	338.298	112	RIA
D-94	2	PVC	0.01 inch machine slot	n/a		109	329.098	2.6	91.6	20	86	106	352.098	332.098	106	RIA
D-95	2	PVC	0.01 inch machine slot	n/a		101	348.598	3.3	84.3	20	81	101	368.598	348.598	101	RIA
F-1-D	2	Sch 40 PVC	10 slot	Locking steel protective cover		79.5	n/a	2.85	76.95	5	n/a	n/a	n/a	n/a	79.1	RIA
F-1-S	2	Sch 40 PVC	10 slot	Locking steel protective cover	34.9	32.9	n/a	2.4	22.5	10	22.5	32.5	436.198	426.198	34.9	As-built
F-2	2	Sch 40 PVC	10 slot	Locking steel protective cover	27.55	25.7	n/a	2.25	10.3	15	10.3	25.3	437.198	422.198	27.55	As-built
F-3	2	Sch 40 PVC	10 slot	Locking steel protective cover	45.1	46	n/a	2.3	32.8	10	32.8	42.8	433.728	423.728	45.1	As-built
I-2	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	52.71	52	393.298	3.21	39.5	10	39.5	49.5	403.298	393.298	52.71	As-built
I-4	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	79.07	79	389.098	2.57	66.5	10	66.5	76.5	399.098	389.098	79.07	As-built
I-7	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	49.97	50	396.598	2.47	37.5	10	37.5	47.5	406.598	396.598	49.97	As-built
I-9	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	55.59	55.6	394.998	2.49	43.1	10	43.1	53.1	404.998	394.998	55.59	As-built
I-11	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	93.17	93	386.698	2.67	80.5	10	80.5	90.5	396.698	386.698	93.17	As-built
I-50	0	0	0	n/a		40.6	407.998	4.48	35.08	10	30.6	40.6	417.998	407.998	40.6	RIA
I-55	2	PVC	n/a	n/a		60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	60	RIA
I-56	2	PVC	n/a	n/a		60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	60 (61.1 well schedule)	RIA
I-58	2	PVC	n/a	n/a		60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	60	RIA
I-59	n/a	n/a	n/a	n/a		43.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	43.5	RIA
I-62	n/a	n/a	n/a	n/a		44	399.698	1.98	35.98	10	34	44	409.698	399.698	44	RIA
I-65	n/a	n/a	n/a	n/a		36	402.098	3.3	29.3	10	26	36	412.098	402.098	36	RIA
I-66	n/a	n/a	n/a	n/a		36.9	400.398	4.1	31	10	26.9	36.9	410.398	400.398	36.9	RIA
I-67	n/a	n/a	n/a	n/a		35.4	400.698	2.58	27.98	10	25.4	35.4	410.698	400.698	35.4	RIA
I-68	n/a	n/a	n/a	n/a		31.2	409.298	7.42	28.62	10	21.2	31.2	419.298	409.298	31.2	RIA
I-72	n/a	n/a	n/a	n/a		50	412.298	2.7	49.7	3	47	50	415.298	412.298	50	RIA
I-73	n/a	n/a	n/a	n/a		50	412.298	3.7	50.7	3	43.2	46.2	415.298	412.298	50	RIA
LR-100	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	26.72	26	442.298	1.92	19.7	4.8	19.7	24.5	447.098	442.298	26.72	As-built
LR-101	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	RIA
LR-102	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	61.52	76	451.898	1.52	54.9	4.8	54.9	59.7	456.698	451.898	61.52	As-built
LR-103	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	39.8	40	420.998	1.1	28.6	9.8	28.6	38.4	431.098	421.298	39.8	As-built
LR-104	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	40.23	40	419.098	1.73	28.4	9.8	28.4	38.2	429.198	419.398	40.23	As-built
LR-105	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	38.89	38	447.498	2.59	26.2	9.8	26.2	36	457.598	447.798	38.89	As-built
MW-41	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	RIA
MW-101	2	PVC	0.010 slotted	Locking steel protective cover	29.6	25	n/a	2.3	17.3	10	17.3	27.3	427.658	417.658	29.6	As-built
MW-102	2	PVC	0.010 slotted	Locking steel protective cover	29.1	25	n/a	2.3	16.8	10	16.8	26.8	428.86	418.86	29.1	As-built
MW-103	2	PVC	0.010 slotted	Locking steel protective cover	21.1	18	n/a	2.7	8.4	10	8.4	18.4	428.665	418.665	21.1	As-built
MW-104	2	PVC	0.010 slotted	Locking steel protective cover	22.8	17	n/a	2.9	9.9	10	9.9	19.9	427.909	417.909	22.8	As-built
MW-105	2	PVC	0.010 slotted	Locking steel protective cover	17.3	15	15	2.3	7.3	10	5	15	437.068	427.068	n/a	As-built

DRAFT

TABLE 3-2. MONITORING WELL SURVEY AND CONSTRUCTION DATA
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Borehole ID	Env. Control Prefix	Env. Control Point Number	Hydro Zone	Monitoring Status	Alias	Install Date	Northing (ft)	Easting (ft)	MPE (ft msl)	GSE (ft msl)	Survey Source	2012 Cap Ht. Above Grade	Borehole diameter (in)
MW-106	MW	106	AS	X		4/12/1990	1065996.72	833791.62	443.378	439.768	McLaren Hart 1996	n/a	8
MW-107	MW	107	AS	X		32964	1064711.71	833775.82	447.738	n/a	McLaren Hart 1996	n/a	8
MW-1201	MW	1201	AS	I	PZ-1201-SS & 1201	31107	1067343.97	837077.7	482.438	480.198	EMSI 2018	n/a	n/a
MW-1202	MW	1202	AS	X		31107	1067383.97	837049.7	482.178	480.098	EMSI 2018	n/a	n/a
MW-1203	MW	1203	AS	X		31229	1067229.97	837129.7	483.608	480.698	EMSI 2018	n/a	n/a
MW-1204	MW	1204	SD	A		33329	1066461.146	835998.972	485.358	483.091	EMSI 2012 Survey	2.267	8
MW-1205	MW	1205	AS	X		33329	1067428.36	835795.45	386.368	384.098	Foth & Van Dyke 1991	n/a	11 and 6
MW-1206	MW	1206	AS	X		33298	1067437.24	835799.07	388.078	385.798	Foth & Van Dyke 1991	n/a	8
PZ-100-KS	PZ	100	KS	A	1209	34747	1068883.062	837386.265	485.954	484.82	EMSI 2012 Survey	1.134	10 1/4" (0-34 ft) 5 7/8" (34-391 ft)
PZ-100-SD	PZ	100	SD	A	1208	34753	1068892.808	837369.99	486.084	484.492	EMSI 2012 Survey	1.592	10 1/4 "(0-51 ft) 5 7/8" (51-246 ft)
PZ-100-SS	PZ	100	SS	A	1207	34755	1068908.761	837349.65	486.147	484.835	EMSI 2012 Survey	1.312	10 1/4 "(0-51 ft) 5 7/8" (51-94.5 ft)
PZ-101-SS	PZ	101	SS	A	1210	34764	1068513.92	836797.322	491.161	488.947	EMSI 2012 Survey	2.214	10 1/4 "(0-14 ft) 5 7/8" (14-140 ft)
PZ-102R-SS	PZ	102	SS	A	1211	34868	1068172.734	837033.545	486.05	484.176	EMSI 2012 Survey	1.874	10 1/4 "(0-35 ft) 5 7/8" (35-90.3 ft)
PZ-102-SS	PZ	102	SS	A		34770	1068128.683	837062.591	484.245	482.06	EMSI 2012 Survey	2.185	10 1/4 "(0-37 ft) 5 7/8" (37-90.4 ft)
PZ-103-SS	PZ	103	SS	A	1212	34756	1067701.303	836897.822	483.803	479.904	EMSI 2012 Survey	3.899	10 1/4 "(0-51 ft) 5 7/8" (51-145.5 ft)
PZ-104-KS	PZ	104	KS	A	1215	34869	1067034.018	836995.216	484.197	481.838	EMSI 2012 Survey	2.359	10 1/4 "(0-249 ft) 5 7/8" (249-408 ft)
PZ-104-SD	PZ	104	SD	A	1214	34867	1067054.135	837009.268	483.751	481.474	EMSI 2012 Survey	2.277	10 1/4 "(0-38 ft) 5 7/8" (38-252.5 ft)
PZ-104-SS	PZ	104	SS	A	1213	34854	1067068.815	837021.987	483.596	481.648	EMSI 2012 Survey	1.948	10 1/4 "(0-37 ft) 5 7/8" (37-145 ft)
PZ-105-SS	PZ	105	SS	A	1216	34843	1066462.138	836405.054	483.635	480.805	EMSI 2012 Survey	2.83	10 1/4 "(0-45 ft) 5 7/8" (45-149 ft)
PZ-106-KS	PZ	106	KS	A	1219	34781	1066744.652	835606.899	464.324	462.143	EMSI 2012 Survey	2.181	10 1/4 "(0-204 ft) 5 7/8" (204-375 ft)
PZ-106-SD	PZ	106	SD	A	1218	34782	1066755.685	835590.703	463.435	461.418	EMSI 2012 Survey	2.017	10 1/4 "(0-26 ft) 5 7/8" (26-201.1 ft)
PZ-106-SS	PZ	106	SS	A	1217	34794	1066767.07	835574.642	462.704	460.952	EMSI 2012 Survey	1.752	10 1/4 "(0-23 ft) 5 7/8" (23-165.4 ft)
PZ-107-SS	PZ	107	SS	A	1220	34841	1067204.044	835429.345	465.003	462.852	EMSI 2012 Survey	2.151	10 1/4 "(0-32ft) 5 7/8" (32-103 ft)
PZ-108-SS	PZ	108	SS	X	1221	34787	1067719.34	836147.31	455.798	453.698	Golder 1996	n/a	10 1/4 "(0-20ft) 5 7/8" (20-143.9 ft)
PZ-109-SS	PZ	109	SS	A	1222	34814	1068052.306	836318.4981	458.8977	456.8957	EMSI 2012 Survey	2.002	10 1/4 "(0-15ft) 5 7/8" (15-135.7 ft)
PZ-110-SS	PZ	110	SS	I	1223	34839	1068376.97	836094.3	461.0591	458.0299	EMSI 2012 Survey	3.0292	10 1/4 "(0-61ft) 5 7/8" (61-111.5 ft)
PZ-111-KS	PZ	111	KS	A	1225	34825	1068661.958	836025.2057	465.3987	461.3366	EMSI 2012 Survey	4.0621	14 3/4 "(0-84ft) 10" (84.0-215.5) 5 7/8" (215.5-368.8 ft)
PZ-111-SD	PZ	111	SD	A	1224	34810	1068678.166	836009.0044	466.1727	461.9501	EMSI 2012 Survey	4.2226	10" (0-98 ft) 5 7/8" (98-210 ft)
PZ-111-SS	PZ	111	SS	A		42976	1068631.93	835989.4	464.228	461.708	Feezor 2017	n/a	8"
PZ-112-AS	PZ	112	AS	A	1226	34799	1069042.848	835849.449	462.132	458.41	EMSI 2012 Survey	3.722	8 1/4"
PZ-113-AD	PZ	113	AD	A	1228	34822	1069273.97	835934.5	461.835	459.467	EMSI 2012 Survey	2.368	10 1/4"
PZ-113-AS	PZ	113	AS	A	1227	34800	1069264.97	835922.4	461.783	459.58	EMSI 2012 Survey	2.203	8 1/4"
PZ-113-SS	PZ	113	SS	A	1229	34839	1069282.97	835951.3	462.255	459.654	EMSI 2012 Survey	2.601	9 3/4" (0-115 ft) 5 7/8" (115-159 ft)
PZ-114-AS	PZ	114	AS	A	1230	34809	1069459.999	836942.992	451.739	449.564	EMSI 2012 Survey	2.175	10 1/4"
PZ-115-SS	PZ	115	SS	A	1231	34840	1069449.628	836929.871	452.497	450.213	EMSI 2012 Survey	2.284	9 7/8" (0-39ft) 5 7/8" (39-85ft)
PZ-116-SS	PZ	116	SS	A	1232	34870	1066451.146	836018.584	486.038	483.548	EMSI 2012 Survey	2.49	10 1/4 "(0-33ft) 5 7/8" (33-162 ft)
PZ-200-SS	PZ	200	SS	A		34758	1068537.089	837146.557	485.828	483.548	EMSI 2012 Survey	2.28	10 1/4 "(0-27.5ft) 5 7/8" (27.5-98.3 ft)
PZ-201A-SS	PZ	201	SS	A	1223	34812	1067872.76	837021.163	481.928	479.87	EMSI 2012 Survey	2.058	10 1/4 "(0-33ft) 5 7/8" (33-90 ft)
PZ-201-SS	PZ	201	SS	X		34764	1067860.52	837036.76	479.928	477.598	Golder 1996	n/a	10 1/4 "(0-33ft) 5 7/8" (33-39 ft)
PZ-202-SS	PZ	202	SS	A	1234	34770	1067361.152	837276.124	481.416	479.474	EMSI 2012 Survey	1.942	10 1/4" (0-33.5 ft) 5 7/8" (33.5-90 ft)
PZ-203-SS	PZ	203	SS	A	1235	34853	1066702.372	836782.546	486.783	484.123	EMSI 2012 Survey	2.66	10 1/4" (0-56 ft) 5 7/8" (56-110 ft)
PZ-204A-SS	PZ	204A	SS	A	1236	34932	1066470.424	835731.2717	464.8759	464.8759	EMSI 2012 Survey	0	10 1/4" (0.0-14 ft) 5 7/8" (14-90 ft)
PZ-204-SS	PZ	204	SS	A		34768	1066470.424	835731.2717	464.8759	464.8759	EMSI 2012 Survey	0	10 1/4" (0-14 ft) 5 7/8" (14-90.3 ft)
PZ-205-AS	PZ	205	AS	A	1237	34824	1067504.507	835637.878	460.482	458.538	EMSI 2012 Survey	1.944	14 3/4 "(0-29ft) 8 1/4" (29-49ft)
PZ-205-SS	PZ	205	SS	A	1238	34840	1067524.521	835652.192	461.872	459.616	EMSI 2012 Survey	2.256	9 3/4" (0-54 ft) 5 7/8" (54-90 ft)
PZ-206-SS	PZ	206	SS	A	1239	34813	1068071.821	835984.0148	460.3876	458.1918	EMSI 2012 Survey	2.1958	10" (0-52 ft) 5 7/8" (52-125.5 ft)
PZ-207-AS	PZ	207	AS	A	1240	34799	1069685.45	836212.47	462.244	460.156	EMSI 2012 Survey	2.088	8 1/4"
PZ-208-SS	PZ	208	SS	A	1241	34868	1069260.125	837344.084	474.791	472.48	EMSI 2012 Survey	2.311	10 1/4" (0-17 ft) 5 7/8" (17-99.2 ft)
PZ-209-SS	PZ	209	SS	A		41562	1067112.511	837283.267	489.278	486.988	H&A As-Built		9" for soil, 6" for rock
PZ-209-SD	PZ	209	SD	A		41551	1067116.709	837279.115	489.178	486.838	H&A As-Built		9" for soil, 6" for rock
PZ-210-SS	PZ	210	SS	A		41563	1066869.351	836952.107	486.498	484.128	H&A As-Built		9" for soil, 6" for rock
PZ-210-SD	PZ	210	SD	A		41563	1066865.005	836947.817	486.598	484.078	H&A As-Built		9" for soil, 6" for rock
PZ-211-SS	PZ	211	SS	A		41555	1067101.755	837195.851	487.008	484.658	H&A As-Built		9" for soil, 6" for rock

DRAFT

TABLE 3-2. MONITORING WELL SURVEY AND CONSTRUCTION DATA
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Borehole ID	Pipe Size (in)	Pipe Type	Perforation detail	Surface Casing	Total Pipe Length (ft)	Boring Depth (ft)	Bottom Elev (ft MSL)	Cap Ht. Above Grade (ft)	Solid Length[1] (ft)	Screen Length (ft)	Screen From	Screen To	Top Screen Elevation (msl)	Bottom Screen Elevation (msl)	Total Pipe Length (ft)	Construction Source
MW-106	2	PVC	0.010 slotted	Locking steel protective cover	n/a	15		n/a	n/a	10	5	15	434.768	424.768	n/a	As-built
MW-107	2	PVC	0.010 slotted	Locking steel protective cover	na	15	n/a	n/a	5	10	5	10	n/a	n/a	na	As-built
MW-1201	n/a	n/a	n/a	n/a		250	230.198	2.24	53	197	53	250	427.198	230.198	250	RIA
MW-1202	n/a	n/a	n/a	n/a		250	230.098	2.08	n/a	n/a	n/a	n/a	n/a	n/a	250	RIA
MW-1203	n/a	n/a	n/a	n/a		250	230.698	2.91	n/a	n/a	n/a	n/a	n/a	n/a	250	RIA
MW-1204	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	225.8	227	n/a	2.3	213.5	10	213.5	223.5	269.591	259.591	225.8	As-built
MW-1205	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	125.3	132	n/a	2.3	113	10	113	123	271.098	261.098	125.3	As-built
MW-1206	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	75.3	73	n/a	2.3	63	10	63	73	322.798	312.798	75.3	As-built
PZ-100-KS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	386.01	391.2	99.228	1.88	374	9.8	374	383.8	109.358	99.558	386.01	As-built
PZ-100-SD	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	246.4	246	239.018	1.47	234.8	9.8	234.8	244.6	249.148	239.348	246.4	As-built
PZ-100-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	95.42	94.5	390.018	1.49	73.96	19.64	73.96	93.6	409.988	390.348	95.42	As-built
PZ-101-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	141.4	140	334.878	1.79	129.48	9.8	129.48	139.28	345.008	335.208	141.4	As-built
PZ-102R-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	91.08	90.3	394.138	1.12	79.83	9.8	79.83	89.63	404.268	394.468	91.08	As-built
PZ-102-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	92.63	90.4	390.818	1.8	79.7	9.8	79.7	89.5	401.948	392.148	92.63	As-built
PZ-103-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	147.22	145.5	332.548	2.39	134.7	9.8	134.7	144.5	342.678	332.878	147.22	As-built
PZ-104-KS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 483.3 - 233.32	409.22	408	74.418	1.72	397.37	9.8	397.37	407.17	84.548	74.748	409.22	As-built
PZ-104-SD	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	246.92	252.5	236.368	1.59	235.2	9.8	235.2	245	246.498	236.698	246.92	As-built
PZ-104-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	146.7	145	336.528	2.07	134.5	9.8	134.5	144.3	346.658	336.858	146.7	As-built
PZ-105-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 482.7 - 436.22	151.02	149	332.188	2.39	138.5	9.8	138.5	148.3	342.318	332.518	151.02	As-built
PZ-106-KS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 463.3 - 257.77	376.39	375	87.468	2.49	363.75	9.8	363.75	373.57	97.618	87.798	376.39	As-built
PZ-106-SD	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	202.9	201.1	260.118	1.97	190.79	9.8	190.79	200.59	270.258	260.458	202.9	As-built
PZ-106-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	297.2	165.4	295.118	1.75	155.3	9.8	155.3	165.1	305.248	295.448	297.2	As-built
PZ-107-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 463.6 - 407.63	104.76	103	359.498	2.03	92.6	9.8	92.6	102.4	369.628	359.828	104.76	As-built
PZ-108-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	145.76	143.9	310.038	2.08	133.54	9.8	133.54	143.35	320.178	310.368	145.76	As-built
PZ-109-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	137.56	135.7	320.538	1.73	125.7	9.8	125.7	135.5	330.668	320.868	137.56	As-built
PZ-110-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 457.3 - 395.84	113.37	111.5	345.138	2.07	100.9	9.8	100.9	110.7	355.538	345.738	113.37	As-built
PZ-111-KS	2	Sch 80 PVC	0.01 inch machine slot	10 7/8" Steel Casing elev 459.9 - 375.38; 6 5/8" Steel Casing elev 460.2 - 243.88	368.99	368.8	91.478	1.69	357.15	9.8	357.15	366.96	101.628	91.818	368.99	As-built
PZ-111-SD	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 459.7 - 361.22	211.83	210	249.318	2.33	199.4	9.8	199.4	209.2	259.418	249.618	211.83	As-built
PZ-111-SS	2	Sch 80 PVC	0.01 inch machine slot	6" Steel Casing 0 - 93 ft bgs		0	0	0	0	0	462.11	462.11	0	0	0	RIA
PZ-112-AS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	36.63	36	422.798	1.9	29.6	4.8	29.6	34.4	427.928	423.128	36.63	As-built
PZ-113-AD	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	110.33	108.7	350.728	1.6	98.6	9.8	98.6	108.4	360.858	351.058	110.33	As-built
PZ-113-AS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	40.53	40	420.488	1.5	28.9	9.8	28.9	38.7	430.618	420.818	40.53	As-built
PZ-113-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 460.4 - 344.96	160.51	159	300.858	1.81	148.57	9.8	148.57	158.37	310.988	301.188	160.51	As-built
PZ-114-AS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	31.56	30.5	419.348	1.53	19.9	9.8	19.9	29.7	429.478	419.678	31.56	As-built
PZ-115-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	86.5	85	365.398	1.69	74.68	9.8	74.68	84.48	375.528	365.728	86.5	As-built
PZ-116-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 451.6 - 411.61	163.13	162	321.338	1.8	151.4	9.8	151.4	161	331.268	331.668	163.13	As-built
PZ-200-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	99.99	98.7	385.238	2.02	9.62	88.02	9.62	97.64	473.588	385.568	99.99	As-built
PZ-201A-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	91.94	90	387.818	1.81	80	9.8	80	89.8	397.948	388.148	91.94	As-built
PZ-201-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	90.96	89	388.968	2.32	9.75	78.56	9.75	88.31	467.858	389.298	90.96	As-built
PZ-202-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 480 - 445.01	91.59	90	389.178	2.16	40.2	48.9	40.2	89.1	438.408	389.508	91.59	As-built
PZ-203-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 484.7 - 428.08	112.11	110	374.078	2.41	99.6	9.8	99.6	109.4	384.178	374.378	112.11	As-built
PZ-204A-SS	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	90.93	90	376.828	1.5	79.5	9.6	79.5	89.1	386.758	377.158	90.93	As-built
PZ-204-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	92.28	90.3	376.948	2.6	10.95	78.4	10.95	89.35	455.678	377.278	92.28	As-built
PZ-205-AS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 460 - 430.33	50.34	49	410.248	1.66	38.55	9.8	38.55	48.35	420.378	410.578	50.34	As-built
PZ-205-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 460.5 - 405.53	100.36	99	360.428	1.66	88.57	9.8	88.57	98.37	370.558	360.758	100.36	As-built
PZ-206-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 459.1 - 406.38	126.82	125.5	332.978	1.82	115	9.8	115	124.8	342.978	333.178	126.82	As-built
PZ-207-AS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	41.72	40	421.448	1.69	34.9	4.8	34.9	39.7	426.578	421.778	41.72	As-built
PZ-208-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	100.55	99.2	373.298	1.72	88.7	9.8	88.7	98.5	383.428	373.628	100.55	As-built
PZ-209-SS	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	152.29	150	336.988	2.29	140	10	140	150	346.988	336.988	152.29	As-built
PZ-209-SD	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	252.34	250	236.838	2.34	240	10	240	250	246.838	236.838	252.34	As-built
PZ-210-SS	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	150.37	148	336.128	2.37	138	10	138	148	346.128	336.128	150.37	As-built
PZ-210-SD	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	250.52	248	236.078	2.52	238	10	238	248	246.078	236.078	250.52	As-built
PZ-211-SS	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	149.35	147	337.658	2.35	137	10	137	147	347.658	337.658	149.35	As-built

TABLE 3-2. MONITORING WELL SURVEY AND CONSTRUCTION DATA
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Borehole ID	Env. Control Prefix	Env. Control Point Number	Hydro Zone	Monitoring Status	Alias	Install Date	Northing (ft)	Easting (ft)	MPE (ft msl)	GSE (ft msl)	Survey Source	2012 Cap Ht. Above Grade	Borehole diameter (in)
PZ-211-SD	PZ	211	SD	A		41554	1067097.668	837191.308	487.058	484.428	H&A As-Built		9" for soil, 6" for rock
PZ-212-SS	PZ	212	SS	A		41565	1067531.957	838151.155	482.388	479.758	H&A As-Built		9" for soil, 6" for rock
PZ-212-SD	PZ	212	SD	A		41568	1067536.663	838155.084	482.318	480.078	H&A As-Built		7.25
PZ-300-AD	PZ	300	AI	X		34966	1065254.81	834002.76	449.218	447.698	Golder 1996	n/a	8 1/4"
PZ-300-AS	PZ	300	AS	X		34968	1065539.41	834042.53	450.258	448.098	Golder 1996	n/a	8 1/4"
PZ-300-SS	PZ	300	SS	X		34968	1065245.72	834024.51	449.198	447.998	Golder 1996	n/a	9 7/8" (0-46ft) 5 7/8" (46-93ft)
PZ-301-SS	PZ	301	SS	X		34965	1064842.65	835691.69	514.308	512.698	Golder 1996	n/a	8 1/4" (0-19 ft) 5 7/8" (19-161.5 ft)
PZ-302-AI	PZ	302	AI	I		34968	1067250.868	834895.669	451.194	449.771	EMSI 2012 Survey	1.423	8 1/4"
PZ-302-AS	PZ	302	AS	I		34967	1067238.22	834912.693	451.572	449.355	EMSI 2012 Survey	2.217	8 1/4"
PZ-303-AS	PZ	303	AS	I		34977	1067703.94	834600.481	453.277	451.04	EMSI 2012 Survey	2.237	8 1/4"
PZ-304-AI	PZ	304	AI	I		34974	1068166.325	834609.398	454.151	451.756	EMSI 2012 Survey	2.395	8 1/4"
PZ-304-AS	PZ	304	AS	I		34969	1068187.019	834609.304	453.89	451.731	EMSI 2012 Survey	2.159	8 1/4"
PZ-305-AI	PZ	305	AI	I		34991	1068119.659	835797.8921	459.9808	458.0891	EMSI 2012 Survey	1.8917	8 1/4"
PZ-1201-SS	PZ	1201	SS	X		34887	1067343.39	837078.26	482.018	479.998	Golder 1996	n/a	Unknown (0-53 ft) 5 7/8" (53-250)
S-1	S	1	AS	X		1981	1069726.8	834379.71	446.108	442.898	McLaren Hart 1996	n/a	8.25
S-5	S	5	AS	I	WL-105C	34912	1069196.97	836075.6	466.225	463.022	EMSI 2012 Survey	3.203	8.25
S-8	S	8	AS	I	WI-228	34943	1071085.014	834898.6739	443.9346	441.5499	EMSI 2012 Survey	2.3847	8.25
S-10	S	10	AS	I	WL-216C; WL-232	34943	1069868.787	835106.242	480.1	477.603	EMSI 2012 Survey	2.497	8.25
S-51	S	51	AS	X	HL-3	1981	1066202.28	834495.42	449.168	445.898	McLaren Hart 1996	n/a	n/a
S-52	S	52	AS	X	HL-2	1981	1066510.97	834374.7	446.678	444.298	EMSI 2018 - Calculated	n/a	n/a
S-53	S	53	AS	I	HL-1	1981	1066911.169	834671.966	444.099	441.041	EMSI 2012 Survey	3.058	n/a
S-54	S	54	AS	X	36	Unknown	1067646.97	834642.7	n/a	469.598	EMSI 2018	n/a	n/a
S-60	S	60	AS	X	S-2	29768	1069790.97	834484.7	446.528	442.698	EMSI 2018 - Calculated	n/a	n/a
S-61	S	61	AS	X	S-1	29768	1070200.944	834754.559	449.202	445.496	EMSI 2012 Survey	3.706	n/a
S-75	S	75	AS	X	37	Unknown	1067291.38	834893.45	461.678	458.398	McLaren Hart 1996	n/a	n/a
S-76	S	76	AS	X	37A	28642	1067446.97	834743.7	n/a	473.998	EMSI 2018	n/a	n/a
S-80	S	80	AS	X		30922	1065232.74	834033.05	452.708	447.998	McLaren Hart 1996	n/a	5"
S-82	S	82	AS	I		30921	1069352.643	834447.496	450.113	448.172	EMSI 2012 Survey	1.941	5"
S-84	S	84	AS	A		30895	1069674.22	836614.269	457.044	454.24	EMSI 2012 Survey	2.804	5"
S-88	S	88	AS	X		30895	1068439.36	835408.73	462.358	459.598	McLaren Hart 1996	n/a	5" (0-30 ft), 4 1/2" (30-41.5)

DRAFT

TABLE 3-2. MONITORING WELL SURVEY AND CONSTRUCTION DATA
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Borehole ID	Pipe Size (in)	Pipe Type	Perforation detail	Surface Casing	Total Pipe Length (ft)	Boring Depth (ft)	Bottom Elev (ft MSL)	Cap Ht. Above Grade (ft)	Solid Length[1] (ft)	Screen Length (ft)	Screen From	Screen To	Top Screen Elevation (msl)	Bottom Screen Elevation (msl)	Total Pipe Length (ft)	Construction Source
PZ-211-SD	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	240.46	247	237.428	2.63	237	10	237	247	347.428	237.428	240.46	As-built
PZ-212-SS	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	146.63	150	329.758	2.63	134	10	134	144	345.758	335.758	146.63	As-built
PZ-212-SD	2	Sch. 80 PVC	0.010 slotted	Locking steel protective cover	246.24	245	235.078	2.24	234	10	234	244	246.078	236.078	246.24	As-built
PZ-300-AD	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	43.72	42.2	405.498	1.52	37.1	4.8	37.1	41.9	410.598	405.798	43.72	As-built
PZ-300-AS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	22.16	20	428.098	2.16	9.9	9.8	9.9	19.7	438.198	428.398	22.16	As-built
PZ-300-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 447.6 - 402.4	95.2	94.5	353.998	1.2	83.88	9.8	83.88	93.7	364.118	354.298	95.2	As-built
PZ-301-SS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	162.61	161.5	351.698	1.61	150.9	9.8	150.9	160.7	361.798	351.998	162.61	As-built
PZ-302-AI	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	43.85	43	406.898	1.15	32.6	9.8	32.6	42.4	416.998	407.198	43.85	As-built
PZ-302-AS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	24.22	22.3	426.798	1.92	12.2	9.8	12.2	22	436.898	427.098	24.22	As-built
PZ-303-AS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	28.48	26.5	424.298	2.38	16	9.8	16	25.8	434.398	424.598	28.48	As-built
PZ-304-AI	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	51.52	50	402.098	2.42	39	9.8	39	48.8	412.198	402.398	51.52	As-built
PZ-304-AS	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	29.51	28	423.798	2.31	17.1	9.8	17.1	26.9	433.898	424.098	29.51	As-built
PZ-305-AI	2	Sch 80 PVC	0.01 inch machine slot	Locking steel protective cover	64.98	64	393.898	1.68	53.2	9.8	53.2	63	403.998	394.198	64.98	As-built
PZ-1201-SS	2	Sch 80 PVC	0.01 inch machine slot	6 5/8" Steel Casing elev 483-427.41		250	229.998	2.01	139.71, 0.33	9.6	137.69	147.29	342.308	332.708	147.63	RIA
S-1	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	25.71	25	417.898	3.21	2.5	20	2.5	22.5	440.398	420.398	25.71	As-built
S-5	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	42.95	49.3	415.998	2.95	30	10	30	40	435.298	425.298	42.95	As-built
S-8	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	29.23	29.3	411.898	2.43	6.8	20	6.8	26.8	434.398	414.398	29.23	As-built
S-10	2	Sch. 40 PVC	0.010 slotted	Locking steel protective cover	49.22	54.5	422.598	2.78	32	20	32	52	445.098	425.098	49.22	As-built
S-51	n/a	n/a	n/a	n/a		25.8	420.098	1.42	24.22	3	22.8	25.8	423.098	420.098	25.8	RIA
S-52	n/a	n/a	n/a	n/a		25.2	419.098	2.38	24.58	3	22.2	25.2	422.098	419.098	25.2	RIA
S-53	n/a	n/a	n/a	n/a		23.7	420.698	4.2	24.9	3	20.7	23.7	423.698	420.698	23.7	RIA
S-54	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	40.4	RIA
S-60	n/a	n/a	n/a	n/a		21	421.698	3.83	n/a	n/a	n/a	21	n/a	421.698	21	RIA
S-61	n/a	n/a	n/a	n/a		21.5	423.698	4.57	n/a	n/a	n/a	21.5	n/a	423.698	21.5	RIA
S-75	n/a	n/a	n/a	n/a		26	432.398	1.1	24.1	3	23	26	435.398	432.398	26	RIA
S-76	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	50	RIA
S-80	2	PVC	0.01 inch machine slot	n/a		22	425.998	5	15	10	10	20	437.998	427.998	20	RIA
S-82	2	PVC	0.01 inch machine slot	n/a		26.5	420.798	3	18.5	10	15.5	25.5	431.798	421.798	25.5	RIA
S-84	2	PVC	0.01 inch machine slot	n/a		31.5	420.998	4	24.9	10	20.9	30.9	431.598	421.598	30.9	RIA
S-88	2	PVC	0.01 inch machine slot	n/a		41.5	418.098	2.7	33	10	30	40	429.598	419.598	40	RIA

Notes:
ft - feet
in - inches
msl - mean sea level
n/a - not applicable

EMSI - Environmental Management Support, Inc
RIA - Remedial Investigation Addendum
MPE - Measuring Point Elevation
GSE - Ground Surface Elevation
PVC - Polyvinyl Chloride
Sch - Schedule

Monitoring Status
A - Active
I - Inactive
U - Unknown
X - Abandoned

Environmental Control Prefix
D - Deep
F - Foth
I - Intermediate
LR - Leachate Riser
MW - Monitoring Well
PZ - Piezometer
S - Shallow

Hydrological Zone
AD - Deep Alluvial
AS - Shallow Alluvial
AI - Intermediate Alluvial
LR - Leachate Riser
KS - Keokuk Formation
SD - Salem Formation
SS - Upper Salem/St. Louis Formation

DRAFT

TABLE 3-3. SLUG TESTING RESULTS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Zone	Well ID	Test	Zone	Northing (ft)	Easting (ft)	Test ID	Hvorslev (cm/sec)	Hvorslev (ft/min)	B-R (cm/sec)	B-R (ft/min)	C-P (cm/sec)	C-P (ft/min)	Mean Hvorslev B-R (cm/sec)	Mean Hvorslev B-R (ft/min)	Mean Hvorslev B-R (ft/day)	Source	Min (ft/day)	Max (ft/day)	Geometric Mean (ft/day)
Shallow Alluvium	PZ-112-AS	RH	AS	1069042.848	835849.449	PZ-112-AS-RH1	1.90E-03	3.70E-03	1.10E-03	2.20E-03	NA	NA	1.50E-03	3.00E-03	4.32	Golder 1996	0.35	97	8.9
	PZ-112-AS	FH	AS	1069042.848	835849.449	PZ-112-AS-FH1	3.00E-03	5.90E-03	1.70E-03	3.30E-03	NA	NA	2.40E-03	4.60E-03	6.62	Golder 1996			
	PZ-113-AS	RH	AS	1069264.97	835922.4	PZ-113-AS-RH1	1.40E-02	2.80E-02	5.30E-02	1.00E-01	NA	NA	3.40E-02	6.60E-02	95.04	Golder 1996			
	PZ-113-AS	FH	AS	1069264.97	835922.4	PZ-113-AS-FH1	8.00E-03	1.60E-02	5.10E-03	1.00E-02	NA	NA	6.60E-03	1.30E-02	18.72	Golder 1996			
	PZ-114-AS	FH	AS	1069459.999	836942.992	PZ-114-AS-FH1	3.10E-03	6.10E-03	1.70E-03	3.30E-03	NA	NA	2.40E-03	4.70E-03	6.77	Golder 1996			
	PZ-114-AS	FH	AS	1069459.999	836942.992	PZ-114-AS-FH2	4.50E-03	8.90E-03	2.70E-03	5.30E-03	NA	NA	3.60E-03	7.10E-03	10.22	Golder 1996			
	PZ-205-AS		AS	1067504.507	835637.878	PZ-205-AS	6.00E-04	1.20E-03	4.40E-04	8.70E-04	NA	NA	5.20E-04	1.00E-03	1.44	Golder 1996			
	PZ-207-AS		AS	1069685.45	836212.47	PZ-207-AS	7.60E-03	1.50E-02	4.80E-03	9.40E-03	NA	NA	6.20E-03	1.20E-02	17.28	Golder 1996			
	PZ-300-AS	FH[2]	AS	1065539.41	834042.53	PZ-300-AS-FH2	5.80E-04	1.10E-03	NA	NA	NA	NA	5.80E-04	1.10E-03	1.58	Golder 1996			
	PZ-300-AS	RH	AS	1065539.41	834042.53	PZ-300-AS-RH	7.10E-04	1.40E-03	2.10E-03	4.10E-03	NA	NA	1.40E-03	2.80E-03	4.03	Golder 1996			
	PZ-302-AS	FH[2]	AS	1067238.22	834912.693	PZ-302-AS-FH2	1.10E-04	2.20E-04	NA	NA	NA	NA	1.10E-04	2.20E-04	0.32	Golder 1996			
	PZ-302-AS	RH	AS	1067238.22	834912.693	PZ-302-AS-RH	1.20E-04	2.40E-04	NA	NA	NA	NA	1.20E-04	2.40E-04	0.35	Golder 1996			
	PZ-303-AS	FH[2]	AS	1067703.94	834600.481	PZ-303-AS-FH12	4.00E-04	7.90E-04	NA	NA	NA	NA	4.00E-04	7.90E-04	1.14	Golder 1996			
	PZ-303-AS	FH[2]	AS	1067703.94	834600.481	PZ-303-AS-FH22	6.00E-04	1.20E-03	NA	NA	NA	NA	6.00E-04	1.20E-03	1.73	Golder 1996			
	PZ-303-AS	RH	AS	1067703.94	834600.481	PZ-303-AS-RH	3.70E-03	7.30E-03	1.50E-02	3.00E-02	NA	NA	9.40E-03	1.80E-02	25.92	Golder 1996			
	PZ-304-AS	FH[2]	AS	1068187.019	834609.304	PZ-304-AS-FH2	8.70E-04	1.70E-03	NA	NA	NA	NA	8.70E-04	1.70E-03	2.45	Golder 1996			
	PZ-304-AS	RH	AS	1068187.019	834609.304	PZ-304-AS-RH	5.90E-03	1.20E-02	1.80E-02	3.50E-02	NA	NA	1.20E-02	2.40E-02	34.56	Golder 1996			
	S-1	RH	AS	1069726.8	834379.71	S-1	NA	NA	3.78E-03	7.44E-03	NA	NA	NA	NA	10.71	McLaren Hart 1996			
	S-5	RH	AS	1069196.97	836075.6	S-5	NA	NA	8.76E-04	1.72E-03	NA	NA	NA	NA	2.48	McLaren Hart 1996			
	S-8	RH	AS	1071085.014	834898.6739	S-8	NA	NA	3.43E-02	6.75E-02	NA	NA	NA	NA	97.23	McLaren Hart 1996			
	S-84	RH	AS	1069674.22	836614.269	S-84	NA	NA	2.32E-03	4.57E-03	NA	NA	NA	NA	6.58	McLaren Hart 1996			
	MW-101	RH	AS	1070871.45	834598.7	MW-101	NA	NA	4.17E-03	8.21E-03	NA	NA	NA	NA	11.82	McLaren Hart 1996			
	F-3	RH	AS	1070530.77	835994.53	MW-F3	NA	NA	3.83E-03	7.54E-03	NA	NA	NA	NA	10.86	McLaren Hart 1996			
Intermediate Alluvium	PZ-300-AD	FH	AI	1065254.81	834002.76	PZ-300-AD-FH	3.70E-04	7.30E-04	2.70E-04	5.30E-04	NA	NA	3.20E-04	6.30E-04	0.91	Golder 1996	0.39	189	49
	PZ-300-AD	RH	AI	1065254.81	834002.76	PZ-300-AD-RH	1.60E-04	3.10E-04	1.10E-04	2.20E-04	NA	NA	1.40E-04	2.70E-04	0.39	Golder 1996			
	PZ-302-AI	FH	AI	1067250.868	834895.669	PZ-302-AI-FH	1.50E-02	3.00E-02	9.80E-03	1.90E-02	NA	NA	1.20E-02	2.40E-02	34.56	Golder 1996			
	PZ-302-AI	RH	AI	1067250.868	834895.669	PZ-302-AI-RH	1.50E-02	3.00E-02	1.00E-02	2.00E-02	NA	NA	1.30E-02	2.50E-02	36.00	Golder 1996			
	PZ-304-AI	FH	AI	1068166.325	834609.398	PZ-304-AI-FH	2.40E-02	4.70E-02	1.70E-02	3.30E-02	NA	NA	2.10E-02	4.00E-02	57.60	Golder 1996			
	PZ-305-AI	FH[1]	AI	1068119.659	835797.8921	PZ-305-AI-FH1	1.80E-02	3.50E-02	1.40E-02	2.80E-02	NA	NA	1.60E-02	3.10E-02	44.64	Golder 1996			
	PZ-305-AI	FH[2]	AI	1068119.659	835797.8921	PZ-305-AI-FH2	1.90E-04	3.70E-04	1.70E-04	3.30E-04	NA	NA	1.80E-04	3.50E-04	0.50	Golder 1996			
	I-2	RH	AI	1069739.23	834386.88	I-2	NA	NA	3.27E-02	6.44E-02	NA	NA	NA	NA	92.69	McLaren Hart 1996			
	I-4	RH	AI	1069189.97	836064.6	I-4	NA	NA	5.41E-02	1.06E-01	NA	NA	NA	NA	153.35	McLaren Hart 1996			
	I-7	RH	AI	1070784.02	834474.57	I-7	NA	NA	6.68E-02	1.31E-01	NA	NA	NA	NA	189.35	McLaren Hart 1996			
	I-9	RH	AI	1069358.403	834444.232	I-9	NA	NA	5.47E-02	1.08E-01	NA	NA	NA	NA	155.06	McLaren Hart 1996			
	I-11	RH	AI	1069860.187	835099.736	I-11	NA	NA	4.63E-02	9.11E-02	NA	NA	NA	NA	131.24	McLaren Hart 1996			
	I-68	RH	AI	1069612.97	836861.2	I-68	NA	NA	1.22E-02	2.40E-02	NA	NA	NA	NA	34.58	McLaren Hart 1996			
Deep Alluvium	PZ-113-AD	FH	AD	1069273.97	835934.5	PZ-113-AD-FH1	1.80E-03	3.50E-03	1.50E-03	3.00E-03	NA	NA	1.70E-03	3.20E-03	4.61	Golder 1996	4.6	251	59
	PZ-113-AD	FH	AD	1069273.97	835934.5	PZ-113-AD-FH2	1.90E-03	3.70E-03	1.40E-03	2.80E-03	NA	NA	1.70E-03	3.20E-03	4.61	Golder 1996			
	D-3	RH	AD	1069177.97	836047	D-3	NA	NA	3.15E-02	6.20E-02	NA	NA	NA	NA	89.29	McLaren Hart 1996			
	D-6	RH	AD	1070235.1	834723.492	D-6	NA	NA	4.29E-02	8.44E-02	NA	NA	NA	NA	121.61	McLaren Hart 1996			
	D-12	RH	AD	1069877.227	835110.755	D-12	NA	NA	4.14E-02	8.15E-02	NA	NA	NA	NA	117.35	McLaren Hart 1996			
	D-13	RH	AD	1070527.015	835776.5617	D-13	NA	NA	8.85E-02	1.74E-01	NA	NA	NA	NA	250.87	McLaren Hart 1996			
	D-85	RH	AD	1069667.265	836605.173	D-85	NA	NA	4.50E-03	8.86E-03	NA	NA	NA	NA	12.76	McLaren Hart 1996			
	D-93	RH	AD	1069369.757	834443.556	D-93	NA	NA	4.78E-02	9.41E-02	NA	NA	NA	NA	135.50	McLaren Hart 1996			

TABLE 3-3. SLUG TESTING RESULTS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Zone	Well ID	Test	Zone	Northing (ft)	Easting (ft)	Test ID	Hvorslev (cm/sec)	Hvorslev (ft/min)	B-R (cm/sec)	B-R (ft/min)	C-P (cm/sec)	C-P (ft/min)	Mean Hvorslev B-R (cm/sec)	Mean Hvorslev B-R (ft/min)	Mean Hvorslev B-R (ft/day)	Source	Min (ft/day)	Max (ft/day)	Geometric Mean (ft/day)
St. Louis Form.	PZ-100-SS		SS	1068908.761	837349.65	PZ-100-SS	1.00E-07	2.00E-07	5.70E-08	1.10E-07	NA	NA	7.90E-08	1.50E-07	0.00	Golder 1996	0.000065	7.8	0.0037
	PZ-101-SS		SS	1068513.92	836797.322	PZ-101-SS	8.60E-07	1.70E-06	5.10E-07	1.00E-06	NA	NA	6.90E-07	1.30E-06	0.00	Golder 1996			
	PZ-102R-SS		SS	1068172.734	837033.545	PZ-102R-SS	4.70E-08	9.30E-08	3.00E-08	5.90E-08	NA	NA	3.90E-08	7.60E-08	0.00	Golder 1996			
	PZ-103-SS		SS	1067701.303	836897.822	PZ-103-SS	8.40E-07	1.70E-06	1.70E-06	3.30E-06	NA	NA	1.30E-06	2.50E-06	0.00	Golder 1996			
	PZ-104-SS		SS	1067068.815	837021.987	PZ-104-SS	6.00E-07	1.20E-06	1.30E-06	2.60E-06	NA	NA	9.50E-07	1.90E-06	0.00	Golder 1996			
	PZ-105-SS		SS	1066462.138	836405.054	PZ-105-SS	3.50E-06	6.90E-06	8.50E-06	1.70E-05	NA	NA	6.00E-06	1.20E-05	0.02	Golder 1996			
	PZ-106-SS		SS	1066767.07	835574.642	PZ-106-SS	3.90E-06	7.70E-06	2.50E-06	4.90E-06	NA	NA	3.20E-06	6.30E-06	0.01	Golder 1996			
	PZ-107-SS		SS	1067204.044	835429.345	PZ-107-SS	1.60E-06	3.10E-06	1.20E-06	2.40E-06	NA	NA	1.40E-06	2.80E-06	0.00	Golder 1996			
	PZ-108-SS		SS	1067719.34	836147.31	PZ-108-SS	6.30E-07	1.20E-06	4.30E-07	8.50E-07	NA	NA	5.30E-07	1.00E-06	0.00	Golder 1996			
	PZ-109-SS		SS	1068052.306	836318.4981	PZ-109-SS	1.80E-07	3.50E-07	8.70E-08	1.70E-07	NA	NA	1.30E-07	2.60E-07	0.00	Golder 1996			
	PZ-110-SS		SS	1068376.97	836094.3	PZ-110-SS1	1.60E-06	3.10E-06	8.90E-07	1.80E-06	NA	NA	1.20E-06	2.50E-06	0.00	Golder 1996			
	PZ-113-SS		SS	1069282.97	835951.3	PZ-113-SS	5.20E-06	1.00E-05	4.90E-06	9.60E-06	NA	NA	5.10E-06	9.90E-06	0.01	Golder 1996			
	PZ-115-SS		SS	1069449.628	836929.871	PZ-115-SS	2.90E-05	5.70E-05	2.40E-05	4.70E-05	NA	NA	2.70E-05	5.2E-05	0.07	Golder 1996			
	PZ-116-SS		SS	1066451.146	836018.584	PZ-116-SS	2.90E-08	5.70E-08	1.70E-08	3.30E-08	NA	NA	2.30E-08	4.50E-08	0.00	Golder 1996			
	PZ-200-SS		SS	1068537.089	837146.557	PZ-200-SS	1.50E-06	3.00E-06	2.80E-06	5.50E-06	NA	NA	2.20E-06	4.20E-06	0.01	Golder 1996			
	PZ-201-SS		SS	1067860.52	837036.76	PZ-201-SS	3.30E-05	6.50E-05	5.40E-05	1.10E-04	NA	NA	4.40E-05	8.60E-05	0.12	Golder 1996			
	PZ-201A-SS		SS	1067872.76	837021.163	PZ-201A-SS	1.30E-07	2.60E-07	8.30E-08	1.60E-07	NA	NA	1.10E-07	2.10E-07	0.00	Golder 1996			
	PZ-202-SS		SS	1067361.152	837276.124	PZ-202-SS	3.00E-03	5.90E-03	2.50E-03	4.90E-03	NA	NA	2.80E-03	5.40E-03	7.78	Golder 1996			
	PZ-204-SS		SS	1066470.424	835731.2717	PZ-204-SS	1.80E-06	3.50E-06	2.80E-06	5.50E-06	NA	NA	2.30E-06	4.50E-06	0.01	Golder 1996			
	PZ-204A-SS		SS	1066470.424	835731.2717	PZ-204A-SS	3.50E-07	6.90E-07	2.30E-07	4.50E-07	NA	NA	2.90E-07	5.70E-07	0.00	Golder 1996			
	PZ-205-SS		SS	1067524.521	835652.192	PZ-205-SS	4.40E-07	8.70E-07	3.90E-07	7.70E-07	NA	NA	4.20E-07	8.20E-07	0.00	Golder 1996			
	PZ-206-SS		SS	1068071.821	835984.0148	PZ-206-SS	1.80E-05	3.50E-05	1.10E-05	2.20E-05	NA	NA	1.50E-05	2.90E-05	0.04	Golder 1996			
	PZ-208-SS		SS	1069260.125	837344.084	PZ-208-SS	4.30E-07	8.50E-07	2.70E-07	5.30E-07	NA	NA	3.50E-07	6.90E-07	0.00	Golder 1996			
	PZ-300-SS		SS	1065245.72	834024.51	PZ-300-SS	9.00E-07	1.80E-06	7.70E-07	1.50E-06	NA	NA	8.40E-07	1.60E-06	0.00	Golder 1996			
	PZ-301-SS		SS	1064842.65	835691.69	PZ-301-SS1	7.50E-07	1.50E-06	NA	NA	NA	NA	7.50E-07	1.50E-06	0.00	Golder 1996			
Salem Form.	PZ-100-SD		SD	1068892.808	837369.99	PZ-100-SD	9.10E-07	1.80E-06	6.40E-07	1.30E-06	NA	NA	7.80E-07	1.50E-06	0.00	Golder 1996	0.00024	0.042	0.0019
	PZ-104-SD		SD	1067054.135	837009.268	PZ-104-SD	1.80E-05	3.50E-05	1.20E-05	2.30E-05	NA	NA	1.50E-05	2.90E-05	0.04	Golder 1996			
	PZ-106-SD		SD	1066755.685	835590.703	PZ-106-SD	3.00E-07	5.90E-07	1.60E-07	3.10E-07	NA	NA	2.30E-07	4.50E-07	0.00	Golder 1996			
	PZ-111-SD		SD	1068678.166	836009.0044	PZ-111-SD	1.00E-07	2.00E-07	6.80E-08	1.30E-07	NA	NA	8.40E-08	1.70E-07	0.00	Golder 1996			
Keokuk Form.	PZ-100-KS		KS	1068883.062	837386.265	PZ-100-KS	NA	NA	NA	NA	6.00E-07	1.20E-06	NA	NA	0.00	Golder 1996	0.0017	0.011	0.0058
	PZ-104-KS		KS	1067034.018	836995.216	PZ-104-KS	NA	NA	NA	NA	2.50E-06	4.90E-06	NA	NA	0.01	Golder 1996			
	PZ-106-KS		KS	1066744.652	835606.899	PZ-106-KS	NA	NA	NA	NA	3.10E-06	6.10E-06	NA	NA	0.01	Golder 1996			
	PZ-111-KS		KS	1068661.958	836025.2057	PZ-111-KS	NA	NA	NA	NA	3.80E-06	7.50E-06	NA	NA	0.01	Golder 1996			

Notes:
cm/sec - centimeters per second
ft/min - feet per minute
ft/day - feet per day
Form. - Formation
RH - Rising Head
FH - Falling Head
B-R - Bouwer & Rice
C-P - Cooper Papadopulos
Min - minimum
Max - maximum
[1] Slug tests conducted before piezometer reached equilibrium; data presented but not included in geometric means.
[2] Falling head slug tests conducted within sand pack zone of well; data presented but not included in geometric means.
Rising Head test used to calculate geometric mean; falling head test used if rising head test unavailable
Wells shown in gray not included in geometric mean
Burns & McDonnell slug testing results not included in summary

DRAFT

TABLE 3-4. PACKER TESING RESULTS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Borehole ID	GSE (ft msl)	GSE (ft msl)	Test Interval (ft bgs)	Interval Top (ft bgs)	Interval Bottom (ft bgs)	Interval Top (ft msl)	Interval Bottom (ft msl)	Interval Mid Point (ft msl)	Interval Thickness (ft)	K (cm/s)	K (ft/min)	K (ft/day)	Formation	Comments	Minimum (ft/day)	Maximum (ft/day)	Geometric Mean (ft/day)
PZ-100-KS	438.3	484.82	37.3-42.3	37.3	42.3	447.5	442.5	445.0	5	7.50E-04	1.50E-03	2.16E+00	St. Louis	Unsaturated			
PZ-100-KS	438.3	484.82	50.0-55.0	50.0	55.0	434.8	429.8	432.3	5	3.30E-06	6.60E-06	9.50E-03	St. Louis	Unsaturated			
PZ-104-KS	482.3	481.838	50.0-55.0	50.0	55.0	431.8	426.8	429.3	5	2.90E-06	5.70E-06	8.21E-03	St. Louis	Unsaturated			
PZ-106-KS	460.8	462.143	42.0-47.0	42.0	47.0	420.1	415.1	417.6	5	6.00E-06	1.20E-05	1.73E-02	St. Louis	Unsaturated			
PZ-106-KS	460.8	462.143	61.0-66.0	61.0	66.0	401.1	396.1	398.6	5	2.10E-06	4.10E-06	5.90E-03	St. Louis	Unsaturated	1.0E-03	1.2E-02	2.7E-03
PZ-100-KS	438.3	484.82	110.0-115.0	110.0	115.0	374.8	369.8	372.3	5	3.70E-07	7.20E-07	1.04E-03	St. Louis	Saturated			
PZ-104-KS	482.3	481.838	113.0-118.0	113.0	118.0	368.8	363.8	366.3	5	1.50E-07	2.90E-07	4.18E-04	St. Louis	Unsaturated			
PZ-111-KS	459.2	461.3366	105.0-127.0	105.0	127.0	356.3	334.3	345.3	22	4.40E-06	8.60E-06	1.24E-02	St. Louis	Saturated			
PZ-111-KS	459.2	461.3366	125.0-130.0	125.0	130.0	336.3	331.3	333.8	5	5.40E-07	1.10E-06	1.58E-03	St. Louis	Saturated			
PZ-106-KS	460.8	462.143	148.0-153.0	148.0	153.0	314.1	309.1	311.6	5	4.50E-06	8.80E-06	1.27E-02	Salem				
PZ-111-KS	459.2	461.3366	162.0-167.0	162.0	167.0	299.3	294.3	296.8	5	7.90E-07	1.50E-06	2.16E-03	Salem				
PZ-111-KS	459.2	461.3366	127.0-210.0	127.0	210.0	334.3	251.3	292.8	83	1.30E-06	2.60E-06	3.74E-03	Salem				
PZ-106-KS	460.8	462.143	140.0-201.0	140.0	201.0	322.1	261.1	291.6	61	2.50E-05	5.00E-05	7.20E-02	Salem				
PZ-100-KS	438.3	484.82	195.0-200.0	195.0	200.0	289.8	284.8	287.3	5	3.90E-06	7.70E-06	1.11E-02	Salem				
PZ-111-KS	459.2	461.3366	140.0-210.0	140.0	210.0	321.3	251.3	286.3	70	3.30E-06	6.40E-06	9.22E-03	Salem				
PZ-104-KS	482.3	481.838	162.0-252.5	162.0	252.5	319.8	229.3	274.6	90.5	4.90E-06	9.70E-06	1.40E-02	Salem		1.6E-04	7.2E-02	4.6E-03
PZ-104-KS	482.3	481.838	208.0-213.0	208.0	213.0	273.8	268.8	271.3	5	8.40E-06	1.70E-05	2.45E-02	Salem				
PZ-111-KS	459.2	461.3366	175.0-210.0	175.0	210.0	286.3	251.3	268.8	35	1.20E-06	2.40E-06	3.46E-03	Salem				
PZ-106-KS	460.8	462.143	187.0-201.0	187.0	201.0	275.1	261.1	268.1	14	1.80E-07	3.50E-07	5.04E-04	Salem				
PZ-111-KS	459.2	461.3366	195.0-200.0	195.0	200.0	266.3	261.3	263.8	5	5.80E-08	1.10E-07	1.58E-04	Salem				
PZ-100-KS	438.3	484.82	220.0-225.0	220.0	225.0	264.8	259.8	262.3	5	2.10E-06	4.10E-06	5.90E-03	Salem				
PZ-104-KS	482.3	481.838	235.0-252.5	235.0	252.5	246.8	229.3	238.1	17.5	3.20E-07	6.40E-07	9.22E-04	Salem				
PZ-106-KS	460.8	462.143	215.0-220.0	215.0	220.0	247.1	242.1	244.6	5	2.60E-07	5.10E-07	7.34E-04	Warsaw				
PZ-111-KS	459.2	461.3366	221.0-226.0	221.0	226.0	240.3	235.3	237.8	5	9.50E-07	1.90E-06	2.74E-03	Warsaw				
PZ-111-KS	459.2	461.3366	226.0-231.0	226.0	231.0	235.3	230.3	232.8	5	1.70E-06	3.30E-06	4.75E-03	Warsaw				
PZ-106-KS	460.8	462.143	237.0-242.0	237.0	242.0	225.1	220.1	222.6	5	2.40E-06	4.80E-06	6.91E-03	Warsaw				
PZ-111-KS	459.2	461.3366	220.0-260.0	220.0	260.0	241.3	201.3	221.3	40	1.30E-06	2.50E-06	3.60E-03	Warsaw				
PZ-104-KS	482.3	481.838	270.0-290.0	270.0	290.0	211.8	191.8	201.8	20	4.40E-06	8.70E-07	1.25E-03	Warsaw				
PZ-111-KS	459.2	461.3366	260.0-265.0	260.0	265.0	201.3	196.3	198.8	5	2.00E-06	3.80E-06	5.47E-03	Warsaw				
PZ-100-KS	438.3	484.82	290.0-295.0	290.0	295.0	194.8	189.8	192.3	5	5.60E+05	1.10E-04	1.58E-01	Warsaw				
PZ-104-KS	482.3	481.838	287.0-292.5	287.0	292.5	194.8	189.3	192.1	5.5	2.70E-06	5.30E-06	7.63E-03	Warsaw		7.3E-04	1.6E-01	5.5E-03
PZ-111-KS	459.2	461.3366	260.0-290.0	260.0	290.0	201.3	171.3	186.3	30	1.10E-06	2.20E-06	3.17E-03	Warsaw				
PZ-104-KS	482.3	481.838	290.0-320.0	290.0	320.0	191.8	161.8	176.8	30	7.10E-07	1.40E-06	2.02E-03	Warsaw				
PZ-100-KS	438.3	484.82	265.0-357.6	265.0	357.6	219.8	127.2	173.5	92.6	5.30E-06	1.00E-05	1.44E-02	Warsaw				
PZ-111-KS	459.2	461.3366	290.0-343.7	290.0	343.7	171.3	117.6	144.5	53.7	3.10E-06	6.10E-06	8.78E-03	Warsaw				
PZ-104-KS	482.3	481.838	320.0-358.3	320.0	358.3	161.8	123.5	142.7	38.3	3.40E-06	6.60E-07	9.50E-04	Warsaw				
PZ-106-KS	460.8	462.143	301.0-346.4	301.0	346.4	161.1	115.7	138.4	45.4	3.30E-05	6.60E-05	9.50E-02	Warsaw				
PZ-104-KS	482.3	481.838	343.0-348.0	343.0	348.0	138.8	133.8	136.3	5	1.90E-06	3.70E-06	5.33E-03	Warsaw				
PZ-111-KS	459.2	461.3366	343.0-348.0	343.0	348.0	118.3	113.3	115.8	5	2.50E-05	4.90E-05	7.06E-02	Keokuk				
PZ-104-KS	482.3	481.838	366.0-371.0	366.0	371.0	115.8	110.8	113.3	5	4.00E-06	7.90E-06	1.14E-02	Keokuk				
PZ-100-KS	438.3	484.82	366.0-391.0	366.0	391.0	118.8	93.8	106.3	25	7.60E-07	1.50E-06	2.16E-03	Keokuk				
PZ-111-KS	459.2	461.3366	343.0-368.0	343.0	368.0	118.3	93.3	105.8	25	2.10E-05	4.10E-05	5.90E-02	Keokuk				
PZ-111-KS	459.2	461.3366	355.0-360.0	355.0	360.0	106.3	101.3	103.8	5	4.30E-05	8.50E-05	1.22E-01	Keokuk				
PZ-106-KS	460.8	462.143	357.0-362.2	357.0	362.2	105.1	99.9	102.5	5.2	2.80E-05	5.50E-05	7.92E-02	Keokuk		2.2E-03	1.2E-01	2.8E-02
PZ-106-KS	460.8	462.143	346.0-374.1	346.0	374.1	116.1	88.0	102.1	28.1	2.20E-05	4.30E-05	6.19E-02	Keokuk				
PZ-100-KS	438.3	484.82	377.0-391.0	377.0	391.0	107.8	93.8	100.8	14	1.40E-06	2.70E-06	3.89E-03	Keokuk				
PZ-104-KS	482.3	481.838	360.0-408.0	360.0	408.0	121.8	73.8	97.8	48	5.70E-06	1.10E-05	1.58E-02	Keokuk				
PZ-106-KS	460.8	462.143	364.0-374.0	364.0	374.0	98.1	88.1	93.1	10	1.70E-05	3.40E-05	4.90E-02	Keokuk				
PZ-104-KS	482.3	481.838	390.0-408.0	390.0	408.0	91.8	73.8	82.8	18	1.30E-05	2.60E-05	3.74E-02	Keokuk				

Notes:
ft - feet
min - minute
cm/sec - centimeters per second
bgs - below ground surface
msl - above mean sea level
GSE - Ground Surface Elevation
K - Hydraulic Conductivity
Minimum, maximum, and geometric means calculated using saturated intervals

TABLE 3-5. LABORATORY PERMEABILITY TESTING RESULTS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Sample Number	Sample Length (cm)	Sample Diameter (cm)	Sample Dry Density (pcf)	Maximum Dry Density (pcf)	Compaction (%)	Initial Moisture Content (%)	Optimum Moisture Content (%)	Effective Pressure (psi)	Back Pressure (psi)	Gradient	Average Permeability (cm/sec)	Average Permeability (ft/day)
PZ-101-SS 6-8	7.99	7.22	91.7	---	---	24.4	---	6	94	2	3×10^{-4}	8.5E-01
PZ-102-SS 4-6	8.82	7.07	92.2	---	---	28.2	---	5	95	9	8×10^{-7}	2.3E-03
PZ-103-SS 14-16	7.73	7.18	97.7	---	---	28.3	---	13	87	4	2×10^{-6}	5.7E-03
PZ-104-KS 6-8	9.11	7.14	95.7	---	---	23.6	---	6	94	24	2×10^{-7}	5.7E-04
PZ-106-KS 6-8	8.89	7.14	103.0	---	---	22.2	---	6	94	5	3×10^{-6}	8.5E-03
PZ-106-KS GTS-1 201.9-202.5	7.63	4.50	151.9	---	---	4.5	---	153	98	129	$<1.1 \times 10^{-10}$	3.1E-07
PZ-106-KS GTS-2 229.6-230.1	7.66	4.47	148.0	---	---	4.4	---	170	88	94	1.5×10^{-10}	4.3E-07
PZ-200-SS 6-8	9.59	7.17	95.3	---	---	27.5	---	6	94	4	2×10^{-6}	5.7E-03
PZ-201-SS 26-28	8.11	7.13	86.4	---	---	34.5	---	23	77	14	3×10^{-6}	8.5E-03
PZ-202-SS 6-8	8.08	7.10	96.4	---	---	26.7	---	6	94	10	3×10^{-7}	8.5E-04
PS-1 10	9.56	7.23	100.8	105.0	96	18.4	19.0	5	95	6	2×10^{-7}	5.7E-04
PS-2 7	9.55	7.24	101.7	106.0	96	17.5	17.5	5	95	10	3×10^{-7}	8.5E-04
LR-103	10.16	7.22	79.9	---	---	37.4	17.5	5	95	3	2×10^{-4}	5.7E-01

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement	Preliminary Determination	Remarks
40 C.F.R. Part 192, Subpart A Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, Standards for the Control of Residual Radioactive Material from Inactive Uranium Processing Sites 40 C.F.R. Appendix Table 1 to Subpart A of Part 192, Maximum Concentration of Constituents for Groundwater Protection	Radium, uranium, and trace metals in groundwater Radium-226 (Radium-228) in soil	Maximum constituent concentration: Combined Ra-226 and Ra-228 5 pCi/L Combined U-234 and U-238 30 pCi/L Gross alpha (excluding radon & uranium) 15 pCi/L Arsenic 0.05 mg/L Barium 1.0 mg/L Cadmium 0.01 mg/L Chromium 0.05 mg/L Lead 0.05 mg/L Mercury 0.002 mg/L Selenium 0.01 mg/L Silver 0.05 mg/L Nitrate (as N) 10 mg/L Molybdenum 0.1 mg/L	Not applicable, but potentially relevant and appropriate for OU- 3.	West Lake Landfill OU-3 is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. As potential leaching of radionuclides and trace metals from the radiologically impacted materials at the Site is a possible issue of concern, these standards are potentially relevant and appropriate to the ROD-selected remedy and the partial excavation alternatives. The EPA has determined that the residual radioactive materials considered in 40 C.F.R. § 192.12 are similar to RIM present in OU-1. EPA has concluded that the cleanup standards in 40 C.F.R. § 192.12 are relevant and appropriate for all of OU-1, except for the areas covered by an engineered cap compliant with standards in UMTRCA Subpart A.
Missouri Water Quality Standards, 10 C.S.R. § 20-7.031(5)	Groundwater	Water contaminants shall not cause or contribute to an exceedance of the following: <u>Inorganics (mg/L)</u> Fluoride 4 Nitrate 10 <u>Trace metals (ug/L)</u> Antimony 6 Arsenic 50 Barium 2000 Beryllium 4	Not applicable, but potentially relevant and appropriate for OU-3.	These standards are only applicable to public drinking water systems; however, these standards may potentially be relevant and appropriate standards for groundwater.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement		Preliminary Determination	Remarks
		Boron	2000		
		Cadmium	5		
		Chromium III	100		
		Cobalt	1000		
		Copper	1300		
		Iron	300		
		Lead	15		
		Manganese	50		
		Mercury	2		
		Nickel	100		
		Selenium	50		
		Silver	50		
		Thallium	2		
		Zinc	5000		
		Organics (ug/L)			
		Acrolein	320		
		Bis-2-chloroisopropyl ether	1400		
		2, chlorophenol	0.1		
		2,4-dichlorophenol	93		
		2,4-dinitrophenol	70		
		2,4-dimethylphenol	540		
		2,4,5-trichlorophenol	2600		
		2,4,6-trichlorophenol	2		
		2-methyl-4,6-dinitrophenol	13		
		Ethylbenzene	700		
		Hexachlorocyclopentadiene	50		
		Isophorone	36		
		Nitrobenzene	17		
		Phenol	300		
		Dichloropropene	87		
		Para(1,4)-dichlorobenzene	75		
		Other Dichlorobenzenes	600		
		1,2,4-trichlorobenzene	70		
		1,2,4,5-tetrachlorobenzene	2.3		
		Pentachlorobenzene	3.5		
		1,1,1-trichloroethane	200		
		1,1,2-trichloroethane	0.04		

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement		Preliminary Determination	Remarks
		2,4-dinitrotoluene	0.04		
		1,2-diphenylhydrazine	0.04		
		di (2-ethylhexyl) adipate	400		
		Pesticides (ug/L)	70		
		2,4-D	50		
		2,4,5-TP	2		
		Alachlor	3		
		Atrazine	40		
		Carbofuran	200		
		Dalapon	0.2		
		Dibromochloropropane	7		
		Dinoseb	20		
		Diquat	100		
		Endothall	0.05		
		Ethylene dibromide	200		
		Oxamyl (vydate)	500		
		Picloram	4		
		Simazine	700		
		Glyphosate			
		Bioaccumulatie Anthropogenic Toxics (ug/L)			
		PCBs	0.000045		
		DDT	0.00059		
		DDE	0.00059		
		DDD	0.00083		
		Endrin	2		
		Endrin aldehyde	0.75		
		Aldrin	0.00013		
		Dieldrin	0.00014		
		Heptachlor	0.4		
		Heptachlor epoxide	0.2		
		Methoxychlor	40		
		Toxaphene	3		
		Alpha,beta,delta-BHC	0.0022		
		Chlordane	2		
		Benzidine	0.00012		
		2,3,7,8-TCDD (dioxin)	0.000000013		
		Pentachlorophenol	1		

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement	Preliminary Determination	Remarks
		Anthropogenic Carcinogens (ug/L)		
		Acrylonitrile 0.058		
		Hexachlorobenzene 1		
		Bis (2-chloroethyl) ether 0.03		
		Bis (chloromethyl) ether 0.00013		
		Hexachloroethane 1.9		
		3,3'-dichlorobenzidine 0.04		
		Hexachlorobutadiene 0.456		
		n-nitrosodimethylamine 0.0007		
		Volatile Organic Compounds (ug/L)		
		Chlorobenzene 100		
		Carbon Tetrachloride 5		
		Trihalomethanes 80		
		Bromoform 4.3		
		Chlorodibromomethane 0.41		
		Dichlorobromomethane 0.56		
		Chloroform 5.7		
		Methyl Bromide 48		
		Methyl Chloride 5		
		Methylene Chloride 4.7		
		1,2-dichloroethane 5		
		1,1,2,2-tetrachloroethane 0.17		
		1,1-dichloroethylene 7		
		1,2-trans-dichloroethylene 100		
		1,2-cis-dichloroethylene 70		
		Trichloroethylene 5		
		Tetrachloroethylene 0.8		
		Benzene 5		
		Toluene 1000		
		Xylenes (total) 10000		
		Vinyl chloride 2		
		Styrene 100		
		Polynuclear Aromatic Hydrocarbons (ug/L)		
		Anthracene 9600		
		Fluoranthene 300		
		Fluorene 1300		

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement	Preliminary Determination	Remarks
		Pyrene 960 Benzo(a)pyrene 0.2 Other polynuclear aromatic hydroca 0.0044 Acenaphthene 1200 <u>Phthalate Esters (ug/L)</u> Bis(2-ethylhexyl) phthalate 6 Butylbenzyl phthalate 3000 Diethyl phthalate 23000 Dimethyl phthalate 313000 Di-n-butyl phthalate 2700 <u>Health Advisory Levels (ug/L)</u> Ametryn 60 Baygon 3 Bentazon 20 Bis-2-chloroisopropyl ether 300 Bromacil 90 Bromochloromethane 90 Bromomethane 10 Butylate 350 Carbaryl 700 Carboxin 700 Chloramben 100 o-chlorotoluene 100 p-chlorotoluene 100 Chlorpyrifos 20 DCPA (dacthal) 4000 Diazinon 0.6 Dicamba 200 Diisopropyl methylphosphonate 600 Dimethyl methylphosphonate 100 1,3-dinitrobenzene 1 Diphenamid 200 Diphenylamine 200 Disulfoton 0.3 1,4-dithiane 80		

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement		Preliminary Determination	Remarks
		Diuron	10		
		Fenamiphos	2		
		Fluometron	90		
		Fluorotrichloromethane	2000		
		Fonofos	10		
		Hexazinone	200		
		Malathion	200		
		Maleic hydrazide	4000		
		MCPA	10		
		Methyl parathion	2		
		Metolachlor	70		
		Metribuzin	100		
		Naphthalene	20		
		Nitroguanidine	700		
		p-nitrophenol	60		
		Paraquat	30		
		Pronamide	50		
		Propachlor	90		
		Propazine	10		
		Propham	100		
		2,4,5-T	70		
		Tebuthiuron	500		
		Terbacil	90		
		Terbufos	0.9		
		1,1,1,2-Tetrachloroethane	70		
		1,2,3-trichloropropane	40		
		Trifluralin	5		
		Trinitroglycerol	5		
		Trinitrotoluene	2		

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement	Preliminary Determination	Remarks
Missouri Public Drinking Water Program, Contaminant Levels and Monitoring 10 C.S.R. § 60-4	Inorganics, Synthetic Organic Compounds, Radionuclides, Secondary Contaminants, and Volatile Organic Compounds	Maximum contaminant levels for public water systems. Maximum Contaminant Levels <u>Inorganics</u> Antimony 0.006 mg/L Arsenic 0.01 mg/L Asbestos 7×10^6 fibers/L Barium 2 mg/L Beryllium 0.004 mg/L Cadmium 0.005 mg/L Chromium 0.1 mg/L Cyanide 0.2 mg/L Fluoride 4.0 mg/L Mercury 0.002 mg/L Nitrate (as N) 10 mg/L Nitrite (as N) 1 mg/L Total Nitrate + Nitrite (as N) 10 mg/L Selenium 0.05 mg/L Thallium 0.002 mg/L	Not applicable, but potentially relevant and appropriate for OU-3.	These standards apply to public water systems and therefore are not applicable to West Lake Landfill OU-3. As these standards provide for maximum concentrations in drinking water and the alluvial aquifer could be used for drinking water, these standards are potentially relevant and appropriate for groundwater at the Site.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement	Preliminary Determination	Remarks
		Synthetic Organic Compounds Alachlor 0.002 mg/L Atrazine 0.003 mg/L Benzo(a)pyrene 0.0002 mg/L Carbonfugran 0.04 mg/L Chlordane 0.002 mg/L Dalapon 0.2 mg/L Di(2-ethylhexyl) adipate 0.4 mg/L Dibromochloropropane (DBCP) 0.0002 mg/L Di(2-ethylhexyl) phthalate 0.006 mg/L Dinoseb 0.007 mg/L Diquat 0.02 mg/L Endothall 0.1 mg/L Endrin 0.002 mg/L 2,4-D 0.07 mg/L Ethylene dibromide (EDB) 0.00005 mg/L Glyphosoate 0.7 mg/L Heptachlor 0.0004 mg/L Heptachlor Epoxide 0.0002 mg/L Hexachlorobenzene 0.001 mg/L Hexachlorocyclopentadiene 0.05 mg/L Lindane 0.0002 mg/L Methoxychlor 0.04 mg/L Oxamyl (Vydate) 0.2 mg/L Picloram 0.5 mg/L Polychlorinated biphenyls (PCBs) 0.0005 mg/L Pentachlorophenol 0.001 mg/L Simazine 0.004 mg/L Toxaphene 0.003 mg/L 2,3,7,8-TCDD (Dioxin) 0.00000003 mg/L 2,4,5-TP (Silvex) 0.05 mg/L Radionuclides Combined $_{Ra226}$ ^{and} Ra228 5 pCi/L Gross alpha (excluding radon & urn 15 pCi/L Uranium 30 ug/L		

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement	Preliminary Determination	Remarks
		Secondary Contaminants Aluminum 0.05 - 0.2 mg/L Chloride 250 mg/L Copper 1.0 mg/L Fluoride 2.0 mg/L Benzene 0.005 mg/L 1,1-dichloroethylene 0.007 mg/L para-dichlorobenzene 0.075 mg/L 1,1,1-trichloroethane 0.2 mg/L Trichloroethylene 0.005 mg/L Vinyl chloride 0.002 mg/L cis-1,2-dichloroethylene 0.07 mg/L Dichloromethane 0.005 mg/L 1,2-dichloropropane 0.005 mg/L Ethylbenzene 0.7 mg/L Monodichlorobenzene 0.1 mg/L o-dichlorobenzene 0.6 mg/L Styrene 0.1 mg/L Tetrachloroethylene 0.005 mg/L Toluene 1 mg/L 1,2,4-Trichlorobenzene 0.07 mg/L 1,1,2-Trichloroethane 0.005 mg/L trans-1,2-dischloroethylene 0.1 mg/L Xylenes (total) 10 mg/L		
40 C.F.R. Part 141 National Primary Drinking Water Regulations 40 C.F.R. § 141.50 40 C.F.R. § 141.51 40 C.F.R. § 141.52 40 C.F.R. § 141.53 40 C.F.R. § 141.54 40 C.F.R. § 141.55	Various	Establishes standards including maximum contaminant levels (MCLs) and Contaminant MCLG (mg/L) MCL (mg/L) Trace metals Antimony 0.006 0.006 Asbestos 7 x 10^6 fibers/liter 7 mfl Barium 2 2 Cyanide 0.2 0.2 Fluoride 4 4 Lead 0.015 zero	Not applicable, but potentially relevant and appropriate for OU-3.	These standards are only applicable to public drinking water systems; however, MCLs and non-zero MCLGs may potentially be relevant and appropriate standards for OU-3 groundwater.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement		Preliminary Determination	Remarks
		Mercury (inorganic)	0.002		
		Nitrate (as N)	10		
		Nitrite (as N)	1		
		Selenium	0.05		
		Thallium	0.0005		
		Organic Chemicals			
		Alachlor	zero		
		Atrazine	0.003		
		Benzene	zero		
		Benzo(a)pyrene (PAHs)	zero		
		Carbofuran	0.04		
		Carbon tetrachloride	zero		
		Chlordane	zero		
		Chlorobenzene	0.1		
		2,4-D	0.07		
		Dalapon	0.2		
		1,2-Dibromo-3-chloropropane	zero		
		o-Dichlorobenzene	0.6		
		p-Dichlorobenzene	0.075		
		1,2-Dichloroethane	zero		
		1,1-Dichloroethylene	0.007		
		cis-1,2-Dichloroethene	0.07		
		trans-1,2-Dichloroethene	0.1		
		Dichloromethane	zero		
		1,2-Dichloropropane	zero		
		Di(2-ethylhexyl) adipate	0.4		
		Di(2-ethylhexyl) phthalate	zero		
		Dinoseb	0.007		
		Dioxin (2,3,7,8-TCDD)	zero		
		Diquat	0.02		
		Endothall	0.1		
		Endrin	0.002		
		Ethylbenzene	0.7		
		Ethylene dibromide	zero		
		Glyphosate	0.7		
		Heptachlor	zero		
		Heptachlor epoxide	zero		

		0.002		
		10		
		1		
		0.05		
		0.002		
		0.002		
		0.003		
		0.005		
		0.0002		
		0.04		
		0.005		
		0.002		
		0.1		
		0.07		
		0.2		
		0.0002		
		0.6		
		0.075		
		0.005		
		0.007		
		0.07		
		0.1		
		0.005		
		0.005		
		0.4		
		0.006		
		0.007		
		0.00000003		
		0.02		
		0.1		
		0.002		
		0.7		
		0.00005		
		0.7		
		0.0004		
		0.0002		

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Chemical & Medium	Requirement			Preliminary Determination	Remarks
		Hexachlorobenzene	zero	0.001		
		Hexachlorocyclopentadiene	0.05	0.05		
		Lindane	0.0002	0.0002		
		Methoxychlor	0.04	0.04		
		Oxamyl (Vydate)	0.2	0.2		
		PCBs	zero	0.0005		
		Pentachlorophenol	zero	0.001		
		Picloram	0.5	0.5		
		Simazine	0.004	0.004		
		Styrene	0.1	0.1		
		Tetrachloroethylene	zero	0.005		
		Toluene	1	1		
		Toxaphene	zero	0.003		
		2,4,5-TP (Silvex)	0.05	0.05		
		1,2,4-Trichlorobenzene	0.07	0.07		
		1,1,1-Trichloroethane	0.2	0.2		
		1,1,2-Trichloroethane	0.003	0.005		
		Trichloroethylene	zero	0.005		
		Vinyl chloride	zero	0.002		
		Xylenes (total)	10	10		
		Radionuclides (picocuries per liter [pCi/L])				
		Alpha particles	zero	15		
		Beta particles and photon emitters (millirems per year)	zero	4		
		Radium-226 and Radium-228 (combined)		5		
		Uranium (ug/L)	zero	30		

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Chemical	Maximum Concentration Allowed	Medium	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Toxic Substances	Water contaminants shall not cause an exceedance of criteria in Tables A and B to be exceeded; Concentrations of these substances in bottom sediments or waters shall not harm benthic organism and shall not accumulate through the food chain in harmful concentrations, nor shall state and federal maximum fish tissue levels for fish consumption be exceeded.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(B)(1) The specific criteria shall apply to waters contained in Tables G and H of this rule and the Missouri Use Designation Dataset. (B) Toxic Substances. 1. Water contaminants shall not cause the criteria in Tables A and B to be exceeded. Concentrations of these substances in bottom sediments or waters shall not harm benthic organisms and shall not accumulate through the food chain in harmful concentrations, nor shall state and federal maximum fish tissue levels for fish consumption be exceeded. More stringent criteria may be imposed if there is evidence of additive or synergistic effects.	These standards are potentially applicable to discharges to waters of the state which may occur as part of a groundwater treatment remedy.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Chemical	Maximum Concentration Allowed	Medium	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Toxic Substances	Analysis methods for metals are specified.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(B)(2) (5) Specific Criteria. (B) Toxic Substances. 2. For compliance with this rule, metals shall be analyzed by the following methods: A. Aquatic life protection and human health protection—fish consumption. (I) Mercury—total recoverable metals. (II) All other metals—dissolved metals; B. Drinking water supply—total recoverable metals; and C all other beneficial uses – total recoverable metals.	These standards are potentially applicable to discharges to waters of the state which may occur as part of a groundwater treatment remedy.
Toxic Substances	Other toxic substances for which sufficient toxicity data are not available may not be released to waters of the state until safe levels are demonstrated through studies.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(B)(3) Other potentially toxic substances for which sufficient toxicity data are not available may not be released to waters of the state until safe levels are demonstrated through adequate bioassay studies.	If contaminated media treatment generated free liquids that are discharged to a surface water body, these standards are potentially applicable.
pH	Shall not cause pH to be outside the range of 6.5 - 9.0 standard units.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(E) Water contaminants shall not cause pH to be outside of the range of 6.5 to 9.0 standard pH units.	If contaminated media treatment generated free liquids that are discharged to a surface water body, these standards are potentially applicable.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Chemical	Maximum Concentration Allowed	Medium	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Taste- and Odor-Producing Substance s	Shall not interfere with beneficial uses.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(F) Taste- and Odor-Producing Substances Taste- and odor-producing substances shall be limited to concentrations in the streams or lakes that will not interfere with beneficial uses of the water. For those streams and lakes designated for drinking water supply use, the taste- and odor-producing substances shall be limited to concentrations that will not interfere with the production of potable water by reasonable water treatment processes.	These standards are potentially applicable to discharges to waters of the state.
Turbidity and Color	Shall not cause or contribute substantial visual contrast with natural appearance or interfere with beneficial uses.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(G) Turbidity and Color. Water contaminants shall not cause or contribute to turbidity or color that will cause substantial visible contrast with the natural appearance of the stream or lake or interfere with beneficial uses.	If turbidity and color are elevated in any potential discharge, these standards are potentially applicable.
Solids	Shall not cause or contribute to excess of a level that will interfere with beneficial uses.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(H) Solids. Water contaminants shall not cause or contribute to solids in excess of a level that will interfere with beneficial uses. The stream or lake bottom shall be free of materials which will adversely alter the composition of the benthos, interfere with the spawning of fish or development of their eggs, or adversely change the physical or chemical nature of the bottom.	If elevated Total Suspended Solids (TSS) is present in any potential discharge, these standards are potentially applicable which may occur as part of a groundwater treatment remedy.
Radioactive Materials	Shall conform to state and federal limits for drinking water supply.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(I); cross-reference 10 C.S.R. 60-4.060 Radioactive Materials. All streams and lakes shall conform to state and federal limits for radionuclides established for drinking water supply.	As these standards provide for maximum concentrations in drinking water and the alluvial aquifer could be used for drinking water outside of the West Lake Landfill boundaries, these standards are potentially applicable.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Chemical	Maximum Concentration Allowed	Medium	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Dissolved Oxygen	Shall not cause levels lower than described in Table A or Table K.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 2-7.031(5)(J) Dissolved Oxygen. Water contaminants shall not cause the dissolved oxygen to be lower than the levels described in Table A or Table K—Site-Specific Criteria.	If DO is not within the acceptable range in any potential discharge, these standards are potentially applicable.
Total Dissolved Gases	Operation of impoundments shall not to exceed 110% of the saturation value for gases at the existing atmospheric and hydrostatic pressures.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(K) Total Dissolved Gases. Operation of impoundments shall not cause the total dissolved gas concentrations to exceed one hundred ten percent (110%) of the saturation value for gases at the existing atmospheric and hydrostatic pressures.	If dissolved gases are present in any potential discharge, these standards are potentially applicable.
Sulfates and Chlorides	Shall not cause or contribute to levels in excess of Table A from 2009 version of the Missouri Water Quality Standards.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(L), 10 C.S.R. 20-7.031 Table A (2009)	If sulfides and chlorides are elevated in any potential discharge, these standards are potentially applicable.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Chemical	Maximum Concentration Allowed	Medium	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Carcinogenic Substances	Shall not exceed concentrations in water which correspond to the 10^{-6} cancer risk rate, at average fish and water consumption amounts. Federal limits for drinking water supply shall supersede criteria developed in this manner.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(M) Sulfate and Chloride Limit for Protection of Aquatic Life. Water contaminants shall not cause sulfate or chloride criteria to exceed the levels described in Table A. Carcinogenic Substances. Carcinogenic substances shall not exceed concentration in water which correspond to the 10-6 cancer risk rate. This risk rate equates to one (1) additional cancer case in a population of one (1) million with lifetime exposure. Derivation of this concentration assumes average water and fish consumption amounts. Assumptions are two (2) liters of water and six and one-half (6.5) grams of fish consumed per day. Federally established final maximum contaminant levels for drinking water supply shall supersede drinking water supply criteria developed in this manner.	If carcinogenic substances are elevated in any potential discharge, these standards are potentially applicable.
All Pollutants	Sample collection shall be performed per Standard Methods, 40 CFR 136, for the examination of water and wastewater or other procedures approved by EPA and the Department.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(0) All methods of sample collection, preservation, and analysis used in applying criteria in these standards shall be in accord with those prescribed in the latest edition of Standard Methods for the Examination of Water and Wastewater or other procedures approved by the Environmental Protection Agency and the Missouri Department of Natural Resources.	These standards are potentially applicable to sample collection and analysis of discharges to waters of the state.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Chemical	Maximum Concentration Allowed	Medium	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Whole Effluent Toxicity (WET)	Chronic WET tests performed at the percent effluent at the edge of the missing zone shall not be toxic to the more sensitive of at least two representative, diverse species. Pollutant attenuation will be considered.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031(5)(Q) WET Chronic Tests. Chronic WET tests performed at the percent effluent at the edge of the mixing zone shall not be toxic to the more sensitive of at least two (2) representative, diverse species. Pollutant attenuation processes such as volatilization and biodegradation which may occur within the allowable mixing zone will be considered in interpreting results.	If WET is elevated in any potential discharge, these standards are potentially applicable.
Biocriteria	Receiving waters shall not be significantly different than reference waters.	Water	May be an ARAR if groundwater discharges to surface water.	10 C.S.R. 20-7.031 (5)(R) Biocriteria. The biological integrity of waters, as measured by lists or numeric indices of benthic invertebrates, fish, algae, or other appropriate biological indicators, shall not be significantly different from reference waters. Waters targeted for numeric biological criteria assessment must be contained within the Missouri Use Designation Dataset and shall be compared to reference waters of similar size, scale within the stream network, habitat type, and aquatic ecoregion type. Reference water locations for some aquatic habitat types are listed in Table I.	If biocriteria are met in any potential discharge, these standards are potentially applicable.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Chemical	Maximum Concentration Allowed	Medium	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Water Quality	Appendix 1 Appendix 2	Water	Continue to monitor	10 C.S.R. 80-3.010(11)B.4 10 C.S.R. 80-3.010 Appendix 1 10 C.S.R. 80-3.010 Appendix 2 Groundwater Monitoring. (A) Requirements. The owner/operator of a sanitary landfill shall implement a groundwater monitoring program capable of determining the sanitary landfill's impact on the quality of groundwater underlying the sanitary landfill. (B) Satisfactory Compliance-Design	Not applicable to CERCLA sites, but may be relevant and appropriate if water is required to be monitored.
Water Quality	TMDLs	Water	Continue to monitor	TMDL for Missouri Load Missouri's Water Quality Standards, 10 C.S.R. 20- 7.031, Table A, under Persistent, Bioaccumulative, Man-made Toxics. Satisfactory Compliance-Design	Not applicable to CERCLA sites, but may be relevant and appropriate if water is required to be monitored.
Water pollutants	Safe Drinking Water Law and specified regulatory contaminant limits	Water	Drinking water protection	640.100-640.140 RSMo Drinking water regulations	Not applicable to CERCLA sites since these pertain to drinking water, but may be relevant and appropriate if water pollutants are present in any water discharged or to groundwater.

DRAFT

TABLE 3-6. PRELIMINARY IDENTIFICATION OF POTENTIAL CHEMICAL-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

OSWER Directives and Other Guidance Documents Identified as TBCs

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
EPA Memo "Considering a Noncancer Oral Reference Dose for Uranium for Superfund Human Health Risk Assessments" (Dated December 1, 2016)	Soluble uranium	Various	This memorandum provides information and recommendations about an oral reference dose (RfD) for non-radiological toxicity of soluble uranium. This memorandum recommends the use of the ATSDR intermediate MRL for soluble uranium without further adjustment, in lieu of the RfD currently published in IRIS, for assessment of chronic exposures also. Specifically, evaluation of the non-carcinogenic risks posed by uranium should use a toxicity value of 0.0002 mg/kg-day.	Potential TBC	As this is only guidance, it is not an ARAR. This guidance may be a TBC if soluble uranium is identified as a COPC.
OSWER 4283.1- 14 ("Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA Sites")	Radionuclides	Ground-water	OSWER Directive 9283.1-14 addresses the use of uranium drinking water standards for groundwater remediation at CERCLA sites. This directive specifies that both the uranium MCL (40 CFR 141) and the UMTRCA standards (40 CFR 192) are potentially relevant and appropriate. This directive also provides guidance on the groundwater point of compliance standard in 40 C.F.R. 192.02(c)(4) relative to the CERCLA approach for conducting groundwater responses.	Potential TBC	As this is only guidance, it is not an ARAR. This guidance may be a TBC, insofar as it specifies certain standards as ARARs.

DRAFT

TABLE 3-7. PRELIMINARY IDENTIFICATION OF POTENTIAL ACTION-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Action	Medium	Requirement	Preliminary Determination	Remarks
Resource Conservation and Recovery Act (RCRA) Subtitle C (40 C.F.R. 240 et seq.)	Hazardous waste management		Establishes standards for identification of and treatment, storage and disposal of hazardous wastes including hazardous wastes disposed in landfills. Standards for Identification of hazardous wastes (40 C.F.R. 261) Standards for Generators of hazardous wastes (40 C.F.R. 262) Standards for Transporters of hazardous wastes (40 C.F.R. 263) Use and Management of Containers (40 C.F.R. 264 Subpart I) Land Disposal Restrictions (40 C.F.R. 264 Subpart N) Staging Piles (40 C.F.R. 264.554) Specifically, must determine if solid waste is a hazardous waste using the following method: ▪ Should first determine if waste is excluded from regulation under 40 C.F.R. 261.4; and ▪ Must then determine if waste is listed as a hazardous waste under subpart D 40 C.F.R. part 261 or (characteristic waste) identified in subpart C of 40 C.F.R. part 261 by either: (1) Testing the waste according to the methods set forth in subpart C of 40 C.F.R. part 261, or according to an equivalent method approved by the Administrator under 40 C.F.R. §260.21; or	Potentially applicable in the event that hazardous wastes or materials that potentially could be hazardous wastes are encountered during remedy implementation	Extracted groundwater may be considered hazardous waste per TCLP results and may require treatment prior to disposal; therefore, these requirements may be potentially applicable.

DRAFT

TABLE 3-7. PRELIMINARY IDENTIFICATION OF POTENTIAL ACTION-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Action	Medium	Requirement	Preliminary Determination	Remarks
			(2) Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used. A generator may accumulate hazardous waste at the facility provided that (accumulation of RCRA hazardous waste on site as defined in 40 C.F.R. §260.10): ▪ waste is placed in containers that comply with 40 C.F.R. 265.171–173; and ▪ the date upon which accumulation begins is clearly marked and visible for inspection on each container; ▪ container is marked with the words "hazardous waste"; or ▪ container may be marked with other words that identify the contents if accumulation of 55 gal. or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in §261.33(e) at or near any point of generation.		
CERCLA Offsite Rule 40 C.F.R. 300.440	Off-site disposal		Wastes can only be disposed at offsite facilities operating in compliance with applicable regulations as verified by EPA.	Applicable to off-site disposal	These requirements would be applicable to hazardous groundwater results as determined TCLP analyses as part of a groundwater remedy.

DRAFT

TABLE 3-7. PRELIMINARY IDENTIFICATION OF POTENTIAL ACTION-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Citation	Action	Medium	Requirement	Preliminary Determination	Remarks
DOT and NRC regulations for shipment of radioactive materials 49 C.F.R. Parts 171-180 and 10 C.F.R. Part 71	Off-site disposal		Specifies requirements for shipment of radioactive materials including hazard communications, labeling, manifests, security, emergency response, and planning.	Applicable to off-site disposal.	These requirements would be applicable to hazardous groundwater results as determined TCLP analyses as part of a groundwater remedy.
Offsite disposal Waste Acceptance Criteria	Off-site disposal		Lists the types of materials and activity levels of waste materials that can be accepted by off-site disposal facilities.	Applicable to off-site disposal.	These requirements would be applicable to hazardous groundwater results as determined TCLP analyses as part of a groundwater remedy.
40 C.F.R. Part 131 (Water Quality Standards) 40 C.F.R. § 131.36	Sets forth requirements and procedures for developing, reviewing, revising and approving water quality standards by the States as authorized by the Clean Water Act	Groundwater	40 C.F.R. Part 131 describes the requirements and procedures for developing, reviewing, revising, and approving water quality standards by the States as authorized by section 303(c) of the Clean Water Act. 40 C.F.R. Part 131 does not lay out specific standards to be applied, but rather serves as a framework by which States must develop water quality standards for water bodies, including uses that may be made of such bodies, and standards to promote the safety of water as used. It also provides for the process by which EPA reviews, revises and approves of water quality standards developed by States.	Not applicable, but potentially relevant and appropriate for OU-3.	It does not appear that these standards are applicable to Missouri. It should be noted that Missouri has adopted Water Quality Standards under 10 C.S.R. 20-7.031(5), which regulate concentrations of inorganics, trace metals, organics, pesticides, man-made volatiles, PAHs, phthalates and other chemicals.

DRAFT

TABLE 3-7. PRELIMINARY IDENTIFICATION OF POTENTIAL ACTION-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Action Subject to Requirement	Requirement	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Release of Pollutants to Waters of the State	Unlawful to pollute waters of the state, reduce quality below water quality standards, violate pretreatment and toxic material control regulations, discharge radiological, chemical or biological gen or high-level radioactive wastes into waters of the state.	To protect water quality and ensure existing or proposed discharges do not degrade water quality beyond the bounds of the law.	644.051.1 It is unlawful for any person to cause pollution of any waters of the state or to place or cause or permit to be placed any water contaminant in a location where it is reasonably certain to cause pollution of any waters of the state.	Substantive elements of these chapters may be applicable if implementing a remedial action to include a groundwater treatment remedy.
Corrective Measures	Groundwater quality	Landfill location	10 C.S.R. 80-3.010(12)(C) Requirement related to the establishment and implementation of a corrective action groundwater monitoring program.	Not applicable to CERCLA sites, but may be relevant and appropriate if water pollutants are present in groundwater or any water discharge.
Installation of observation or monitoring wells	Regulates drilling, construction, registration, and abandonment of monitoring wells in Missouri	Groundwater protection	10 C.S.R. 23-4 Monitoring Well Construction Code	Substantive portions of Division 23 may be relevant and appropriate if wells are constructed and/or abandoned as part of the remedy, but will mostly be administrative.
Practice of geology	Regulates practice	Health and safety	4 C.S.R. 145-1.010 Board of Geologist Registration	Substantive portions of 4 C.S.R. 145-1.010 may be relevant and appropriate if a PG stamp and seal on drawings are necessary as part of the remedy. Otherwise mostly administrative.

DRAFT

TABLE 3-7. PRELIMINARY IDENTIFICATION OF POTENTIAL ACTION-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Action Subject to Requirement	Requirement	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Abandonment of unused domestic supply wells	Regulates activity	Groundwater protection	10 C.S.R. 23-3.110 Plugging of Wells	Although abandonment of unused domestic supply wells are not envisioned; could be relevant and appropriate if monitoring wells are required to be abandoned.
Groundwater tracing	Registration and reporting of results to Missouri Geological Survey	Groundwater protection	L.1991 S.B.221, an Act RSMo 256.621 All persons engaged in groundwater or surface water tracing, for any purpose, shall register with the division. The registrant shall report in writing all proposed injections of tracers to the division prior to actual injection. Written and graphical documentation of traces shall be provided to the division within thirty days of completion of each trace. The division shall maintain records of all injections and traces reported and will provide this information to interested parties upon request.	If groundwater tracing is required, this might be considered an ARAR, but note that this activity is not part of the proposed RI activities.
Hazardous Waste Generation, storage, treatment, transportation and disposal	Follow all applicable state and federal hazardous waste laws and regulations	Health and safety	Hazardous Waste Management Law 260.350- 260.1039 Hazardous Waste Regulations 10 C.S.R. 25-1 through 19.	Substantive portions of Division 25 may be Relevant and Appropriate if hazardous waste is required to be managed under the selected remedial options.

DRAFT

TABLE 3-8. PRELIMINARY IDENTIFICATION OF POTENTIAL LOCATION-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Location Subject to Requirement	Requirement	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Fee Fee Creek Watershed	Effluent Limitations for Metropolitan No-Discharge Streams. Discharge is prohibited except as specifically permitted under the Water Quality Standards 10 C.S.R 20-7031(7).	To ensure existing or proposed discharges are in compliance.	10 C.S.R 20-7.015(5) (A) Discharge to metropolitan no-discharge streams is prohibited, except as specifically permitted under the Water Quality Standards 10 C.S.R 20-7.031 and noncontaminated storm water flows.	These standards are potentially applicable if water pollutants are present in any water discharge.
Waters of the State of Missouri	Protection of designated uses.	To ensure existing or proposed discharges are in compliance.	10 C.S.R 20-7.031(2)(A)-(C) (2) Designation of Uses. (A) Rebuttable presumption. (B) Presumed Uses. All waters described in subsection (2)(A) shall also be assigned Livestock and wildlife protection and Irrigation designated uses, as defined in this rule. (C) Other Uses	These standards are potentially applicable if water pollutants are present in any water discharge.
Waters of the State of Missouri	Waters of the state are subject to applicable Anti- Degradation Tiers 1 & 2.	To ensure existing or proposed discharges are in compliance.	10 C.S.R 20-7.031(3) The antidegradation policy shall provide three (3) levels of protection.	These standards are potentially applicable if water pollutants are present in any water discharge.
Waters of the State of Missouri	General criteria are applicable to all waters of the state at all times, including mixing zones.	To ensure existing or proposed discharges are in compliance.	10 C.S.R 20-7.031(4) The following water quality criteria shall be applicable to all waters of the state at all times including mixing zones.	These standards are potentially applicable if water pollutants are present in any water discharge.

DRAFT

TABLE 3-8. PRELIMINARY IDENTIFICATION OF POTENTIAL LOCATION-SPECIFIC ARARS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Location Subject to Requirement	Requirement	Reason Why Requirement May Be an ARAR	Regulatory Citation	Discussion/Analysis
Mixing Zones	Where mixing zones are applicable, they will be based on 7Q10 low flow.	To ensure existing or proposed discharges are in compliance.	10 C.S.R 20-7.031(5)(A) Specific Criteria. The specific criteria shall apply to waters contained in Tables G and H of this rule and the Missouri Use Designation Dataset. Protection of drinking water supply is limited to surface waters designated for raw drinking water supply and aquifers. Protection of whole body contact recreation is limited to waters designated for that use. (A) The maximum chronic toxicity criteria in Tables A and B shall apply to waters designated for the indicated uses given in the Missouri Use Designation Dataset and Tables G and H.	These standards are potentially applicable if water pollutants are present in any water discharge. The immediate receiving stream is not classified for mixing zone to apply.

DRAFT

TABLE 5-1. PRELIMINARY MONITORING WELL INVENTORY
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Well ID	DTW (ft bmp)	TD (ft bmp)	Construction	Comments
D-13	40.19	135.57	2" SCH 80 PVC	SILTY, WATERRA
I-65	11.61	38.48	2" SCH 40 PVC	WATERRA
I-65	11.68	41.14	2" SCH 40 PVC	SOFT, WATERRA
I-67	11.53	40.56	2" SCH 40 PVC	
D-12	49.63	148.55	2" SCH 80 PVC	WATERRA
S-10	49.98	56.63	2" SCH 40 PVC	WATERRA
I-11	49.95	94.48	2" SCH 80 PVC	WATERRA
D-6	17.35	108.09	2" SCH 80 PVC	WATERRA
I-9	20.5	56.8	2" SCH 40 PVC	STICK UP MISLABELED, WATERRA
S-82	19.73	26.42	2" SCH 40 PVC	WATERRA
D-93	19.6	114.52	2" SCH 40 PVC	STICK UP MISLABELED, WATERRA
MW-103	8.42	14.35	2" SCH 40 PVC	WATERRA
I-62	16.1	44.78	2" SCH 40 PVC	WATERRA
D-83	18.4	98.09	2" SCH 40 PVC	WATERRA
D-3	37.57	107.7	2" SCH 80 PVC	WATERRA
I-4	34.91	35.9	2" SCH 40 PVC	PINCHED CASING, WATERRA
S-5	34.19	43.43	2" SCH 40 PVC	WATERRA
D-89	26.25	50.46	2" SCH 40 PVC	NO SURVEY DATA
D-81	20.05	62.56	2" SCH 40 PVC	NO SURVEY DATA
D-87	34.2	115.25	2" SCH 40 PVC	

Notes:
DTW - depth to water
ft bmp - feet below measuring point
TD - total depth
SCH - schedule
PVC - polyvinyl chloride
WATERRA - contains Waterra check valve and tubing

DRAFT

TABLE 5-2. PROPOSED MONITORING WELL RATIONALE
WEST LAKE LANDFILL OU3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Prefix	Series	Zone	Borehole ID	Total Depth (ft bgs)	Ground Surface Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Borehole Diameter (inches)	Well Construction	Nearby Wells/Piezometers/Staff Gauges	Data Gaps Addressed	Additional Rationale	Drilling Method	Property Owner
MW	304	AD	MW-304-AD	111	451	340	9	2-inch Sch. 80 PVC	PZ-304 Cluster	2, 3, 5, 6, 7, 9	No deep or bedrock wells exist at PZ-304 cluster	Air/Sonic/Continuous Core	Bridgeton Landfill, LLC
MW	304	SS	MW-304-SS	151	451	300	9/6	2-inch Sch. 80 PVC	PZ-304 Cluster	2, 3, 5, 6, 7, 9	No deep or bedrock wells exist at PZ-304 cluster	Air/Sonic/Continuous Core	Bridgeton Landfill, LLC
MW	304	SD	MW-304-SD	211	451	240	9/6	2-inch Sch. 80 PVC	PZ-304 Cluster	2, 3, 5, 6, 7, 9	No deep or bedrock wells exist at PZ-304 cluster	Air/Sonic/Continuous Core	Bridgeton Landfill, LLC
MW	400	AS	MW-400-AS	26	446	420	12	2-inch triple nested Sch. 80 PVC	S-61, MW-102, D-6	2, 3, 5, 6, 7, 9	S-61 and MW-102 abandoned, D-6 slated for abandonment	Air/Sonic/Continuous Core	AAA Trailers
MW	400	AI	MW-400-AI	51	446	395	12	2-inch triple nested Sch. 80 PVC	S-61, MW-102, D-6	2, 3, 5, 6, 7, 9	S-61 and MW-102 abandoned, D-6 slated for abandonment	Air/Sonic/Continuous Core	AAA Trailers
MW	400	AD	MW-400-AD	106	446	340	12	2-inch triple nested Sch. 80 PVC	S-61, MW-102, D-6	2, 3, 5, 6, 7, 9	S-61 and MW-102 abandoned, D-6 slated for abandonment	Air/Sonic/Continuous Core	AAA Trailers
MW	400	SS*	MW-400-SS*	146	446	300	9/6	2-inch Sch. 80 PVC	S-61, MW-102, D-6	2, 3, 5, 6, 7, 9	S-61 and MW-102 abandoned, D-6 slated for abandonment	Air/Sonic/Continuous Core	AAA Trailers
MW	400	SD	MW-400-SD	206	446	240	9/6	2-inch Sch. 80 PVC	S-61, MW-102, D-6	2, 3, 5, 6, 7, 9	S-61 and MW-102 abandoned, D-6 slated for abandonment	Air/Sonic/Continuous Core	AAA Trailers
MW	401	AS	MW-401-AS	25	445	420	12	2-inch triple nested Sch. 80 PVC	S-8, I-62, D-83	2, 3, 5, 6, 7, 9	S-8, I-62, and D-83 slated for abandonment	Air/Sonic/Continuous Core	AAA Trailers
MW	401	AI	MW-401-AI	50	445	395	12	2-inch triple nested Sch. 80 PVC	S-8, I-62, D-83	2, 3, 5, 6, 7, 9	S-8, I-62, and D-83 slated for abandonment	Air/Sonic/Continuous Core	AAA Trailers
MW	401	AD	MW-401-AD	105	445	340	12	2-inch triple nested Sch. 80 PVC	S-8, I-62, D-83	2, 3, 5, 6, 7, 9	S-8, I-62, and D-83 slated for abandonment	Air/Sonic/Continuous Core	AAA Trailers
MW	401	SS*	MW-401-SS*	145	445	300	9/6	2-inch Sch. 80 PVC	S-8, I-62, D-83	2, 3, 5, 6, 7, 9	No bedrock wells exist at this location	Air/Sonic/Continuous Core	AAA Trailers
MW	401	SD	MW-401-SD	205	445	240	9/6	2-inch Sch. 80 PVC	S-8, I-62, D-83	2, 3, 5, 6, 7, 9	No bedrock wells exist at this location	Air/Sonic/Continuous Core	AAA Trailers
MW	402	AS	MW-402-AS	34	454	420	12	2-inch triple nested Sch. 80 PVC	I-66, D-13	2, 3, 5, 6, 7, 9, 10	No shallow alluvial well exists at this location	Air/Sonic/Continuous Core	Bridgeton Landfill, LLC
MW	402	AI	MW-402-AI	59	454	395	12	2-inch triple nested Sch. 80 PVC	I-66, D-13	2, 3, 5, 6, 7, 9	No intermediate alluvial well exists at this location	Air/Sonic/Continuous Core	Bridgeton Landfill, LLC
MW	402	AD	MW-402-AD	114	454	340	12	2-inch triple nested Sch. 80 PVC	I-66, D-13	2, 3, 5, 6, 7, 9	Replace well D-6	Air/Sonic/Continuous Core	Bridgeton Landfill, LLC
MW	402	SS*	MW-402-SS*	154	454	300	9/6	2-inch Sch. 80 PVC	I-66, D-13	2, 3, 5, 6, 7, 9	No bedrock wells exist at this on-site location	Air/Sonic/Continuous Core	Bridgeton Landfill, LLC
MW	402	SD	MW-402-SD	214	454	240	9/6	2-inch Sch. 80 PVC	I-66, D-13	2, 3, 5, 6, 7, 9	No bedrock wells exist at this on-site location	Air/Sonic/Continuous Core	Bridgeton Landfill, LLC
MW	500	AS	MW-500-AS	19	439	420	12	2-inch triple nested Sch. 80 PVC	SG-500	2, 3, 5, 6, 8, 9,10	Downgradient of Inactive Sanitary Landfill	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	500	AI	MW-500-AI	44	439	395	12	2-inch triple nested Sch. 80 PVC	SG-500	2, 3, 5, 6, 9,10	Downgradient of Inactive Sanitary Landfill	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	500	AD	MW-500-AD	99	439	340	12	2-inch triple nested Sch. 80 PVC	SG-500	2, 3, 5, 6, 9,10	Downgradient of Inactive Sanitary Landfill	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	500	SS*	MW-500-SS*	139	439	300	9/6	2-inch Sch. 80 PVC	SG-500	2, 3, 5, 6, 9,10	Downgradient of Inactive Sanitary Landfill	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	500	SD	MW-500-SD	199	439	240	9/6	2-inch Sch. 80 PVC	SG-500	2, 3, 5, 6, 9,10	Downgradient of Inactive Sanitary Landfill	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	501	AS	MW-501-AS	18	438	420	12	2-inch triple nested Sch. 80 PVC	SG-400	2, 3, 5, 6, 8, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	501	AI	MW-501-AI	43	438	395	12	2-inch triple nested Sch. 80 PVC	SG-400	2, 3, 5, 6, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	501	AD	MW-501-AD	98	438	340	12	2-inch triple nested Sch. 80 PVC	SG-400	2, 3, 5, 6, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	501	SS*	MW-501-SS*	138	438	300	9/6	2-inch Sch. 80 PVC	SG-400	2, 3, 5, 6, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	501	SD	MW-501-SD	198	438	240	9/6	2-inch Sch. 80 PVC	SG-400	2, 3, 5, 6, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Right-of-Way
MW	502	AS	MW-502-AS	25	445	420	12	2-inch triple nested Sch. 80 PVC	USGS St. Charles Missouri River Gauge	2, 3, 5, 6, 8, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Levee District
MW	502	AI	MW-502-AI	50	445	395	12	2-inch triple nested Sch. 80 PVC	USGS St. Charles Missouri River Gauge	2, 3, 5, 6, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Levee District
MW	502	AD	MW-502-AD	105	445	340	12	2-inch triple nested Sch. 80 PVC	USGS St. Charles Missouri River Gauge	2, 3, 5, 6, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Levee District
MW	500	SS*	MW-500-SS*	145	445	300	9/6	2-inch Sch. 80 PVC	USGS St. Charles Missouri River Gauge	2, 3, 5, 6, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Levee District
MW	502	SD	MW-502-SD	205	445	240	9/6	2-inch Sch. 80 PVC	USGS St. Charles Missouri River Gauge	2, 3, 5, 6, 9,10	Downgradient of wells D-83 and D-6	Air/Sonic/Continuous Core	Earth City Levee District
MW	600	AS	MW-600-AS	25	445	420	12	2-inch double/triple nested Sch. 80 PVC	SG-600	2, 3, 4, 5, 6, 9	Sidegradient background alluvial well	Air/Sonic/Continuous Core	City of Bridgeton
MW	600	AI	MW-600-AI	50	445	395	12	2-inch double/triple nested Sch. 80 PVC	SG-600	2, 3, 4, 5, 6, 9	Sidegradient background alluvial well	Air/Sonic/Continuous Core	City of Bridgeton
MW	600	AD*	MW-600-AD*	105	445	340	12	2-inch triple nested Sch. 80 PVC	SG-600	2, 3, 4, 5, 6, 9	Sidegradient background alluvial well	Air/Sonic/Continuous Core	City of Bridgeton
MW	600	SS*	MW-600-SS*	145	445	300	9/6	2-inch Sch. 80 PVC	SG-600	2, 3, 4, 5, 6, 9	Sidegradient background bedrock well	Air/Sonic/Continuous Core	City of Bridgeton
MW	600	SD	MW-600-SD	205	445	240	9/6	2-inch Sch. 80 PVC	SG-600	2, 3, 4, 5, 6, 9	Sidegradient background bedrock well	Air/Sonic/Continuous Core	City of Bridgeton
MW	601	SS	MW-601-SS	232	532	300	9/6	2-inch Sch. 80 PVC	N/A	2, 3, 4, 5, 6, 9	Background bedrock wells	Air/Sonic/Continuous Core	City of Bridgeton
MW	601	SD	MW-601-SD	292	532	240	9/6	2-inch Sch. 80 PVC	N/A	2, 3, 4, 5, 6, 9	Background bedrock wells	Air/Sonic/Continuous Core	City of Bridgeton
MW	602	SS	MW-602-SS	214	514	300	9/6	2-inch Sch. 80 PVC	N/A	2, 3, 4, 5, 6, 9	Background bedrock wells	Air/Sonic/Continuous Core	City of Bridgeton
MW	602	SD	MW-602-SD	274	514	240	9/6	2-inch Sch. 80 PVC	N/A	2, 3, 4, 5, 6, 9	Background bedrock wells	Air/Sonic/Continuous Core	City of Bridgeton
MW	603	AS	MW-603-AS	14	434	420	12	2-inch double/triple nested Sch. 80 PVC	SG-600	2, 3, 5, 6, 8, 9,10	Sidegradient background alluvial well	Air/Sonic/Continuous Core	EarthCity Right-of-Way
MW	603	AI	MW-603-AI	39	434	395	12	2-inch double/triple nested Sch. 80 PVC	SG-600	2, 3, 5, 6, 9,10	Sidegradient background alluvial well	Air/Sonic/Continuous Core	EarthCity Right-of-Way
MW	603	AD*	MW-603-AD*	94	434	340	12	2-inch triple nested Sch. 80 PVC	SG-600	2, 3, 5, 6, 9,10	Sidegradient background alluvial well	Air/Sonic/Continuous Core	EarthCity Right-of-Way
MW	603	SS*	MW-603-SS*	134	434	300	9/6	2-inch Sch. 80 PVC	SG-600	2, 3, 5, 6, 9,10	Sidegradient background bedrock well	Air/Sonic/Continuous Core	EarthCity Right-of-Way
MW	603	SD	MW-603-SD	194	434	240	9/6	2-inch Sch. 80 PVC	SG-600	2, 3, 5, 6, 9,10	Sidegradient background bedrock well	Air/Sonic/Continuous Core	EarthCity Right-of-Way

Notes:
Data Gaps
1 Adequacy, usability, and status of existing and abandoned on-site and perimeter monitoring wells and associated data;
2 Aquifer properties, including recharge/discharge rates and hydraulic conductivities;
3 Regional and localized hydraulic gradients and flow directions within and between the alluvial aquifer and shallow and deep units (upper and lower intervals) of the bedrock aquifer system (Mississippian age);
4 Background groundwater quality of aquifers located at and near the Site;
5 Occurrence and extent of groundwater contamination;
6 Groundwater geochemistry parameters, redox couples, and organic content;
7 Effects of the Bridgeton Landfill related infrastructure (leachate extraction system, EVOH cover, etc.) and hydraulic characteristics of landfill material on the groundwater system, and leachate chemistry/occurrence;
8 Vapor intrusion;
9 Temporal variability in groundwater levels and flow direction;
10 Temporal and spatial water elevation effects from nearby surface water features (Missouri River) and storm events.

Series Explanation
100 Immediately adjacent to the perimeter of the active sanitary landfill
200 Within 500 feet of the active sanitary landfill
300 Adjacent to inactive landfill areas in western portion of site and upgradient of site
400 Within 500 feet of Area 2
500 Downgradient
600 Background

Zone Explanation
AS Shallow Alluvial
AI Intermediate Alluvial
AD Deep Alluvial
SS Deep St. Louis/Shallow Salem Formation
SD Salem Formation
KS Keokuk Formation

* - installed if encountered
Staff gauges proposed in RI/FS WP
All boreholes drilled using air/sonic drilling techniques and piezometers constructed using 0.005-inch factory slotted PVC screen
PVC - polyvinyl chloride
Sch. - Schedule
N/A - not applicable

DRAFT

TABLE 5-3. GROUNDWATER VELOCITIES AND ADVECTIVE TRANSPORT DISTANCES
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

	Hydraulic Conductivity (ft/day)			Average Regional Gradient (ft/ft)	Effective Porosity (-)	Groundwater Velocity (ft/year)			50 Year Travel Distance (ft)		
Zone	Minimum	Maximum	Geometric Mean			Minimum	Maximum	Geometric Mean	Minimum	Maximum	Geometric Mean
Shallow Alluvium	0.35	97	8.9	0.0006	0.15	0.50	142	13.1	25	7,103	654
Intermediate Alluvium	0.39	190	49	0.0006	0.2	0.43	208	53	21	10,410	2,666
Deep Alluvium	4.6	250	59	0.0006	0.2	5.0	274	65	252	13,697	3,243
St. Louis Formation	0.000065	7.8	0.0037	0.003	0.008	0.01	1065	0.505	0.4	53,253	25
Salem Formation	0.00024	0.042	0.0019	0.003	0.008	0.0335	5.72	0.266	1.7	286	13
Keokuk Formation	0.0017	0.011	0.0058	0.003	0.008	0.237	1.48	0.80	12	74	40

Notes:
ft/day - feet per day
ft/ft - feet per foot
ft/year - feet per year
ft - feet

DRAFT

TABLE 5-4. PROPOSED MONITORING WELL NETWORK
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Prefix	Series	Zone	Well ID	Current Monitoring Status
PZ	112	AS	PZ-112-AS	A
PZ	113	AS	PZ-113-AS	A
PZ	114	AS	PZ-114-AS	A
PZ	205	AS	PZ-205-AS	A
PZ	207	AS	PZ-207-AS	A
S	84	AS	S-84	A
MW	103	AS	MW-103	I
MW	104	AS	MW-104	I
MW	1201	AS	MW-1201	I
PZ	302	AS	PZ-302-AS	I
PZ	303	AS	PZ-303-AS	I
PZ	304	AS	PZ-304-AS	I
S	5	AS	S-5	I
S	8	AS	S-8	I
S	10	AS	S-10	I
S	53	AS	S-53	I
S	82	AS	S-82	I
MW	400	AS	MW-400-AS	P
MW	401	AS	MW-401-AS	P
MW	402	AS	MW-402-AS	P
MW	500	AS	MW-500-AS	P
MW	501	AS	MW-501-AS	P
MW	502	AS	MW-502-AS	P
MW	600	AS	MW-600-AS	P
MW	603	AS	MW-603-AS	P
I	68	AI	I-68	A
I	73	AI	I-73	A
D	89	AI	D-89	I
I	4	AI	I-4	I
I	9	AI	I-9	I
I	11	AI	I-11	I
I	62	AI	I-62	I
I	65	AI	I-65	I
I	66	AI	I-66	I
I	67	AI	I-67	I
PZ	302	AI	PZ-302-AI	I
PZ	304	AI	PZ-304-AI	I
PZ	305	AI	PZ-305-AI	I
MW	400	AI	MW-400-AI	P
MW	401	AI	MW-401-AI	P
MW	402	AI	MW-402-AI	P
MW	500	AI	MW-500-AI	P
MW	501	AI	MW-501-AI	P
MW	502	AI	MW-502-AI	P
MW	600	AI	MW-600-AI	P

DRAFT

TABLE 5-4. PROPOSED MONITORING WELL NETWORK
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Prefix	Series	Zone	Well ID	Current Monitoring Status
MW	603	AI	MW-603-AI	P
I	7	AI	I-7	U
D	85	AD	D-85	A
PZ	113	AD	PZ-113-AD	A
D	3	AD	D-3	I
D	6	AD	D-6	I
D	12	AD	D-12	I
D	13	AD	D-13	I
D	81	AD	D-81	I
D	83	AD	D-83	I
D	87	AD	D-87	I
D	93	AD	D-93	I
MW	304	AD	MW-304-AD	P
MW	400	AD	MW-400-AD	P
MW	401	AD	MW-401-AD	P
MW	402	AD	MW-402-AD	P
MW	500	AD	MW-500-AD	P
MW	501	AD	MW-501-AD	P
MW	502	AD	MW-502-AD	P
MW	600	AD*	MW-600-AD*	P
MW	603	AD*	MW-603-AD*	P
LR	100	LR	LR-100	I
LR	103	LR	LR-103	I
LR	104	LR	LR-104	I
LR	105	LR	LR-105	I
PZ	100	SS	PZ-100-SS	A
PZ	101	SS	PZ-101-SS	A
PZ	102	SS	PZ-102R-SS	A
PZ	102	SS	PZ-102-SS	A
PZ	103	SS	PZ-103-SS	A
PZ	104	SS	PZ-104-SS	A
PZ	105	SS	PZ-105-SS	A
PZ	106	SS	PZ-106-SS	A
PZ	107	SS	PZ-107-SS	A
PZ	109	SS	PZ-109-SS	A
PZ	111	SS	PZ-111-SS	A
PZ	113	SS	PZ-113-SS	A
PZ	115	SS	PZ-115-SS	A
PZ	116	SS	PZ-116-SS	A
PZ	200	SS	PZ-200-SS	A
PZ	201	SS	PZ-201A-SS	A
PZ	202	SS	PZ-202-SS	A
PZ	203	SS	PZ-203-SS	A
PZ	204A	SS	PZ-204A-SS	A
PZ	204	SS	PZ-204-SS	A

DRAFT

TABLE 5-4. PROPOSED MONITORING WELL NETWORK
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Prefix	Series	Zone	Well ID	Current Monitoring Status
PZ	205	SS	PZ-205-SS	A
PZ	206	SS	PZ-206-SS	A
PZ	208	SS	PZ-208-SS	A
PZ	209	SS	PZ-209-SS	A
PZ	210	SS	PZ-210-SS	A
PZ	211	SS	PZ-211-SS	A
PZ	212	SS	PZ-212-SS	A
PZ	110	SS	PZ-110-SS	I
MW	304	SS	MW-304-SS	P
MW	601	SS	MW-601-SS	P
MW	602	SS	MW-602-SS	P
MW	400	SS*	MW-400-SS*	P
MW	401	SS*	MW-401-SS*	P
MW	402	SS*	MW-402-SS*	P
MW	500	SS*	MW-500-SS*	P
MW	500	SS*	MW-500-SS*	P
MW	500	SS*	MW-500-SS*	P
MW	600	SS*	MW-600-SS*	P
MW	603	SS*	MW-603-SS*	P
MW	1204	SD	MW-1204	A
PZ	100	SD	PZ-100-SD	A
PZ	104	SD	PZ-104-SD	A
PZ	106	SD	PZ-106-SD	A
PZ	111	SD	PZ-111-SD	A
PZ	209	SD	PZ-209-SD	A
PZ	210	SD	PZ-210-SD	A
PZ	211	SD	PZ-211-SD	A
PZ	212	SD	PZ-212-SD	A
MW	304	SD	MW-304-SD	P
MW	400	SD	MW-400-SD	P
MW	401	SD	MW-401-SD	P
MW	402	SD	MW-402-SD	P
MW	500	SD	MW-500-SD	P
MW	501	SD	MW-501-SD	P
MW	502	SD	MW-502-SD	P
MW	600	SD	MW-600-SD	P
MW	601	SD	MW-601-SD	P
MW	602	SD	MW-602-SD	P
MW	603	SD	MW-603-SD	P

DRAFT

TABLE 5-4. PROPOSED MONITORING WELL NETWORK
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Prefix	Series	Zone	Well ID	Current Monitoring Status
PZ	100	KS	PZ-100-KS	A
PZ	104	KS	PZ-104-KS	A
PZ	106	KS	PZ-106-KS	A
PZ	111	KS	PZ-111-KS	A

Notes:
Environmental Control Prefix
S - Shallow
I - Intermediate
D - Deep
LR - Leachate Riser
MW - Monitoring Well
PZ - Piezometer

Hydrological Zone
AS - Shallow Alluvial
AI - Intermediate Alluvial
AD - Deep Alluvial
LR - Leachate Riser
SS - Upper Salem/St. Louis Formation
SD - Salem Formation
KS - Keokuk Formation

Monitoring Status
A - Active
I - Inactive
U - Unknown
P - Proposed

Samples will not be collected from well I-4 due to compromised casing

DRAFT

TABLE 5-5. WELL NEST LOCATIONS TO CONSIDER FOR DATALOGGER PLACEMENT
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

NEW OFFSITE WELL LOCATIONS

	Aquifer Monitoring Intervals					
Well ID	**AS**	**AI**	**AD**	**SS**	**SD**	**KS**
MW-500	X	X	X	X		
MW-502	X	X	X	X		
MW-600	X	X	X	X	X	
MW-600				X	X	

EXISTING ONSITE WELL LOCATIONS

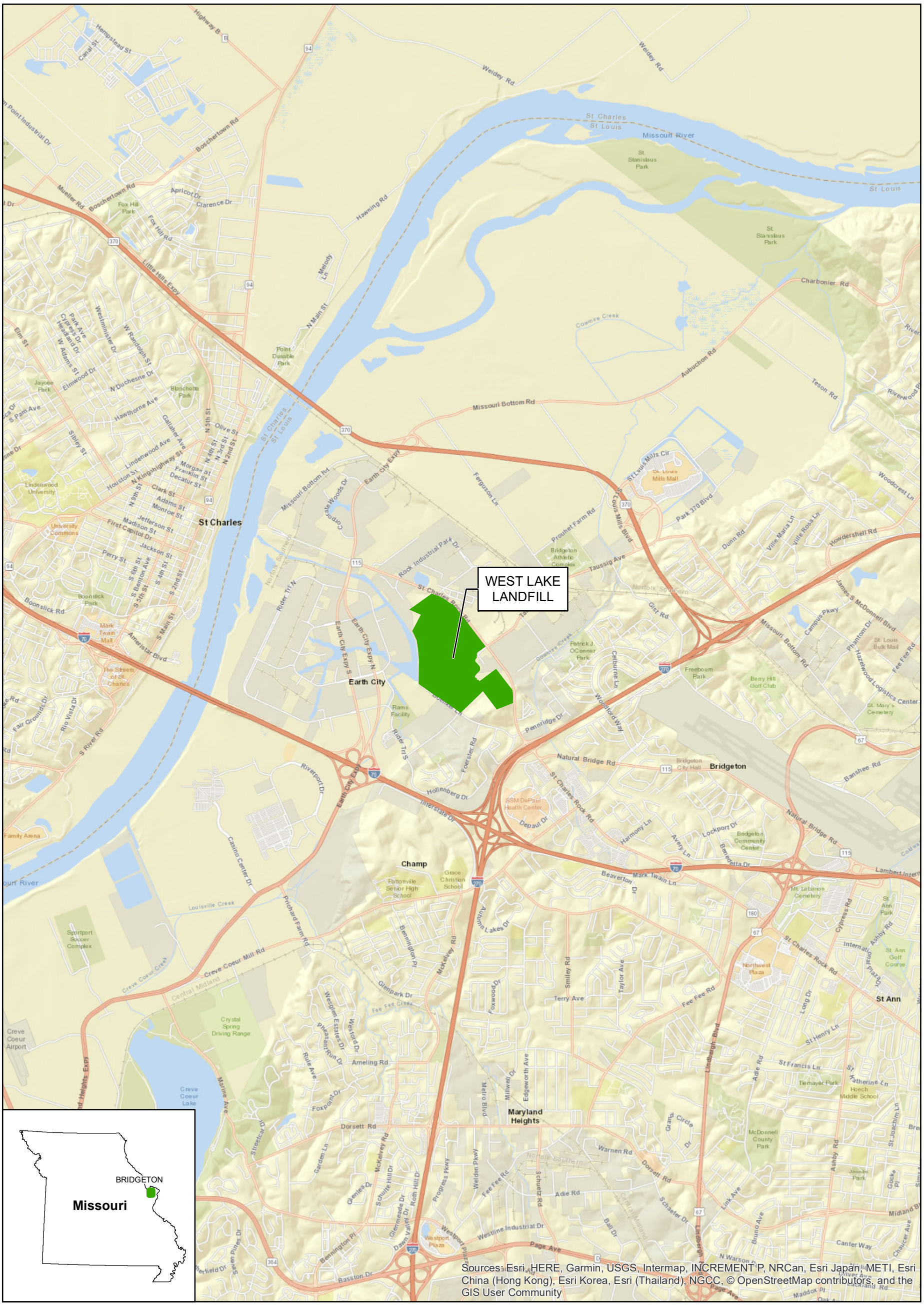
	Aquifer Monitoring Intervals					
Well ID	**AS**	**AI**	**AD**	**SS**	**SD**	**KS**
S-8	X					
I-62		X				
D-83			X			
S-82	X					
I-9		X				
D-93			X			
PZ-202				X		
PZ-209				X	X	
PZ-211				X	X	
PZ-113	X		X	X		
PZ-100				X	X	X

Notes:
AS = Shallow Alluvium
AI = Intermediate Alluvium
AD = Deep Alluvium
SS = St. Louis and Upper Salem Formations
SD = The base of the Salem Formation
KS = Keokuk Formation

DRAFT

FIGURES

DRAFT



EXPLANATION

LANDFILL BOUNDARY

LATITUDE: 38.768106
LONGITUDE: -90.444574
LATITUDE AND LONGITUDE ARE IN NAD83

N

0 4,000'

DRAFT

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

FIGURE 1-1

SITE LOCATION MAP

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: KEJ	Checked By: MS	Scale: 1 " = 4,000 '	Date: 5/7/19	File: 1-1_SiteLocation_Fig1-1.mxd

I:\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILL\GIS\MAPPING\201906_RIFS_WP\201906_DRAFTS\1-1_SITELOCATION_FIG1-1.MXD

EXPLANATION

- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY
- OPERABLE UNIT 1

N

0 1,000 '

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

DRAFT

FIGURE 1-2

SITE LAYOUT MAP

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: KEJ	Checked By: MS	Scale: 1 " = 1,000 '	Date: 5/31/19	File: 1-2_SiteLayout_Fig1-2.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILLGIS\MAPPING\20190606_RIFS_WP\20190606_DRAFTS\1-2_SITELAYOUT_FIG1-2.MXD

EXPLANATION

- SUPERFUND SITE BOUNDARY
- LANDFILL BOUNDARY
- LEACHATELAGOON
- OPERABLE UNIT 1

N

0 500 '

Trihydro Corporation
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

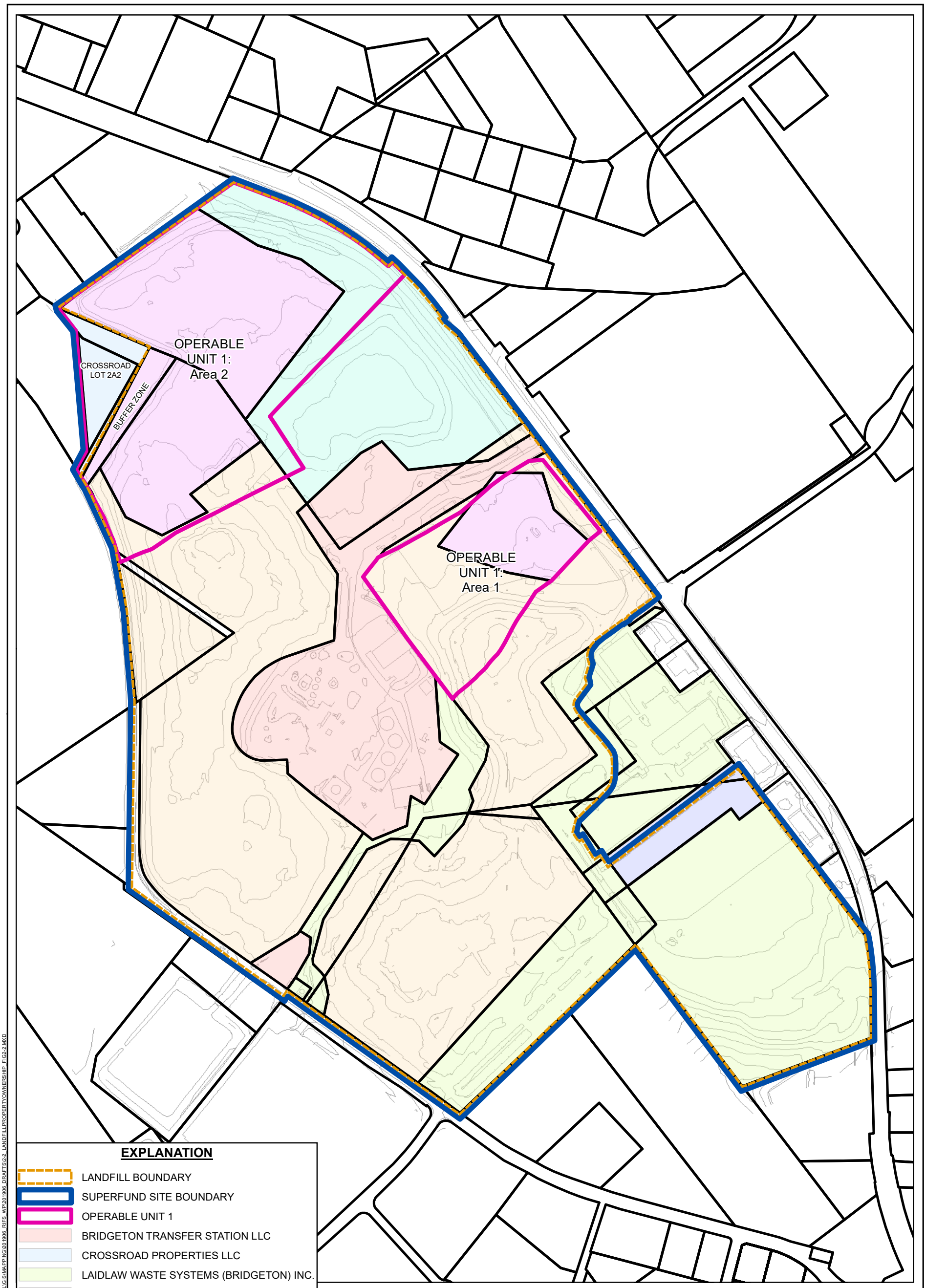
FIGURE 2-1

AREAS OF LANDFILL OPERATIONS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: KEJ	Checked By: MS	Scale: 1 " = 500 '	Date: 5/7/19	File: 2-1_LandfillOperations_Fig2-1.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKE\LANDFILL\GIS\MAPPING\201906_RIFS_WP\201906_DRAFTS\2-1_LANDFILLOPERATIONS_FIG2-1.MXD



EXPLANATION

- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY
- OPERABLE UNIT 1
- BRIDGETON TRANSFER STATION LLC
- CROSSROAD PROPERTIES LLC
- LAIDLAW WASTE SYSTEMS (BRIDGETON) INC.
- ROCK ROAD INDUSTRIES, INC.
- WEST LAKE ACRES FACILITIES ASSN.
- WEST LAKE LANDFILL, INC.
- WEST LAKE LANDFILL, INC. ET AL.

NOTE:

-LANDOWNER PARCEL DATA DOWNLOADED FROM SAINT LOUIS COUNTY GIS SERVICE CENTER

N

0 500 '

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

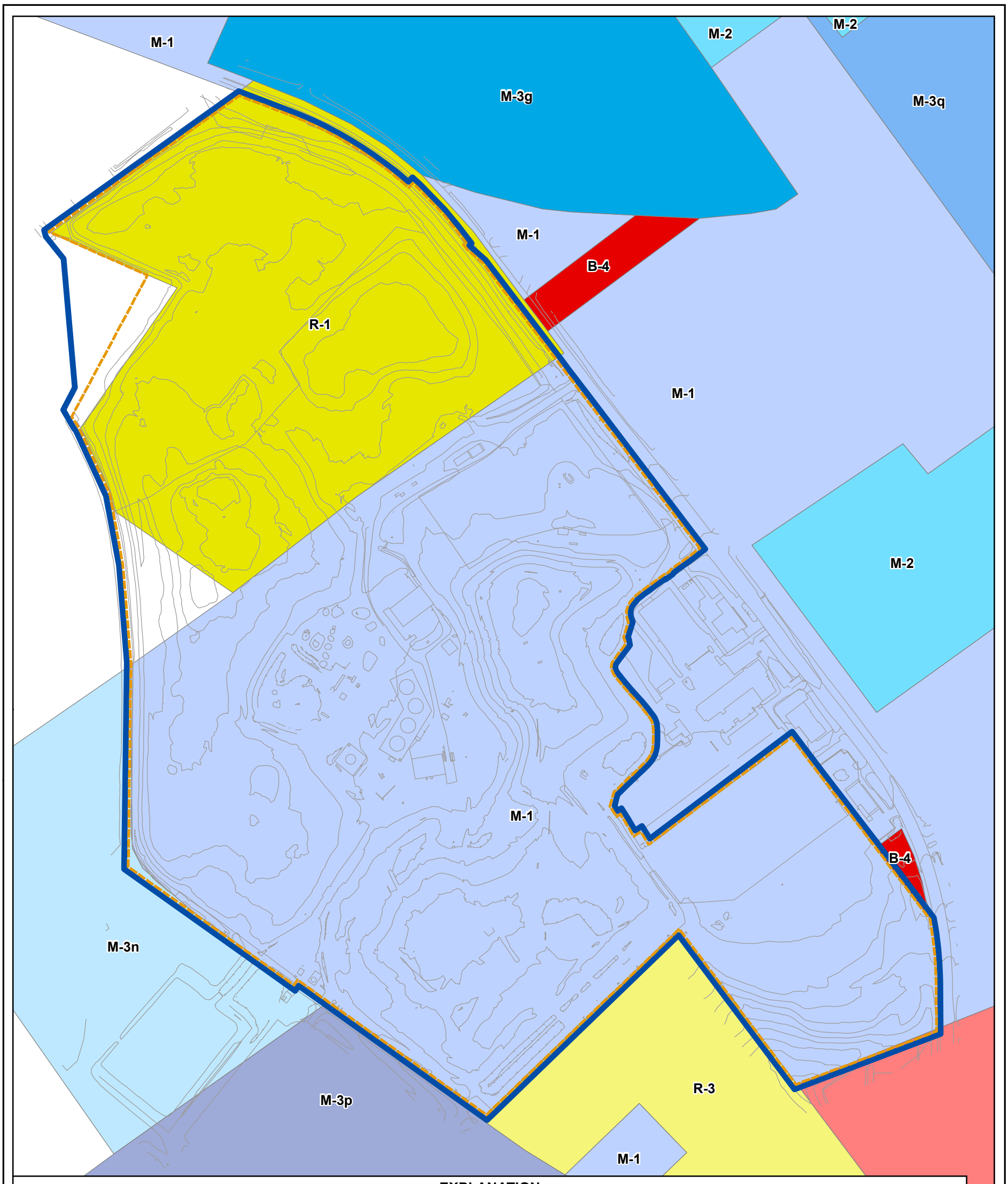
FIGURE 2-2

LANDFILL PROPERTY OWNERSHIP

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: KEJ	Checked By: MS	Scale: 1 " = 500 '	Date: 5/7/19	File: 2-2_LandfillPropertyOwnership_Fig2-2.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKE\LANDFILL\GIS\MAPPING\201906 RIFS WP\201906 DRAFTS\2-2 LANDFILLPROPERTYOWNERSHIP FIG2-2.MXD



EXPLANATION

- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY
- B-3 = TRAVEL / ENTERTAINMENT SERVICES DISTRICT
- B-4 = GENERAL COMMERCIAL DISTRICT
- M-1 = MANUFACTURING DISTRICT, LIMITED
- M-2 = MANUFACTURING DISTRICT
- M-3A = PLANNED MANUFACTURING DISTRICT (HOLLENBERG BUSINESS PARK)
- M-3G = PLANNED MANUFACTURING DISTRICT (NORTHWEST INDUSTRIAL SUBDIVISION)
- M-3N = PLANNED MANUFACTURING DISTRICT (CORPORATE EXCHANGE PLAT)
- M-3O = PLANNED MANUFACTURING DISTRICT (CORPORATE EXCHANGE PLAT)
- M-3P = PLANNED MANUFACTURING DISTRICT (CORPORATE EXCHANGE PLAT)
- M-3Q = PLANNED MANUFACTURING DISTRICT (NORTHWEST INDUSTRIAL PARK)
- R-1 = SINGLE FAMILY DWELLING DISTRICT
- R-3 = SINGLE FAMILY DWELLING DISTRICT

NOTES:

-LANDOWNER PARCEL DATA DOWNLOADED FROM SAINT LOUIS COUNTY GIS SERVICE CENTER
-ZONING DATA FROM CITY OF BRIDGETON ZONING MAP AMENDED 9/20/2017

N

0 500 '

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 2-3

LANDFILL AND SURROUNDING AREA ZONING

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: KEJ	Checked By: MS	Scale: 1 " = 500 '	Date: 5/7/19	File: 2-3_Zoning_Fig2-3.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKE\LANDFILL\GIS\MAPPING\20190906 RIFS WP\20190906 DRAFTS\2-3_ZONING_FIG2-3.MXD

N

0 500 '

Area 5

Area 4

Area 1

Area 3

Area 2

Area 6

EXPLANATION

- SUPERFUND SITE BOUNDARY
- MDNR AREA
- DEMOLITION
- SANITARY
- PERMIT 118903, 1/27/1976 — ACTUAL AUTHORIZATION GRANTED ON 8/27/1974
- PERMIT 218903, 1/27/1976 — USED FOR SANITARY WASTE DISPOSAL PRIOR TO ISSUANCE OF DEMOLITION FILL PERMIT
- PERMIT 118903, 5/23/1978 — EXPANSION OF ORIGINAL 25 ACRE TRACT
- PERMIT 118906, 1/22/1979
- PERMIT 118908, 8/27/1980
- PERMIT 118909, 8/20/1981
- PERMIT 218912, 9/18/1984
- PERMIT 118912, 11/18/1985 — SUPERSEDES PERMIT 118909 AND 118906, PLUS 33 ACRES, PER EXPANSION
- OPERABLE UNIT 1

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

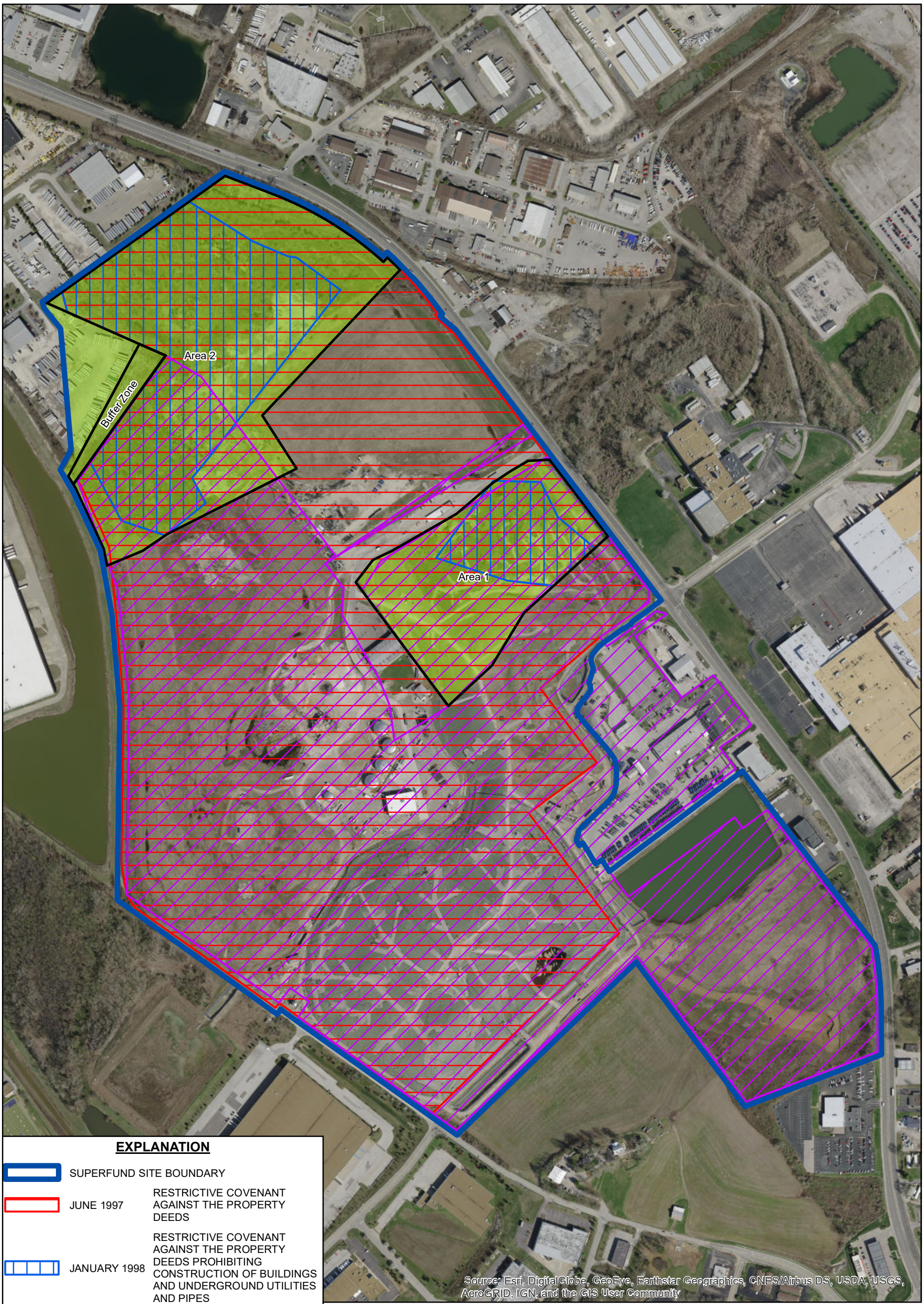
FIGURE 2-4

MDNR PERMITTED AREAS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: KEJ	Checked By: MS	Scale: 1 " = 500 '	Date: 5/7/19	File: 2-4_PermittedAreas_Fig2-4.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILLGIS\MAPPING\201906 RIFS WP\201906 DRAFTS\2-4 PERMITTEDAREAS FIG2-4.MXD



EXPLANATION

- SUPERFUND SITE BOUNDARY
- JUNE 1997 — RESTRICTIVE COVENANT AGAINST THE PROPERTY DEEDS
- JANUARY 1998 — RESTRICTIVE COVENANT AGAINST THE PROPERTY DEEDS PROHIBITING CONSTRUCTION OF BUILDINGS AND UNDERGROUND UTILITIES AND PIPES
- AUGUST 2005 — NEGATIVE EASEMENT AND RESTRICTIVE COVENANTS PROHIBITING ADDITIONAL DEPOSITING OR DUMPING
- OCTOBER 2016 — SUPPLEMENTAL AND PARTIALLY RESTATED COVENANTS AND RESTRICTIONS
- OPERABLE UNIT 1

N

0 500 '

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

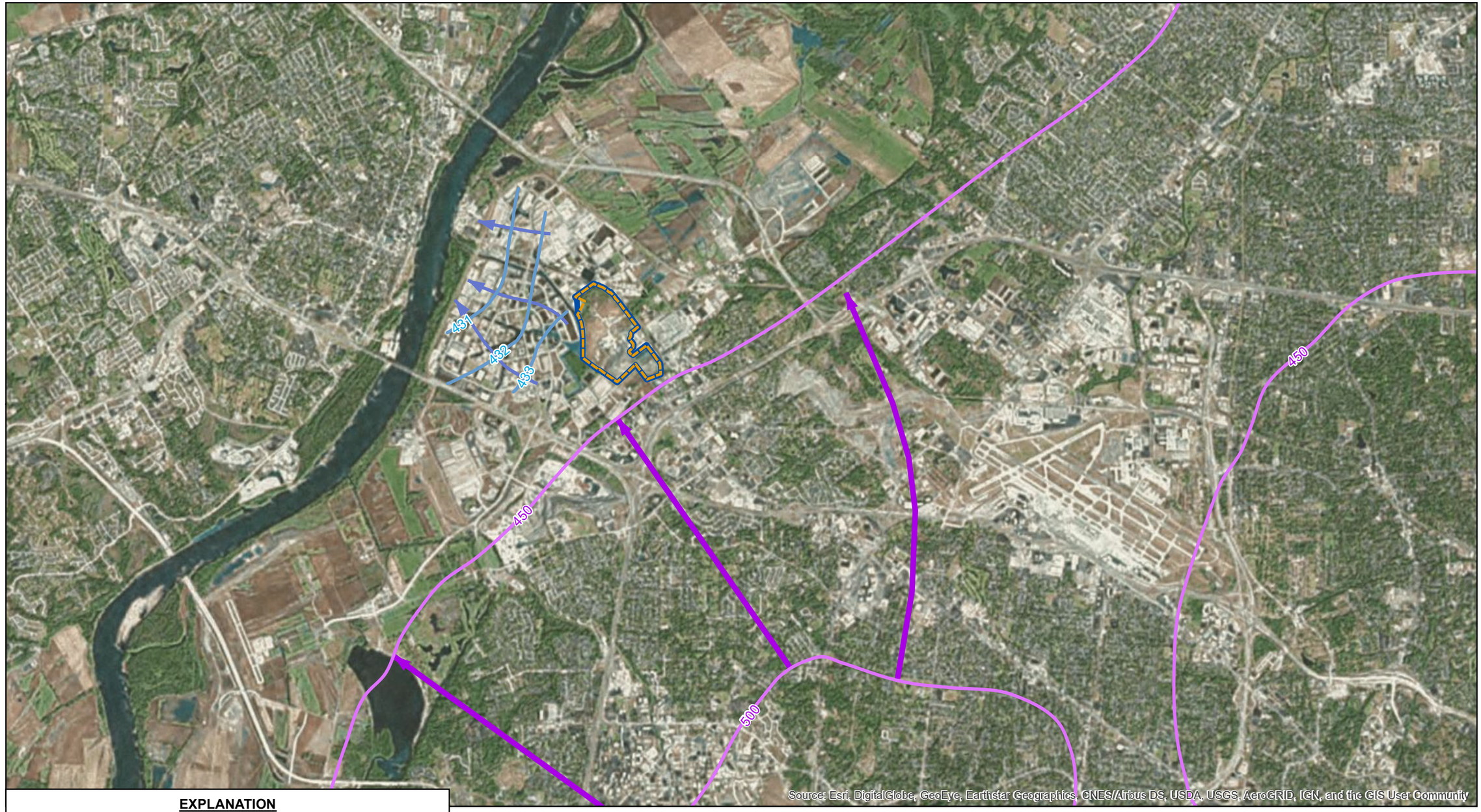
FIGURE 2-5

LAND USE RESTRICTIONS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: KEJ	Checked By: MS	Scale: 1 " = 500 '	Date: 5/7/19	File: 2-5_LandRestrictions_Fig2-5.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILLGIS\MAPPING\20190618_RIFS_WP\20190618_DRAFTS\2-5_LANDRESTRICTIONS_FIG2-5.MXD



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

EXPLANATION

- 1974 ALLUVIAL WATER TABLE CONTOUR
- MISSISSIPPIAN-AGE ROCKS POTENTIOMETRIC SURFACE CONTOUR
- 1974 ALLUVIAL FLOW DIRECTION
- MISSISSIPPIAN-AGE ROCKS FLOW DIRECTION
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

NOTES:

1. 1974 WATER TABLE CONTOURS DIGITIZED FROM BURNS & MCDONNELL 1986
2. MISSISSIPPIAN-AGE ROCKS POTENTIOMETRIC SURFACE DIGITIZED FROM AMES 1990
3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 5,000'

Trihydro CORPORATION
152 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

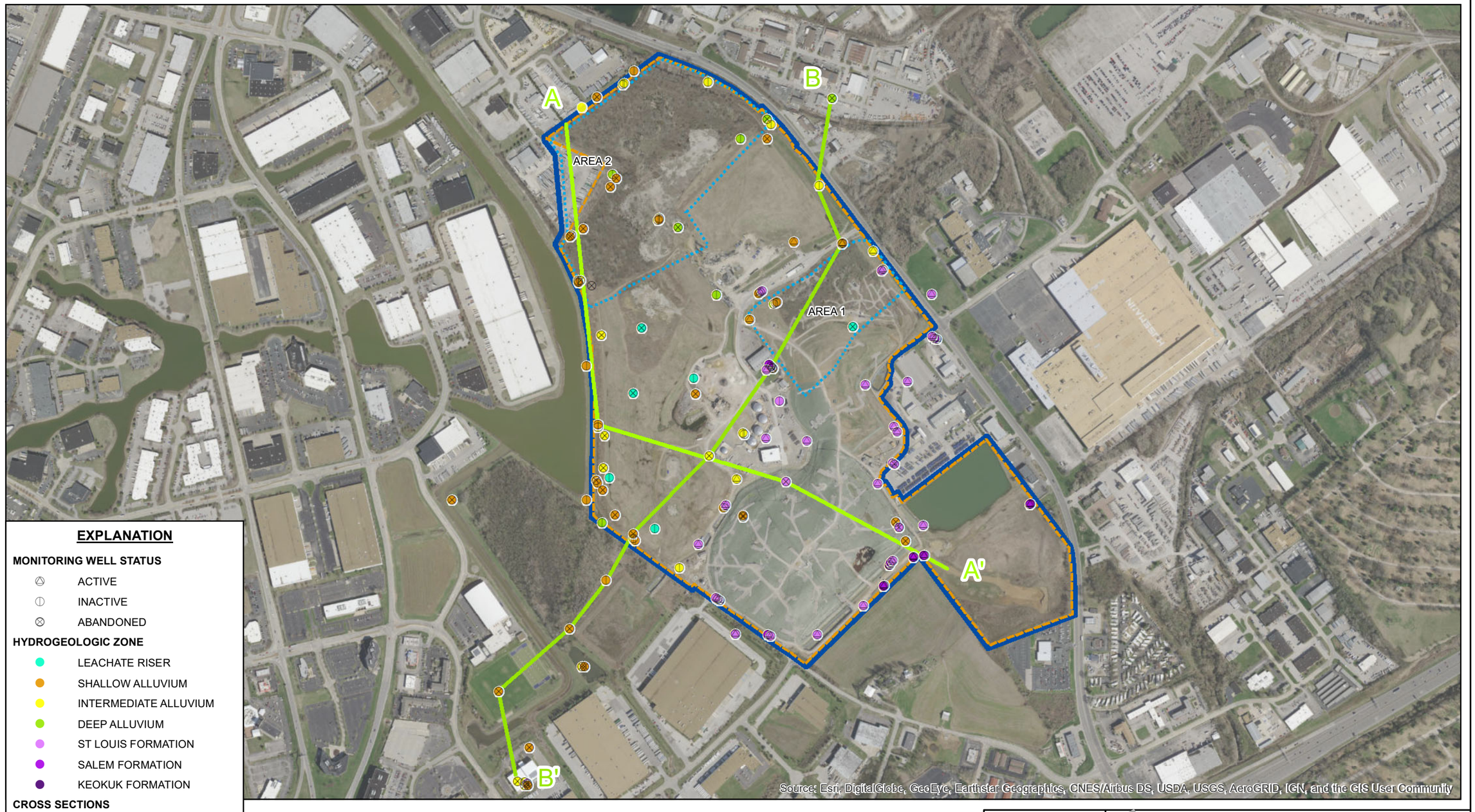
FIGURE 3-1

REGIONAL POTENTIOMETRIC SURFACE MAPS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 5,000 '	Date: 5/7/19	File: 3-1_RegionalPS_Fig3-1.mxd

I:\TRIHYDRO.COM\CLIENT\SWTOZ\WEST LAKE\LANDFILL\GIS\MAPPING\201906 RI FS WP\201906 DRAFT\SS-1 REGIONALPS FIGS-1.MXD



EXPLANATION

MONITORING WELL STATUS

- ACTIVE
- INACTIVE
- ABANDONED

HYDROGEOLOGIC ZONE

- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

CROSS SECTIONS

- CROSS SECTION A
- CROSS SECTION B

SITE FEATURES

- OU-1
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

N

0 800'

Trihydro Corporation
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

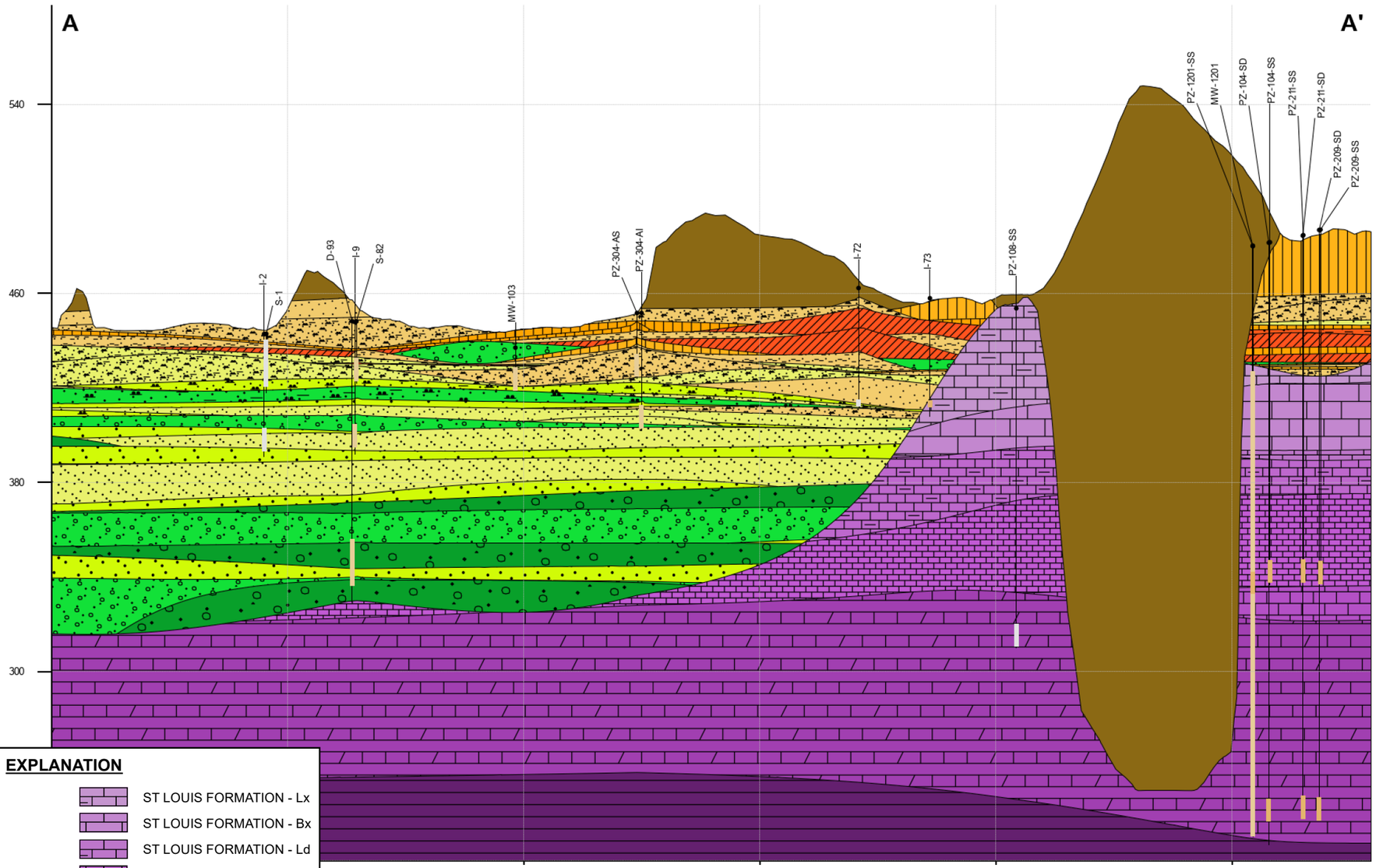
FIGURE 3-2

CROSS SECTION LOCATIONS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 800 '	Date: 5/7/19	File: 3-2_X-S_Fig3-2.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILLGIS\MAPPING\201906_RFS_WP\201906_DRAFTS\3-2_X-S_FIG3-2.MXD



EXPLANATION

- REFUSE
- CLAY
- SILT
- FINE SAND WITH FINES
- FINE SAND
- MEDIUM SAND WITH FINES
- MEDIUM SAND
- COARSE SAND WITH FINES
- COARSE SAND
- FINES WITH FINE GRAVEL
- FINE GRAVEL
- COARSE GRAVEL
- ST LOUIS FORMATION - Lx
- ST LOUIS FORMATION - Bx
- ST LOUIS FORMATION - Ld
- ST LOUIS FORMATION - Ls
- ST LOUIS FORMATION - Lb
- ST LOUIS FORMATION - Lc
- SALEM FORMATION
- WARSAW FORMATION
- KEOKUK FORMATION

NOTES:

1. 10 x VERTICAL EXAGGERATION
2. ACTIVE SCREENED INTERVALS SHOWN IN BROWN
3. ABANDONED SCREENED INTERVALS SHOWN IN GRAY

Trihydro CORPORATION
[illegible] Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

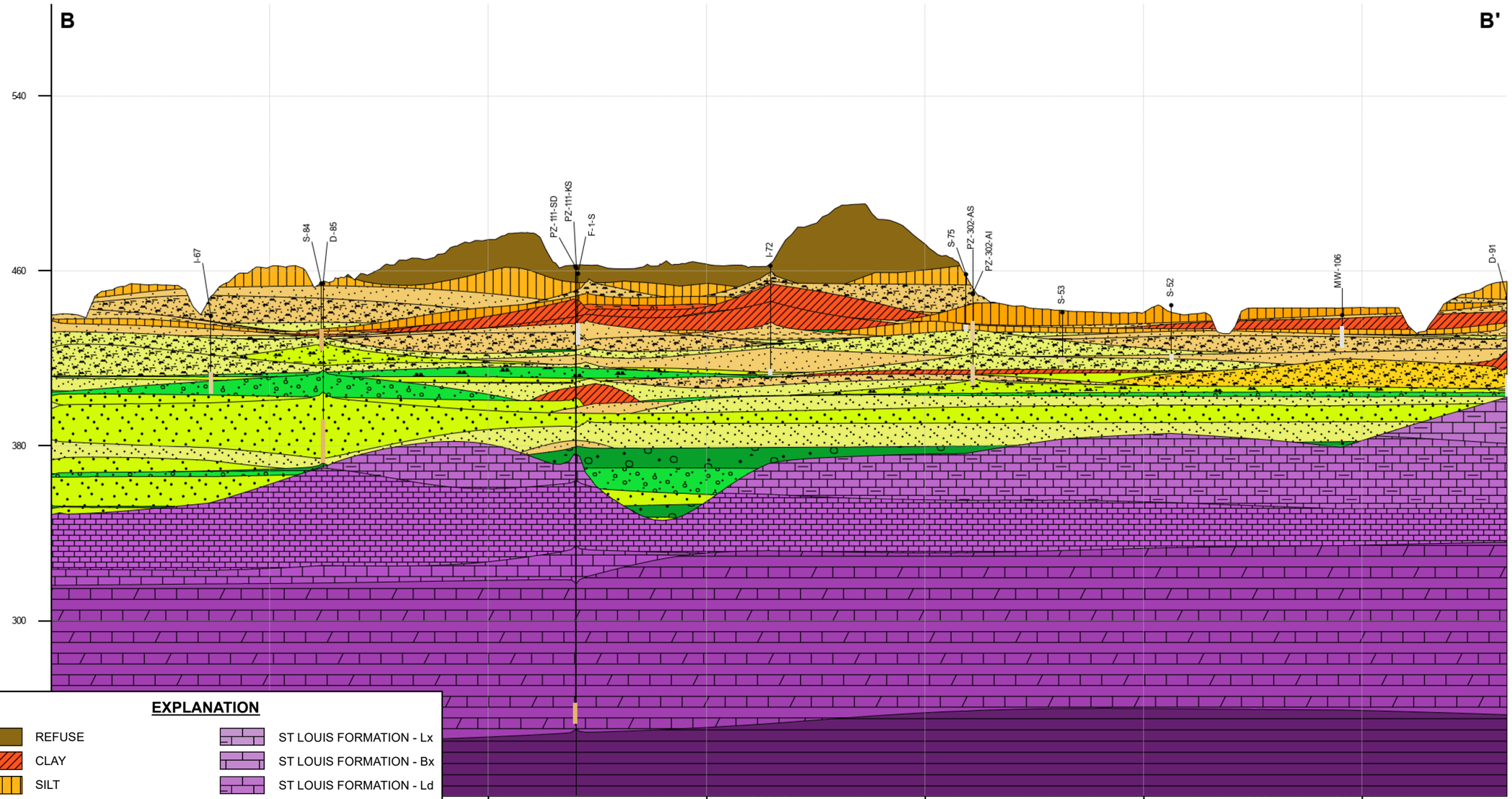
FIGURE 3-3

CROSS SECTION A

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: As Shown	Date: 5/7/19	File: 3-3_X-SA_Fig3-3.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILL\GIS\MAPPING\201906_RI\FS_WP\201906_DRAFTS\3-3_X-SA_FIG3-3.MXD



EXPLANATION

- REFUSE
- CLAY
- SILT
- FINE SAND WITH FINES
- FINE SAND
- MEDIUM SAND WITH FINES
- MEDIUM SAND
- COARSE SAND WITH FINES
- COARSE SAND
- FINES WITH FINE GRAVEL
- FINE GRAVEL
- COARSE GRAVEL
- ST LOUIS FORMATION - Lx
- ST LOUIS FORMATION - Bx
- ST LOUIS FORMATION - Ld
- ST LOUIS FORMATION - Ls
- ST LOUIS FORMATION - Lb
- ST LOUIS FORMATION - Lc
- SALEM FORMATION
- WARSAW FORMATION
- KEOKUK FORMATION

NOTES:

1. 10 x VERTICAL EXAGGERATION
2. ACTIVE SCREENED INTERVALS SHOWN IN BROWN
3. ABANDONED SCREENED INTERVALS SHOWN IN GRAY

Tribyhydro CORPORATION
52 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-4

CROSS SECTION B

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: As Shown	Date: 5/7/19	File: 3-4_X-SB_Fig3-4.mxd

\\TRIHYDRO.COM\CLIENTS\WTOX\WESTLAKELANDFILLGIS\MAPPING\2019\06_RI\FS_WP\2019\06_DRAFTS\3-4_X-SB_FIG3-4.MXD

N

0 1,500 '

DRAFT

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

FIGURE 3-5

EDGE OF THE ALLUVIAL VALLEY

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 1,500 '	Date: 5/7/19	File: 3-5_EdgeAV_Fig3-5.mxd

N:\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILLGIS\MAPPING\201906 RIFS WP\201906 DRAFTS\3-5 EDGEAV FIG3-5.MXD

EXPLANATION

- PROPOSED STAFF GAUGE
- USGS06935965
- ABANDONED STAFF GAUGE
- ST LOUIS LAMBERT PRECIPITATION GAUGE
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

N

0 2,000 '

Trihydro CORPORATION
152 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-6

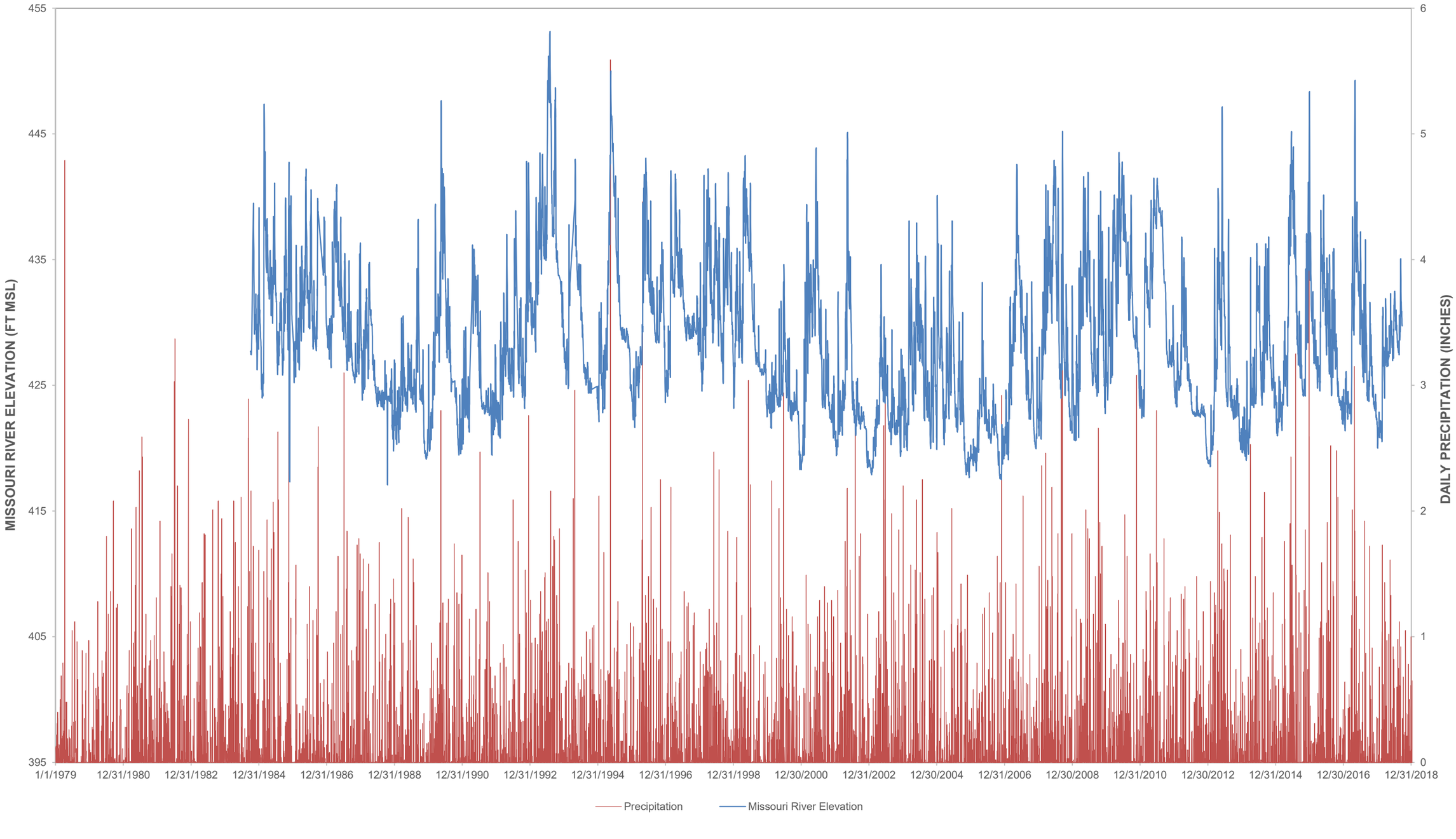
SURFACE WATER AND PRECIPITATION GAUGES

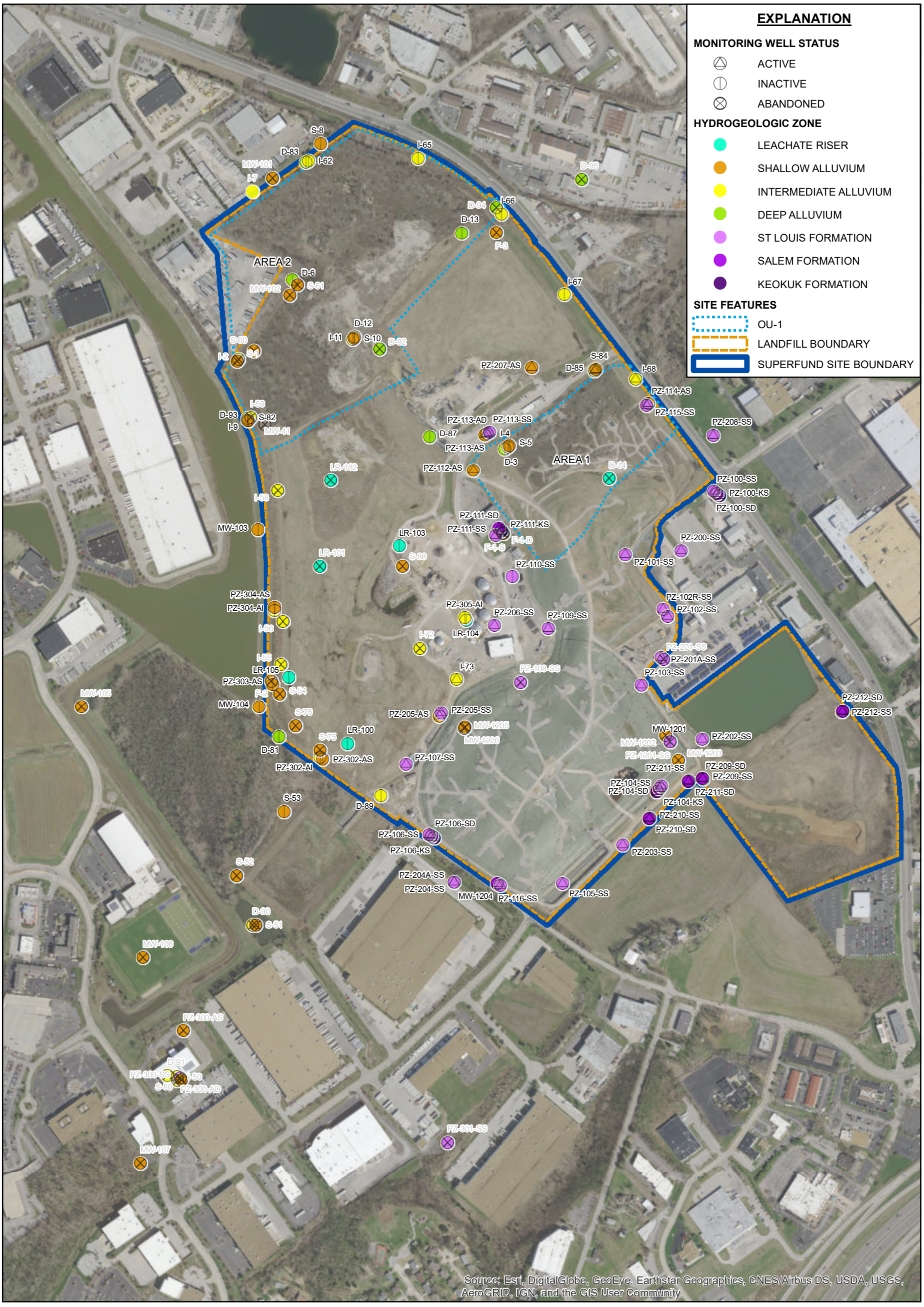
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 2,000 '	Date: 5/9/19	File: 3-6_SW_Precip_Fig3-6.mxd

M:\WTO2\WEST LAKE\LANDFILL\GIS\MAPPING\2019\06 APS_WP-291906_DRAFTS\3-6_SW_PRECIP_FIG3-6.MXD

FIGURE 3-7. MISSOURI RIVER ELEVATION AT ST CHARLES USGS GAUGE AND DAILY PRECIPITATION AT LAMBERT ST LOUIS
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN





N

0 600 '

DRAFT

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

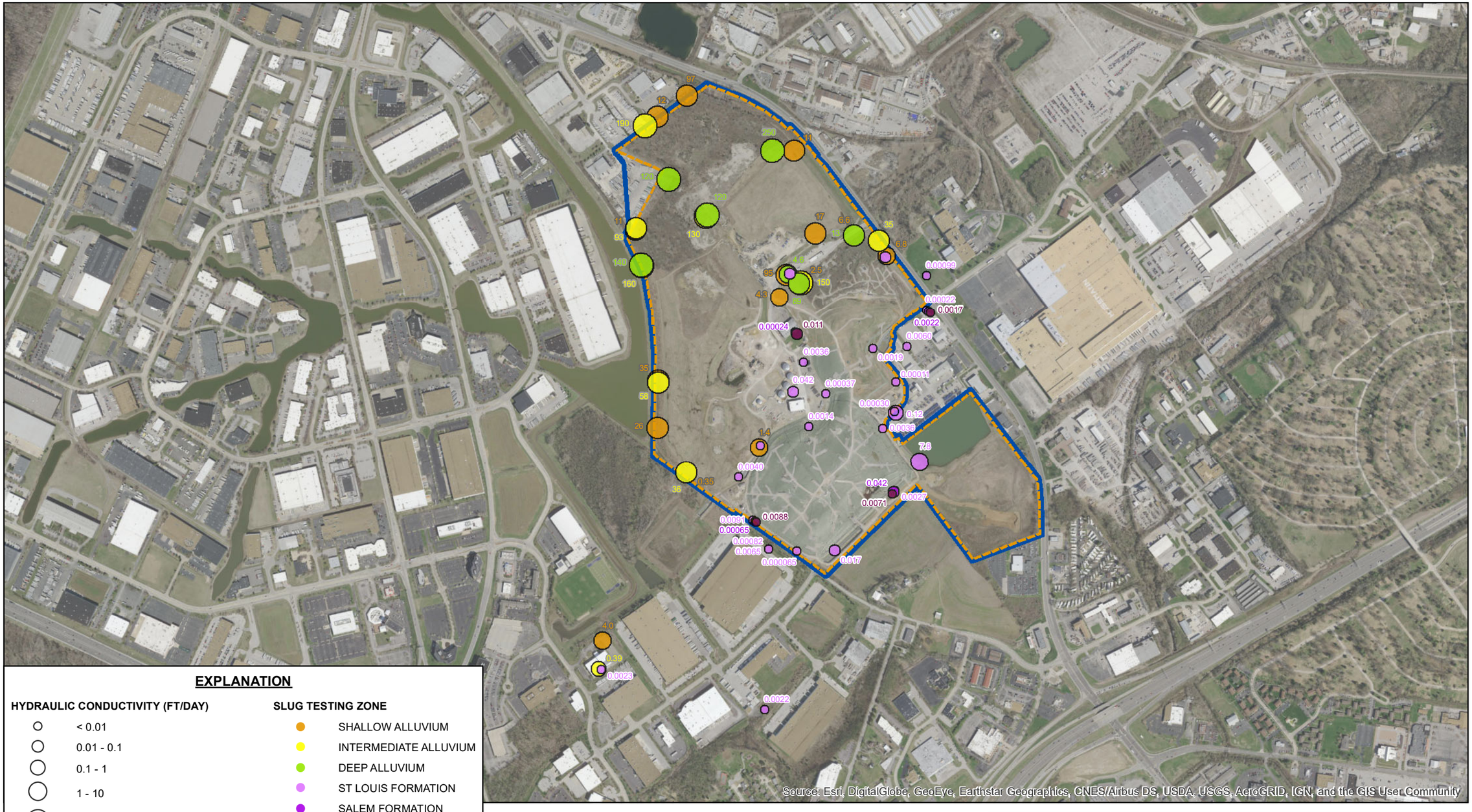
FIGURE 3-8

MONITORING WELL STATUS AND HYDROGEOLOGIC ZONE

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 5/9/19	File: 3-8_MWStatus_Fig3-8.mxd

M:\WTOZ\WESTLAKELANDFILL\GIS\MAPPING\201906_RIFS_WP\201906_DRAFTS\3-8_MWSTATUS_FIG3-8.MXD



EXPLANATION

HYDRAULIC CONDUCTIVITY (FT/DAY)

- < 0.01
- 0.01 - 0.1
- 0.1 - 1
- 1 - 10
- 10 - 100
- > 100

SLUG TESTING ZONE

- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

SITE FEATURES

- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

N

0 1,000'

Trihydro Corporation
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307.745.7729

DRAFT

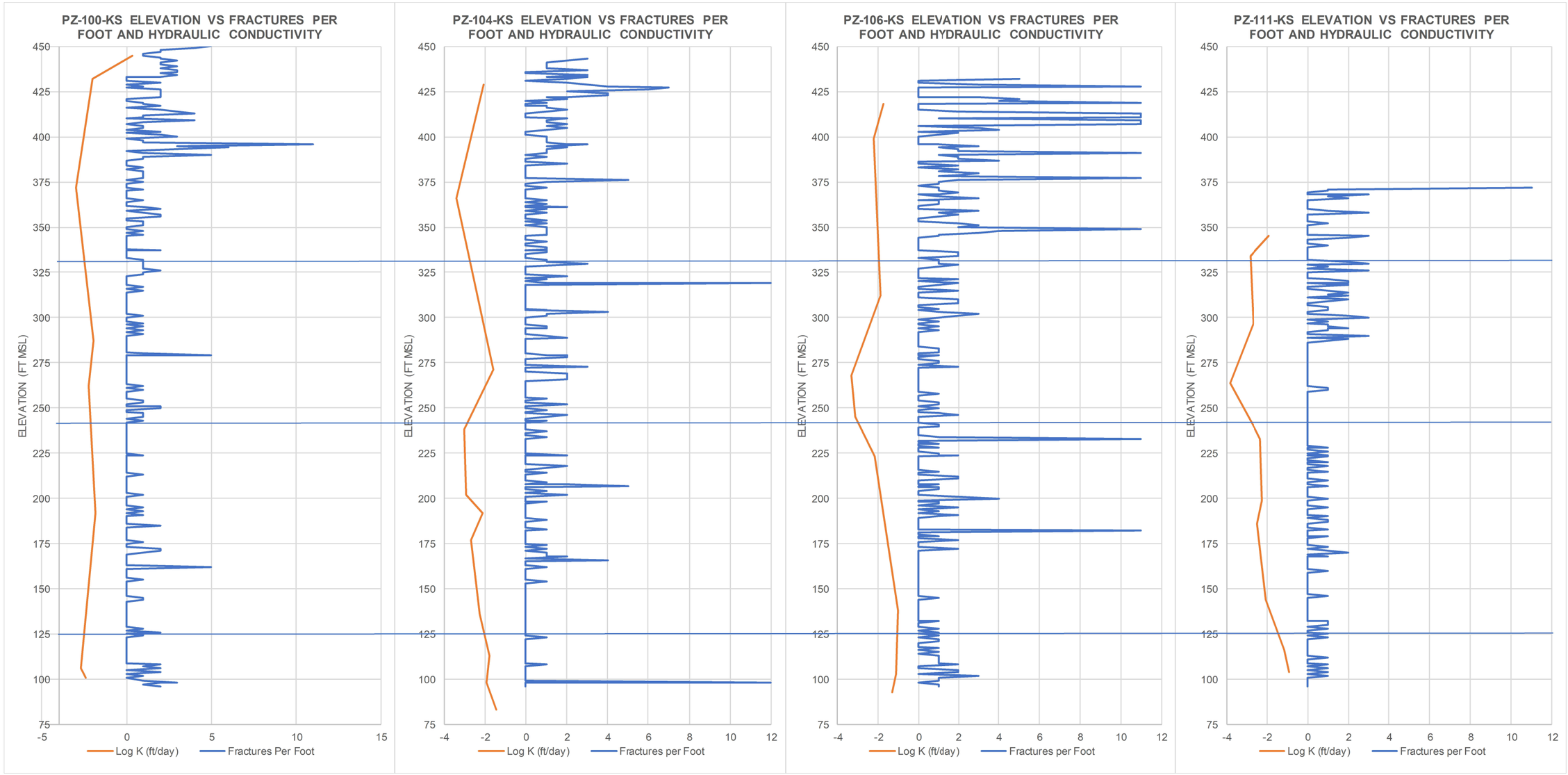
FIGURE 3-9

EXISTING SLUG TESTING RESULTS SUMMARY

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 1,000 '	Date: 5/9/19	File: 3-9_K_Fig3-9.mxd

M:\WTOZ\WEST LAKE\LANDFILL\GIS\MAPPING\201906 RIFS_WP\201906_DRAFTS\3-9_K_FIG3-9.MXD



M:\WYOZ\WESTLAKELANDFILL\PROJECTDOCS\WESTLAKELANDFILLOU3\CADD\201906_RIFS_WP\63N--RIFSWP_PACKERRESULTS_20190509

DRAFT

FIGURE 3-10

EXISTING PACKER TESTING RESULTS SUMMARY

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Trihydro CORPORATION
1252 Commerce Drive
Laramie, Wyoming 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

Drawn By: REP	Checked By: MH	Scale: NONE	Date: 5/9/19	File: 63N-RIFSWP_PACKERRESULTS_20190509

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- SHALLOW / INTERMEDIATE ALLUVIUM POTENTIOMETRIC SURFACE CONTOURS
- DEEP ALLUVIUM POTENTIOMETRIC SURFACE CONTOURS
- SHALLOW / INTERMEDIATE ALLUVIUM GROUNDWATER FLOW DIRECTION
- DEEP ALLUVIUM GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 1
AREA 2
D-83 432.67
I-62 432.73
I-7
I-65 432.85
I-66 433.15
I-67
I-68
S-84 433.32
D-85 433.4
S-61 432.77
S-60 432.58
I-2
I-11
433.0
I-59 432.82
I-9
S-82 432.78
D-87 432.89
I-4
I-58 434.1
S-88 432.83
PZ-304-AI
I-56 434.05
PZ-305-AI
I-72 433.95
I-55 434.5
I-73 433
S-54 434.4
S-76 434.3
D-81 433.07
S-75 435.35
PZ-302-AI
S-53 434.5
D-89 433.05
S-52 433.18
D-90
S-51 431.97
D-91
PZ-300-AD
S-80
I-50 434.28
435.88
434.5
434
432.5
433
433.5
435

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Tribyd
CORPORATION
1,52 ommerce Drive
L ram e, WY 82070
ww.trihydro.com
(P) 30 /745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-11

MISSOURI RIVER ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP OCTOBER 26, 1984

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-11_19841026PS_Fig3-11.mxd

M:\WT0Z\WESTLAKELANDFILL\GIS\MAPPING\2019\06_RIFS_WP-201908_DRAFTS\3-11_19841026PS_FIG3-11.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- SHALLOW / INTERMEDIATE ALLUVIUM POTENTIOMETRIC SURFACE CONTOURS
- DEEP ALLUVIUM POTENTIOMETRIC SURFACE CONTOURS
- SHALLOW / INTERMEDIATE ALLUVIUM GROUNDWATER FLOW DIRECTION
- DEEP ALLUVIUM GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 1

AREA 2

D-83 435.39
I-62 435.51
I-7
I-65 435.57
D-95 435.94
I-66 NA
D-94 434.99
S-61 435.35
435.5
I-67
S-60 434.98
I-2
D-92 434.95
I-11
D-85 435.67
S-84 435.67
I-68
I-5 434.85
I-9
S-82 434.83
D-87 435.14
I-4
435.0
I-58 436.06
S-88 434.83
PZ-304-AI
I-56 435.83
PZ-305-AI
I-72 435.79
I-55 436.07
S-54 435.85
I-73 434.62
S-76 437.06
S-75 436.62
D-81 434.54
PZ-302-AI
D-89 434.57
S-53 435.97
435.5
435.0
S-52 434.68
434.5
434.0
S-51 433.49
D-90
D-91
PZ-300-AD
S-80 441.69
I-50 435.95

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Tribyd
CORPORATION
1,52 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-12

MISSOURI RIVER ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP APRIL 25, 1985

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-12_19850425PS_Fig3-12.mxd

M:\WTOZ\WESTLAKELANDFILL\GIS\MAPPING\2019\00_RIFS_WP-2019\06_DRAFTS\3-12_19850425PS_FIG3-12.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- SHALLOW / INTERMEDIATE ALLUVIUM POTENTIOMETRIC SURFACE CONTOURS
- DEEP ALLUVIUM POTENTIOMETRIC SURFACE CONTOURS
- SHALLOW / INTERMEDIATE ALLUVIUM GROUNDWATER FLOW DIRECTION
- DEEP ALLUVIUM GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 1
AREA 2

S-8 426.69
D-83 427.00
I-62 427.07
I-65 426.70
I-7
I-66 426.90
D-13 426.89
D-6 426.57
MW-102 427.30
S-61 426.79
I-67 426.87
D-12 426.92
S-10 426.91
I-11 426.84
I-2
PZ-207-AS 426.97
S-84 426.94
I-68 427.08
D-85 427.00
PZ-114-AS 427.49
D-93 426.16
I-59
I-9 428.06
PZ-113-AD 427.08
S-5 428.42
D-87 426.99
PZ-113-AS 427.02
D-3 426.97
I-4 427.01
PZ-112-AS 427.01
I-58
MW-103 425.63
PZ-304-AS 427.41
PZ-304-AI 427.41
I-56
PZ-305-AI 427.29
I-72 427.5
I-55
I-73 427.57
PZ-303-AS 427.47
MW-104 427.70
PZ-205-AS 428.58
D-81 427.64
PZ-302-AS 427.53
PZ-302-AI 426.65
D-89
S-53 427.43
D-90
D-91
PZ-300-AD
I-50

427.0
426.5
427.5
428.0
428.5

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. MONITORING WELLS S-5 AND PZ-302-AI NOT CONTOURED
3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-13a

MISSOURI RIVER ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP APRIL 2, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-13a_201304MA_Fig3-13.mxd

M:\WTOZ\WESTLAKE\LANDFILL\GIS\MAPPING\201906 RIFS WP\201906_DRAFTS\3-13A_201304MA_FIG3-13.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- UPPER SALEM/ST. LOUIS FORMATION POTENTIOMETRIC SURFACE CONTOURS
- UPPER SALEM/ST. LOUIS FORMATION GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- BRIDGETON LANDFILL BOUNDARY
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 1

AREA 2

PZ-113-SS 427.17
PZ-115-SS 435.99
PZ-208-SS 451.75
PZ-100-SS 450.78
PZ-101-SS 437.71
PZ-200-SS 454.59
PZ-110-SS 427.69
PZ-102R-SS 456.43
PZ-206-SS 430.56
PZ-102-SS 455.83
PZ-109-SS 430.62
PZ-201A-SS 467.41
PZ-103-SS 473.58
PZ-205-SS 430.31
PZ-202-SS 466.54
PZ-107-SS 427.86
PZ-104-SS 461.8
PZ-106-SS 448.78
PZ-203-SS 461.1
PZ-204A-SS 455.44
PZ-204-SS 459.44
PZ-116-SS 457.2
PZ-105-SS 458.92

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. NOT CONTOURED WITHIN BOUNDARY OF BRIDGETON LANDFILL WHERE FORMATION WAS QUARRIED
3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307.745.7729

DRAFT

FIGURE 3-13b

UPPER SALEM/ST. LOUIS FORMATION GROUNDWATER ELEVATION CONTOUR MAP APRIL 2, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-13b_201304SS_Fig3-13.mxd

M:\WTOZ\WEST LAKE\LANDFILL\GIS\MAPPING\201906_RIFS_WP\201906_DRAFTS\3-13B_20130SS_FIG3-13.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- SALEM FORMATION POTENTIOMETRIC SURFACE CONTOURS
- SALEM FORMATION GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- BRIDGETON LANDFILL BOUNDARY
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 2

AREA 1

PZ-100-SD
449.44

PZ-111-SD
427.10

PZ-104-SD
461.10

PZ-106-SD
448.29

MW-1204
457.29

430 435 440 445 450 455 460

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. NOT CONTOURED WITHIN BOUNDARY OF BRIDGETON LANDFILL WHERE FORMATION WAS QUARRIED
3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307.745.7729

DRAFT

FIGURE 3-13c
SALEM FORMATION
GROUNDWATER ELEVATION CONTOUR MAP
APRIL 2, 2013

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-13c_201304SD_Fig3-13.mxd

M:\WTOZ\WEST LAKE\LANDFILL\GIS\MAPPING\201906_RIFS_WP\201906_DRAFTS\3-13C_201304SD_FIG3-13.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- KEOKUK FORMATION POTENTIOMETRIC SURFACE CONTOURS
- KEOKUK FORMATION GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- BRIDGETON LANDFILL BOUNDARY
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 2

AREA 1

PZ-111-KS
455.96

PZ-100-KS
458.88

PZ-106-KS
459.20

PZ-104-KS
464.84

456

458

460

462

464

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Tribyl
CORPORATION
1,52 ommerce Drive
L ramie, WY 82070
ww.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-13d

KEOKUK FORMATION
GROUNDWATER ELEVATION CONTOUR MAP
APRIL 2, 2013

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-13d_201304KS_Fig3-13.mxd

M:\WT0Z\WESTLAKELANDFILL\GIS\MAPPING\201900_RIFS_WP-201908_DRAFTS\3-13D_201304KS_FIG3-13.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- SHALLOW / INTERMEDIATE ALLUVIUM POTENTIOMETRIC SURFACE CONTOURS
- DEEP ALLUVIUM POTENTIOMETRIC SURFACE CONTOURS
- SHALLOW / INTERMEDIATE ALLUVIUM GROUNDWATER FLOW DIRECTION
- DEEP ALLUVIUM GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 1

AREA 2

S-8 429.61
I-62 429.97
I-65 429.64
D-83 429.78
I-7
I-66 429.93
429.5
D-13 429.8
D-6 429.33
MW-102 429.57
S-61 429.59
I-67 429.93
S-10 429.72
D-12 429.66
I-11 429.72
I-2
PZ-207-AS 429.99
S-84 430.03
I-68 430.07
D-85 430.02
PZ-114-AS 430.32
430.0
D-93 430.61
I-59
I-9 428.76
PZ-113-AD 430.16
PZ-113-AS 430.1
S-5 430.29
D-87 419.96
D-3 430.02
I-4 430.09
PZ-112-AS 430.02
430.5
I-58
430.0
MW-103 429.6
PZ-304-AS 429.95
PZ-304-AI 429.98
I-56
PZ-305-AI 430.42
I-72
I-55
430.5
I-73 430.27
PZ-303-AS 429.6
PZ-205-AS 432.24
431.0
MW-104 430.12
D-81 430.12
PZ-302-AS 430.37
PZ-302-AI 430.36
D-89
S-53 430.08
D-90
D-91
PZ-300-AD
I-50

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. MONITORING WELL D-87 NOT CONTOURED DUE TO POSSIBLE GAUGING ERROR
3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Tribyl
CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-14a

MISSOURI RIVER ALLUVIUM GROUNDWATER ELEVATION CONTOUR MAP SEPTEMBER 30, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-14a_201309MA_Fig3-14.mxd

M:\WTOZ\WESTLAKELANDFILL\GIS\MAPPING\201906 RIFS WP\201906 DRAFTS\3-14A_201309MA_FIG3-14.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- UPPER SALEM/ST. LOUIS FORMATION POTENTIOMETRIC SURFACE CONTOURS
- UPPER SALEM/ST. LOUIS FORMATION GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- BRIDGETON LANDFILL BOUNDARY
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 1

AREA 2

PZ-113-SS 430.2

PZ-115-SS 434.76

PZ-208-SS 452.39

PZ-100-SS 451.63

PZ-101-SS 436.37

PZ-200-SS 458.9

PZ-110-SS 430.1

PZ-102R-SS 459.74

PZ-206-SS 433.09

PZ-102-SS 458.73

PZ-109-SS 430.35

PZ-201A-SS 467.85

PZ-103-SS 474.52

PZ-205-SS 434.5

PZ-202-SS 465.13

PZ-104-SS 463.49

PZ-107-SS 430.54

PZ-106-SS 450.91

PZ-203-SS 460.8

PZ-204A-SS 456.57

PZ-204-SS 456.87

PZ-116-SS 460.24

PZ-105-SS 458.42

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. NOT CONTOURED WITHIN BOUNDARY OF BRIDGETON LANDFILL WHERE FORMATION WAS QUARRIED
3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

DRAFT

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307.745.7729

FIGURE 3-14b

UPPER SALEM/ST. LOUIS FORMATION GROUNDWATER ELEVATION CONTOUR MAP SEPTEMBER 30, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-14b_201309SS_Fig3-14.mxd

M:\WTOZ\WEST LAKE LANDFILL\GIS\MAPPING\201906_RIFS_WP\201906_DRAFTS\3-14B_20130SS_FIG3-14.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- SALEM FORMATION POTENTIOMETRIC SURFACE CONTOURS
- SALEM FORMATION GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- BRIDGETON LANDFILL BOUNDARY
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 2

AREA 1

PZ-111-SD
430.95

PZ-100-SD
450.32

PZ-104-SD
461.12

PZ-106-SD
450.58

MW-1204
459.75

435 440 445 450 455 460

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. NOT CONTOURED WITHIN BOUNDARY OF BRIDGETON LANDFILL WHERE FORMATION WAS QUARRIED
3. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-14c

SALEM FORMATION GROUNDWATER ELEVATION CONTOUR MAP SEPTEMBER 30, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-14c_201309SD_Fig3-14.mxd

M:\WTOZ\WEST LAKE\LANDFILL\GIS\MAPPING\201906_RIFS_WP\201906_DRAFTS\3-14C_201309SD_FIG3-14.MXD

EXPLANATION

MONITORING WELL STATUS (2019) AND ZONE

- ACTIVE
- INACTIVE
- ABANDONED
- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION

- KEOKUK FORMATION POTENTIOMETRIC SURFACE CONTOURS
- KEOKUK FORMATION GROUNDWATER FLOW DIRECTION
- EDGE OF ALLUVIAL VALLEY
- OU-1
- BRIDGETON LANDFILL BOUNDARY
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

AREA 2

AREA 1

PZ-100-KS
459.13

PZ-111-KS
456.05

PZ-104-KS
463.50

PZ-106-KS
458.74

458

460

462

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:

1. CONTOURS GENERATED USING SURFER AND MANUALLY RENDERED
2. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N

0 600'

Tribyd
CORPORATIO
1, 52 ommerce Drive
L ram e, WY 82070
ww.trihydro.com
(P) 30 745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-14d

KEOKUK FORMATION GROUNDWATER ELEVATION CONTOUR MAP SEPTEMBER 30, 2013

WEST LAKE LANDFILL OU-3 REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 600 '	Date: 6/5/19	File: 3-14d_201309KS_Fig3-14.mxd

M:\WT0Z\WESTLAKELANDFILL\GIS\MAPPING\201900_RIFS_WP-201908_DRAFTS\3-14D_201309KS_FIG3-14.MXD

EXPLANATION

- PRELIMINARY OU-3 BOUNDARY
- OU-1
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

N

0 2,000 '

Tribydro CORPORATION
152 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 3-15

PRELIMINARY OU-3 BOUNDARY

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 2,000 '	Date: 6/4/19	File: 3-15_OU-3_Fig3-15.mxd

M:\MWTO2\WEST LAKE LANDFILL\GIS\MAPPING\20190606_RIFS_WP\20190606_DRAFTS\3-15_OU-3_FIG3-15.MXD

S-8
I-62
D-83
I-65
I-66
D-13
D-6
AREA 2
I-67
D-12
I-11
S-10
PZ-207-AS
S-84
D-85
I-68
PZ-114-AS
PZ-115-SS
D-93
S-82
I-9
D-87
PZ-113-AD
PZ-113-SS
I-4
PZ-113-AS
S-5
PZ-112-AS
D-3
AREA 1
PZ-208-SS
PZ-100-KS
PZ-100-SS
PZ-100-SD
MW-103
PZ-111-SD
PZ-111-KS
PZ-111-SS
LR-103
PZ-200-SS
PZ-101-SS
PZ-110-SS
PZ-304-AS
PZ-304-AI
PZ-305-AI
PZ-206-SS
PZ-109-SS
LR-104
PZ-102R-SS
PZ-102-SS
PZ-201A-SS
LR-105
PZ-303-AS
MW-104
I-73
PZ-103-SS
PZ-205-SS
PZ-205-AS
PZ-212-SD
PZ-212-SS
LR-100
MW-1201
PZ-202-SS
D-81
PZ-302-AS
PZ-302-AI
PZ-107-SS
PZ-211-SS
PZ-209-SD
PZ-209-SS
PZ-104-SD
PZ-211-SD
PZ-104-KS
S-53
D-89
PZ-210-SS
PZ-210-SD
PZ-106-SD
PZ-106-SS
PZ-106-KS
PZ-203-SS
PZ-204A-SS
PZ-116-SS
PZ-204-SS
MW-1204
PZ-105-SS

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

EXPLANATION

MONITORING WELL STATUS

- ACTIVE
- INACTIVE

HYDROGEOLOGIC ZONE

- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION
- EDGE OF ALLUVIUM (APPROXIMATE)

SITE FEATURES

- OU-1
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

N

0 500 '

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 5-1

CURRENT MONITORING WELL NETWORK

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 500 '	Date: 5/7/19	File: 5-1_MWNetwork_Fig5-1.mxd

I:\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKE\LANDFILL\GIS\MAPPING\20\1906_RIFS_WP\2019\06_DRAFTS\5-1_MWNETWORK_FIG5-1.MXD

NOTES:

AS - SHALLOW ALLUVIUM
AI - INTERMEDIATE ALLUVIUM
AD - DEEP ALLUVIUM
SS - UPPER SALEM/ST LOUIS FORMATION
SD - SALEM FORMATION
* - INSTALLED IF ENCOUNTERED AT LOCATION

MW-401-AS
MW-401-AI
MW-401-AD
MW-401-SS
MW-401-SD
S-8
I-62
D-83
I-65
I-66
D-13
MW-402-AS
MW-402-AI
MW-402-AD
MW-402-SS
MW-402-SD
D-6
AREA 2
I-67
MW-400-AS
MW-400-AI
MW-400-AD
MW-400-SS
MW-400-SD
D-12
I-11
S-10
PZ-207-AS
S-84
D-85
I-68
PZ-114-AS
PZ-115-SS
D-93
S-82
I-9
D-87
PZ-113-AD
PZ-113-SS
PZ-113-AS
S-5
D-3
I-4
AREA 1
PZ-112-AS
PZ-208-SS
PZ-100-SS
PZ-100-KS
PZ-100-SD
PZ-111-SD
PZ-111-KS
PZ-111-SS
MW-103
LR-103
PZ-200-SS
PZ-101-SS
PZ-110-SS
MW-304-AD
MW-304-SS
MW-304-SD
PZ-304-AS
PZ-304-AI
PZ-305-AI
PZ-206-SS
LR-104
PZ-109-SS
PZ-102R-SS
PZ-102-SS
PZ-201A-SS
I-73
LR-105
PZ-303-AS
MW-104
PZ-103-SS
PZ-212-SD
PZ-212-SS
PZ-205-SS
PZ-205-AS
MW-1201
PZ-202-SS
LR-100
D-81
PZ-302-AS
PZ-302-AI
PZ-107-SS
PZ-104-SS
PZ-211-SS
PZ-209-SS
PZ-104-SD
PZ-209-SD
PZ-211-SD
PZ-104-KS
S-53
D-89
PZ-210-SS
PZ-210-SD
PZ-106-SS
PZ-106-SD
PZ-106-KS
PZ-203-SS
PZ-204A-SS
PZ-204-SS
PZ-116-SS
MW-1204
PZ-105-SS

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

EXPLANATION

PROPOSED ON/NEAR-SITE MONITORING WELL

MONITORING WELL STATUS

ACTIVE
INACTIVE

HYDROGEOLOGIC ZONE

LEACHATE RISER
SHALLOW ALLUVIUM
INTERMEDIATE ALLUVIUM
DEEP ALLUVIUM
ST LOUIS FORMATION
SALEM FORMATION
KEOKUK FORMATION
EDGE OF ALLUVIUM (APPROXIMATE)

SITE FEATURES

OU-1
LANDFILL BOUNDARY
SUPERFUND SITE BOUNDARY

N
0
500 '

Trihydro Corporation
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

DRAFT

FIGURE 5-2

PROPOSED ON-SITE AND NEAR-SITE MONITORING WELLS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 500 '	Date: 5/7/19	File: 5-2_On-SiteMW_Fig5-2.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILL\GIS\MAPPING\201906_RIFS_WP\201906_DRAFTSIS-2_ON-SITEMW_FIG5-2.MXD

NOTES:

AS - SHALLOW ALLUVIUM
AI - INTERMEDIATE ALLUVIUM
AD - DEEP ALLUVIUM
SS - UPPER SALEM/ST LOUIS FORMATION
SD - SALEM FORMATION
* - INSTALLED IF ENCOUNTERED AT LOCATION

MW-502-AS
MW-502-AI
MW-502-AD
MW-502-SS*
MW-502-SD

MW-501-AS
MW-501-AI
MW-501-AD
MW-501-SS*
MW-501-SD

MW-500-AS
MW-500-AI
MW-500-AD
MW-500-SS*
MW-500-SD

AREA 2
AREA 1

S-8 D-83 I-62 I-65 I-66 D-13 D-6 I-67 D-12 I-11 S-10 PZ-207-AS D-85 I-68 S-84 PZ-114-AS PZ-115-SS PZ-208-SS D-93 S-82 I-9 PZ-113-AD D-87 I-4 S-5 D-3 PZ-112-AS PZ-100-SS PZ-100-KS PZ-100-SD MW-103 LR-103 PZ-111-SD PZ-111-SS PZ-111-KS PZ-200-SS PZ-110-SS PZ-101-SS PZ-102R-SS PZ-102-SS PZ-304-AS PZ-304-AI PZ-305-AI LR-104 PZ-109-SS PZ-206-SS PZ-201A-SS I-73 LR-105 PZ-303-AS MW-104 PZ-205-AS PZ-205-SS PZ-103-SS PZ-212-SS PZ-212-SD PZ-202-SS D-81 LR-100 PZ-107-SS MW-1201 PZ-211-SD PZ-209-SS PZ-209-SD PZ-302-AI PZ-302-AS PZ-104-SD PZ-104-KS PZ-211-SS S-53 D-89 PZ-106-SD PZ-210-SD PZ-106-SS PZ-210-SS PZ-106-KS PZ-204-SS PZ-203-SS PZ-204A-SS MW-1204 PZ-116-SS PZ-105-SS

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

EXPLANATION

PROPOSED OFF-SITE MONITORING WELL

MONITORING WELL STATUS

ACTIVE
INACTIVE

HYDROGEOLOGIC ZONE

LEACHATE RISER
SHALLOW ALLUVIUM
INTERMEDIATE ALLUVIUM
DEEP ALLUVIUM
ST LOUIS FORMATION
SALEM FORMATION
KEOKUK FORMATION
EDGE OF ALLUVIUM (APPROXIMATE)

SITE FEATURES

OU-1
LANDFILL BOUNDARY
SUPERFUND SITE BOUNDARY

N

0 1,000'

Trihydro CORPORATION
[illegible]52 Commerce Drive
L[illegible]ramie, WY 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

DRAFT

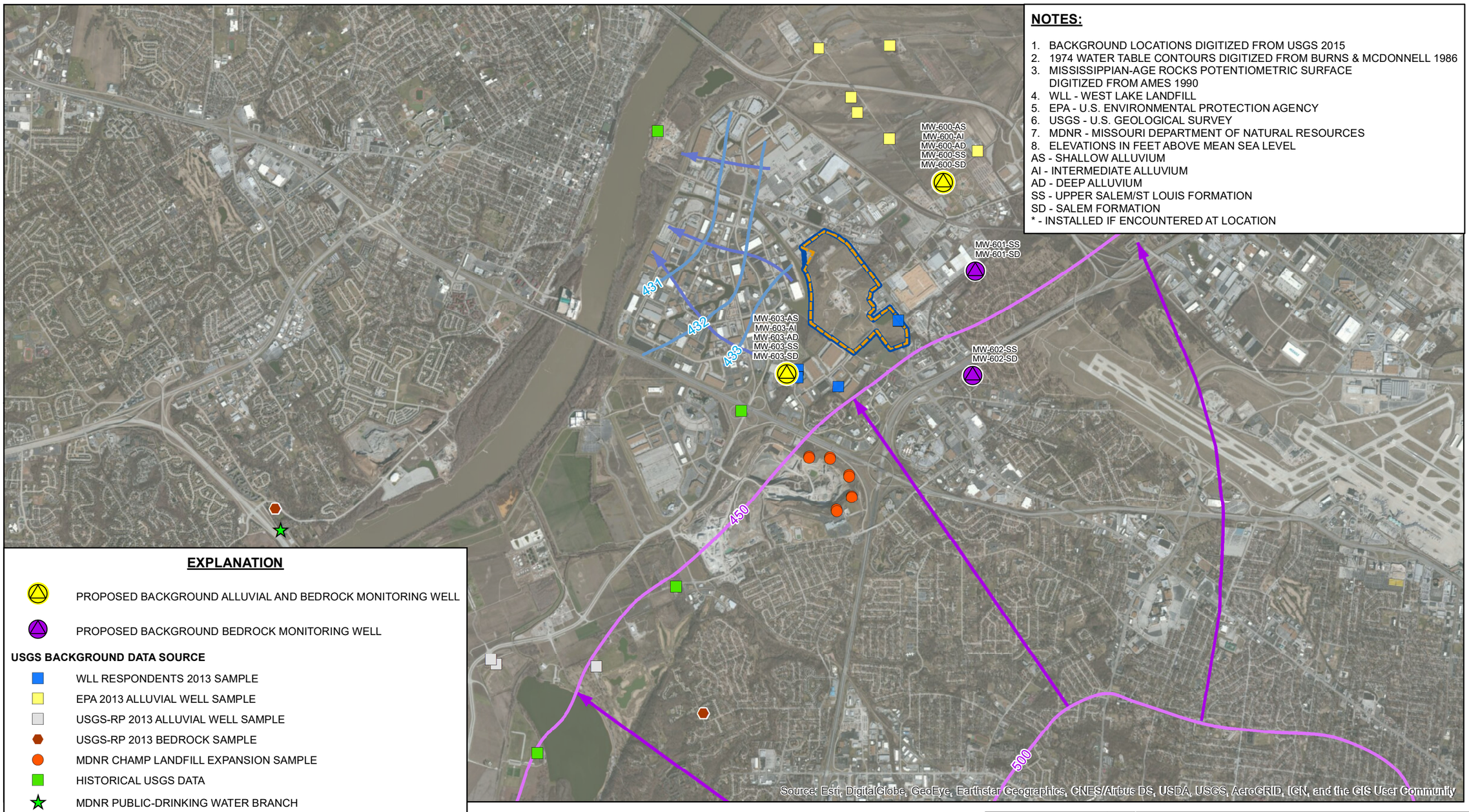
FIGURE 5-3

PROPOSED OFF-SITE MONITORING WELLS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 1,000 '	Date: 5/7/19	File: 5-3_Off-SiteMW_Fig5-3.mxd

I:\TRIHYDRO.COM\CLIENTS\WTO2\WESTLAKELANDFILL\GIS\MAPPING\201906 AFS_WP201906 DRAFTS\5-3_OFF-SITEMW_FIG5-3.MXD



NOTES:

1. BACKGROUND LOCATIONS DIGITIZED FROM USGS 2015
2. 1974 WATER TABLE CONTOURS DIGITIZED FROM BURNS & MCDONNELL 1986
3. MISSISSIPPIAN-AGE ROCKS POTENTIOMETRIC SURFACE DIGITIZED FROM AMES 1990
4. WLL - WEST LAKE LANDFILL
5. EPA - U.S. ENVIRONMENTAL PROTECTION AGENCY
6. USGS - U.S. GEOLOGICAL SURVEY
7. MDNR - MISSOURI DEPARTMENT OF NATURAL RESOURCES
8. ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

AS - SHALLOW ALLUVIUM
AI - INTERMEDIATE ALLUVIUM
AD - DEEP ALLUVIUM
SS - UPPER SALEM/ST LOUIS FORMATION
SD - SALEM FORMATION
* - INSTALLED IF ENCOUNTERED AT LOCATION

EXPLANATION

- PROPOSED BACKGROUND ALLUVIAL AND BEDROCK MONITORING WELL
- PROPOSED BACKGROUND BEDROCK MONITORING WELL

USGS BACKGROUND DATA SOURCE

- WLL RESPONDENTS 2013 SAMPLE
- EPA 2013 ALLUVIAL WELL SAMPLE
- USGS-RP 2013 ALLUVIAL WELL SAMPLE
- USGS-RP 2013 BEDROCK SAMPLE
- MDNR CHAMP LANDFILL EXPANSION SAMPLE
- HISTORICAL USGS DATA
- MDNR PUBLIC-DRINKING WATER BRANCH
- 1974 ALLUVIAL WATER TABLE
- 1974 ALLUVIAL FLOW DIRECTION
- MISSISSIPPIAN-AGE ROCKS POTENTIOMETRIC SURFACE CONTOUR
- MISSISSIPPIAN-AGE ROCKS FLOW DIRECTION
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

N

0 4,000'

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307.745.7729

DRAFT

FIGURE 5-4

PROPOSED BACKGROUND MONITORING WELLS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 4,000 '	Date: 5/7/19	File: 5-4_BGMW_Fig5-4.mxd

\\TRIHYDRO.COM\CLIENT\SWT\OZW\WESTLAKELANDFILL\GIS\MAPPING\201906 RFS_WP\201906_DRAFTS\5-4 BGMW_FIG5-4.MXD

NOTES:

AS - SHALLOW ALLUVIUM
AI - INTERMEDIATE ALLUVIUM
AD - DEEP ALLUVIUM
SS - UPPER SALEM/ST LOUIS FORMATION
SD - SALEM FORMATION
* - INSTALLED IF ENCOUNTERED AT LOCATION

MW-600-AS
MW-600-AI
MW-600-AD
MW-600-SS
MW-600-SD
SG-600
MW-502-AS
MW-502-AI
MW-502-AD
MW-502-SS*
MW-502-SD
MW-401-AS
MW-401-AI
MW-401-AD
MW-401-SS
MW-401-SD
SG-400
S-8
I-62
I-65
D-83
I-66
D-13
MW-501-AS
MW-501-AI
MW-501-AD
MW-501-SS*
MW-501-SD
AREA 2
MW-402-AS
MW-402-AI
MW-402-AD
MW-402-SS
MW-402-SD
I-67
D-6
MW-400-AS
MW-400-AI
MW-400-AD
MW-400-SS
MW-400-SD
D-12
I-11
S-10
PZ-207-AS
D-85
S-84
I-68
PZ-114-AS
SG-500
D-93
I-9
S-82
PZ-113-AD
PZ-113-SS
PZ-115-SS
D-87
I-4
PZ-208-SS
AREA 1
PZ-112-AS
D-3
S-5
PZ-100-SS
PZ-100-KS
PZ-111-SD
PZ-111-KS
PZ-100-SD
MW-500-AS
MW-500-AI
MW-500-AD
MW-500-SS*
MW-500-SD
MW-103
LR-103
PZ-111-SS
PZ-110-SS
PZ-200-SS
MW-304-AD
MW-304-SS
MW-304-SD
PZ-304-AS
PZ-305-AI
PZ-101-SS
LR-104
PZ-102R-SS
PZ-102-SS
PZ-109-SS
PZ-201A-SS
PZ-304-AI
LR-105
I-73
PZ-303-AS
PZ-103-SS
PZ-212-SS
PZ-205-AS
PZ-205-SS
PZ-212-SD
MW-104
PZ-202-SS
SG-501
D-81
PZ-107-SS
MW-1201
PZ-209-SS
LR-100
PZ-104-SD
PZ-209-SD
PZ-302-AI
D-89
PZ-104-KS
PZ-211-SS
S-53
PZ-106-SS
PZ-210-SD
PZ-106-SD
PZ-210-SS
PZ-106-KS
PZ-116-SS
PZ-203-SS
PZ-204A-SS
PZ-204-SS
MW-1204
PZ-105-SS
MW-601-SS
MW-601-SD
MW-603-AS
MW-603-AI
MW-603-AD
MW-603-SS
MW-603-SD
MW-602-SS
MW-602-SD

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

EXPLANATION

- PROPOSED MONITORING WELL
- PROPOSED STAFF GAUGE

MONITORING WELL STATUS

- PHASE I ACTIVE

HYDROGEOLOGIC ZONE

- LEACHATE RISER
- SHALLOW ALLUVIUM
- INTERMEDIATE ALLUVIUM
- DEEP ALLUVIUM
- ST LOUIS FORMATION
- SALEM FORMATION
- KEOKUK FORMATION
- EDGE OF ALLUVIUM (APPROXIMATE)

SITE FEATURES

- OU-1
- LANDFILL BOUNDARY
- SUPERFUND SITE BOUNDARY

N

0 1,200'

DRAFT

Trihydro CORPORATION
152 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307.745.7474 (F) 307/745.7729

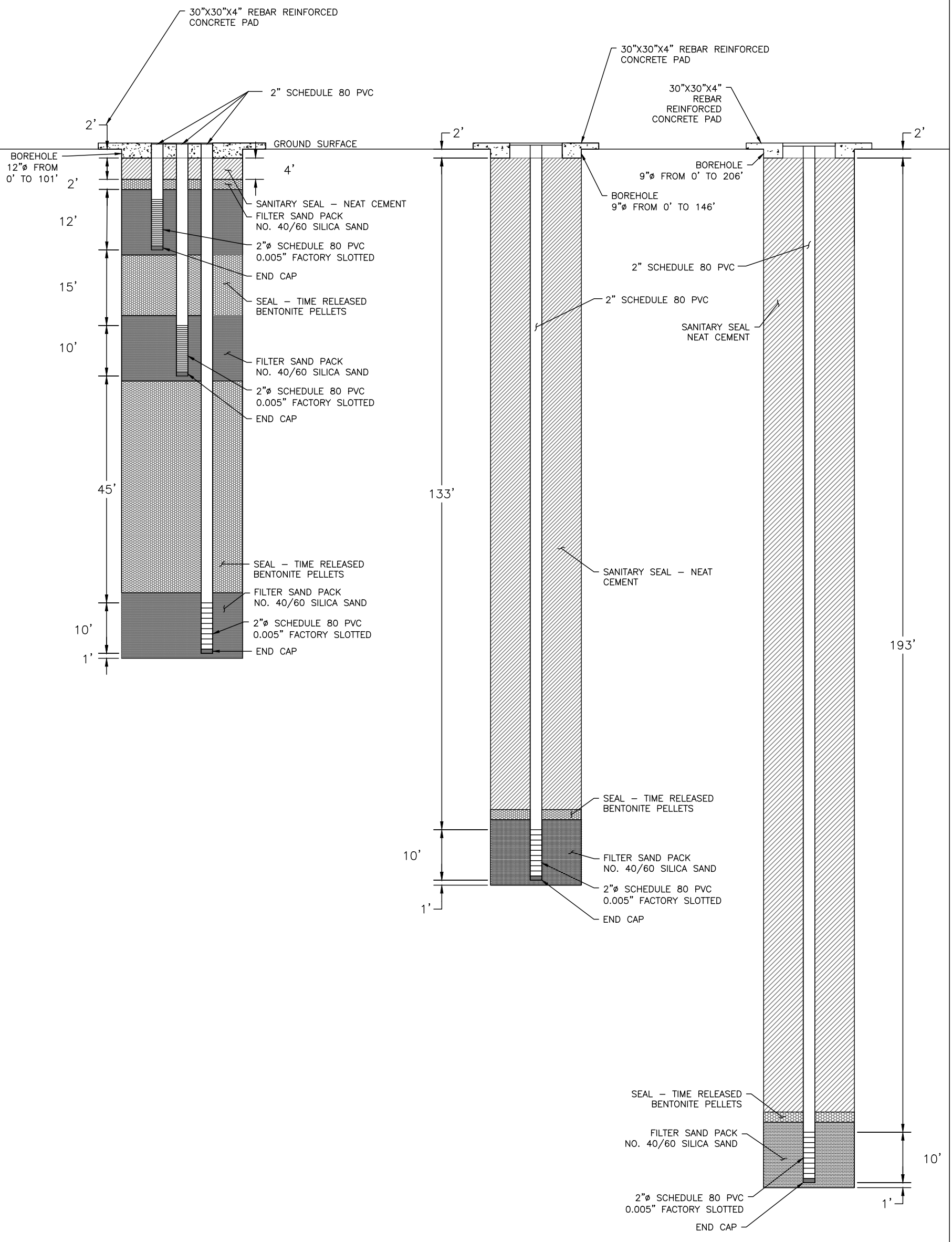
FIGURE 5-5

PROPOSED MONITORING WELL NETWORK

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Drawn By: MGS	Checked By: SLL	Scale: 1 " = 1,200 '	Date: 5/7/19	File: 5-5_MWNetwork_Fig5-5.mxd

\\TRIHYDRO.COM\CLIENTS\WTOZ\WESTLAKELANDFILLGIS\MAPPING\091906_APS_WP\201906_DRAFTS\5-5_MWNETWORK_FIG5-5.MXD



NOTES:

1. DRAWING IS SCALED VERTICALLY TO SHOW DEPTH. HORIZONTAL SCALE IS ADJUSTED TO SHOW FEATURES AND IS INDEPENDENT OF VERTICAL SCALE.
2. BGS = BELOW GROUND SURFACE
3. ACTUAL INTERVALS MAY VARY BASED ON FIELD CONDITIONS.
4. WELL CLUSTERS MAY BE COMPLETED AS NESTED WELLS BASED ON SPATIAL LIMITATIONS.

Trihydro CORPORATION
1252 Commerce Drive
Laramie, Wyoming 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

DRAFT

FIGURE 5-6

EXAMPLE MONITORING WELL CONSTRUCTION DETAILS

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Drawn By: DMB	Checked By: MGS	Scale: NONE	Date: 4/5/2019	File: 63N_MONWELLDETAIL201903

M:\WTOZ\WESTLAKELANDFILL\PROJECTDOCS\WESTLAKELANDFILLOU3\CADD\SINGLEFIGURES\63N_MONWELLDETAIL201903

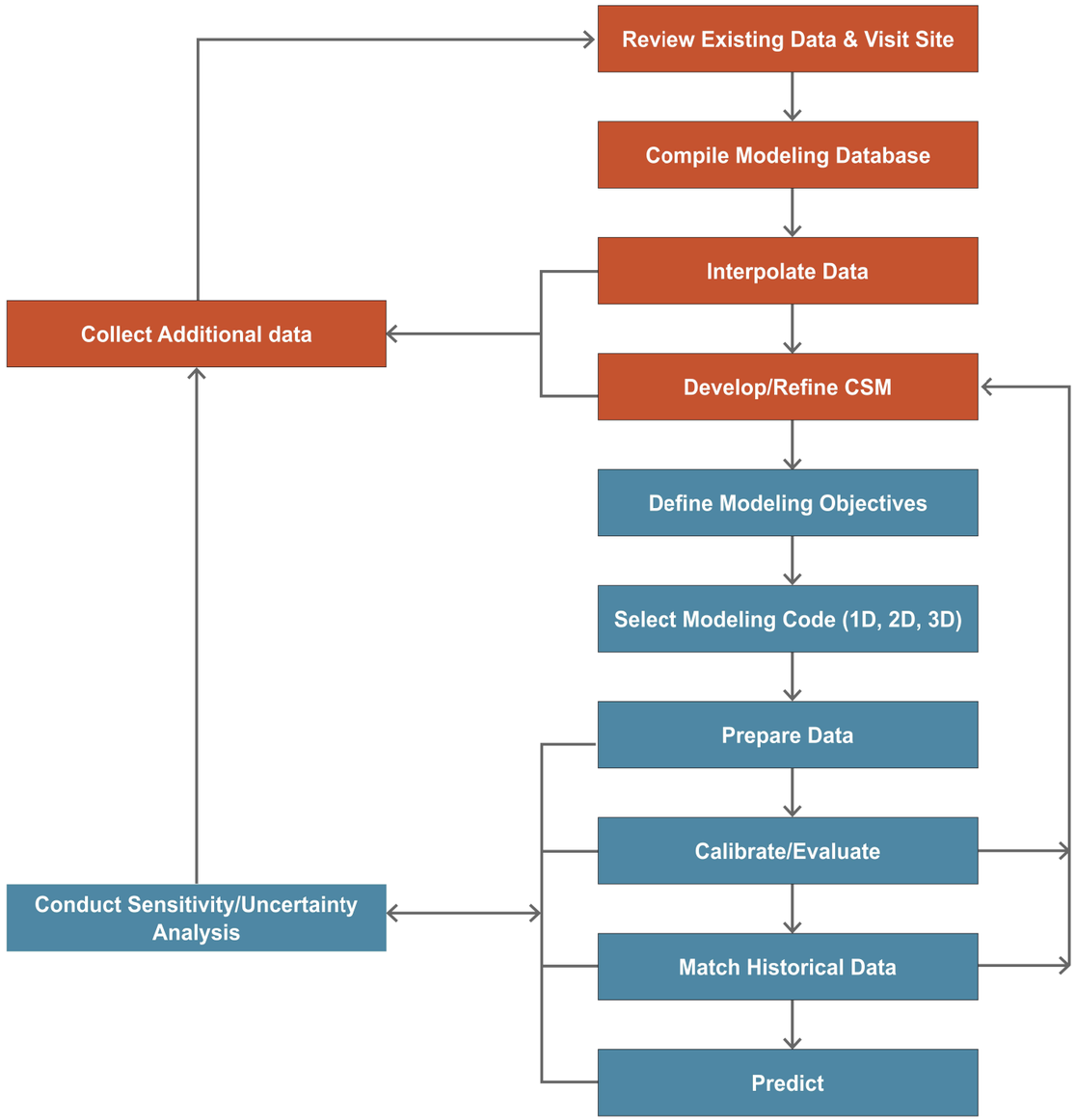


FIGURE 5-7

GROUNDWATER MODELING PROCESS FLOW DIAGRAM

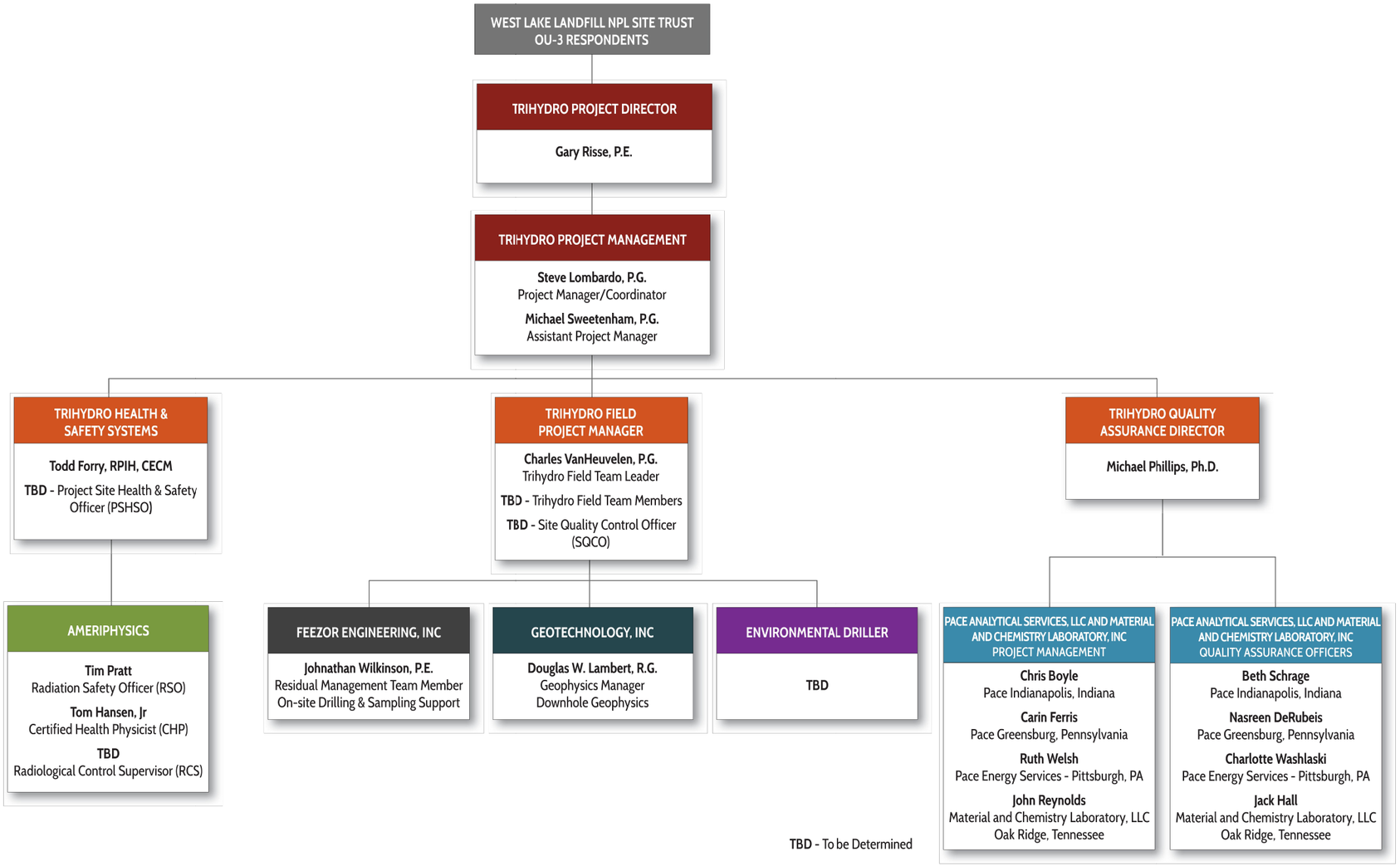
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN

Trihydro CORPORATION
1252 Commerce Drive
Laramie, Wyoming 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

Drawn By: REP	Checked By: MH	Scale: NONE	Date: 5/9/19	File: 63N-RIFSWP_FLOWCHART2_20190509

DRAFT

M:\WTOZ\WESTLAKELANDFILL\PROJECTDOCS\WESTLAKELANDFILLOU3\CADD\20190606_RIFS_WP\63N-RIFSWP_FLOWCHART2_20190509



TBD - To be Determined

DRAFT

FIGURE 10-1

PROJECT ORGANIZATIONAL CHART

WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
WORK PLAN

Trihydro CORPORATION
1252 Commerce Drive
Laramie, Wyoming 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

Drawn By: REP	Checked By: MH	Scale: NONE	Date: 5/14/19	File: 63N-RIFSWP_ORGCHART_20190509

M:\WTOZ\WESTLAKELANDFILL\PROJECTDOCS\WESTLAKELANDFILLOU3\CADD\201906_RIFS_WP\63N-RIFSWP_ORGCHART_20190509

APPENDIX A

AERIAL PHOTOGRAPHY

DRAFT

OU-1 Area 2

St. Charles Rock Road

OU-1 Area 1

7/30/1941
West Lake Landfill
St. Louis, MO
Photo Source: NARA

375 0 375 Feet

N

DRAFT

OU-1 Area 2

OU-1 Area 1

St. Charles Rock Road

7/7/1947

West Lake Landfill
St. Louis, MO

Photo Source: NARA

375 0 375 Feet

N

DRAFT

8/13&14/1953
West Lake Landfill
St. Louis, MO
Photo Source: NARA

375 0 375 Feet

N

WESTLAKE LANDFILL SITE
BRIDGETON, MISSOURI
PIC 89787
DATE FLOWN: SEPTEMBER 7, 1953
SOURCE: ASCS FRAME NO. TQ-2K-91
APPROX. SCALE 1 inch = 360 feet
N
EPA Environmental Monitoring Systems Laboratory-Las Vegas

WESTLAKE LANDFILL SITE
BRIDGETON, MISSOURI
PIC 89787
DATE FLOWN: MAY 13, 1958
SOURCE: ASCS FRAME NO. TQ-2T-50
APPROX. SCALE 1 inch = 350 feet

EPA Environmental Monitoring Systems Laboratory, Las Vegas

DRAFT

6/3/1960
West Lake Landfill
St. Louis, MO
Photo Source: NOS

375 0 375 Feet

N

DRAFT

6/14/1962
West Lake Landfill
St. Louis, MO
Photo Source: NARA

375 0 375 Feet

N

DRAFT

4/10/1964
West Lake Landfill
St. Louis, MO
Photo Source: Surdex

375 0 375 Feet

N

DRAFT

3/27/1965
West Lake Landfill
St. Louis, MO
Photo Source: USGS-Corona

375 0 375 Feet

N

DRAFT

7/11/1965
West Lake Landfill
St. Louis, MO
Photo Source: NOS

375 0 375 Feet

N

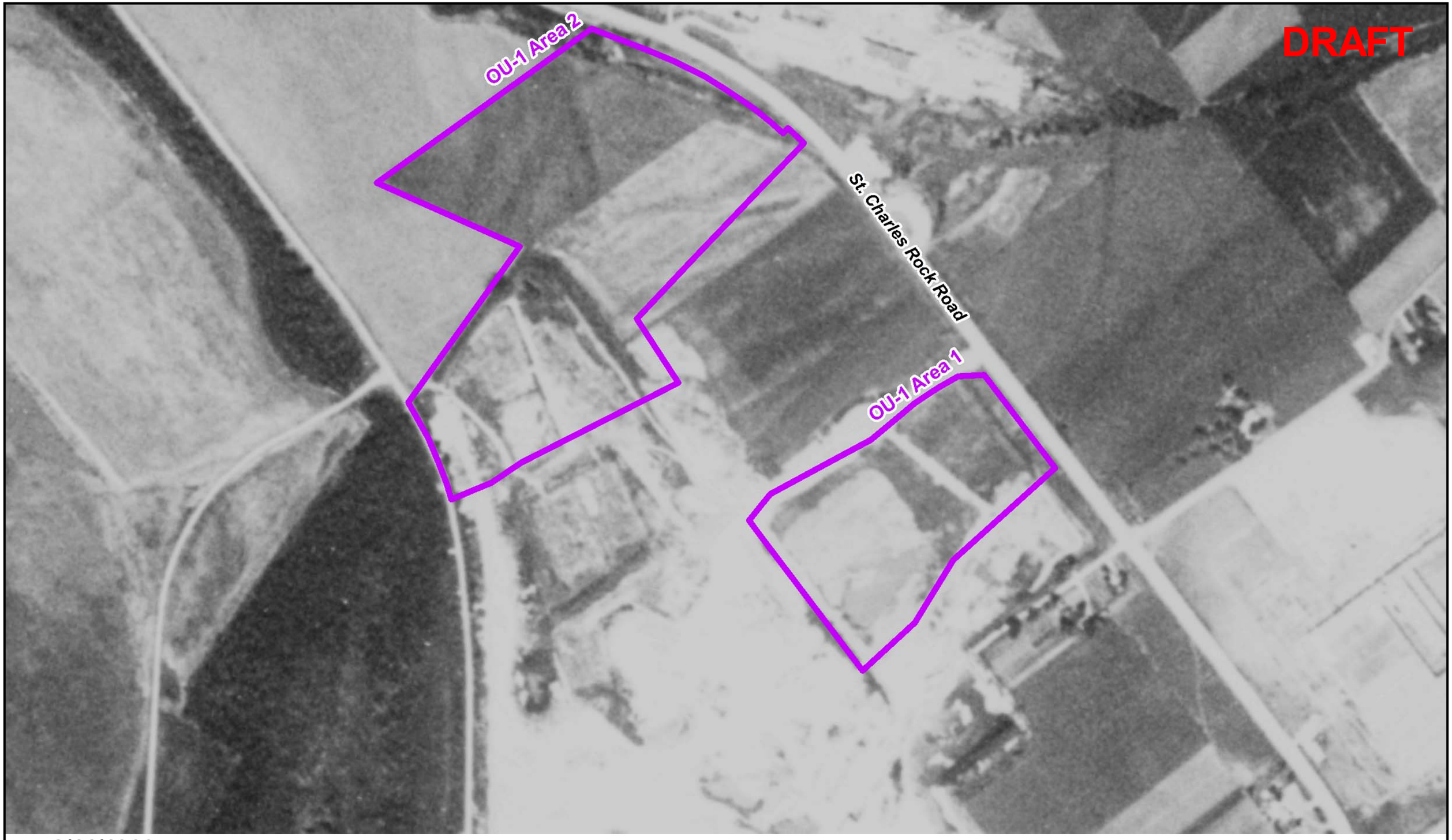
DRAFT

10/10/1965
West Lake Landfill
St. Louis, MO
Photo Source: USDA

375 0 375 Feet

N

DRAFT

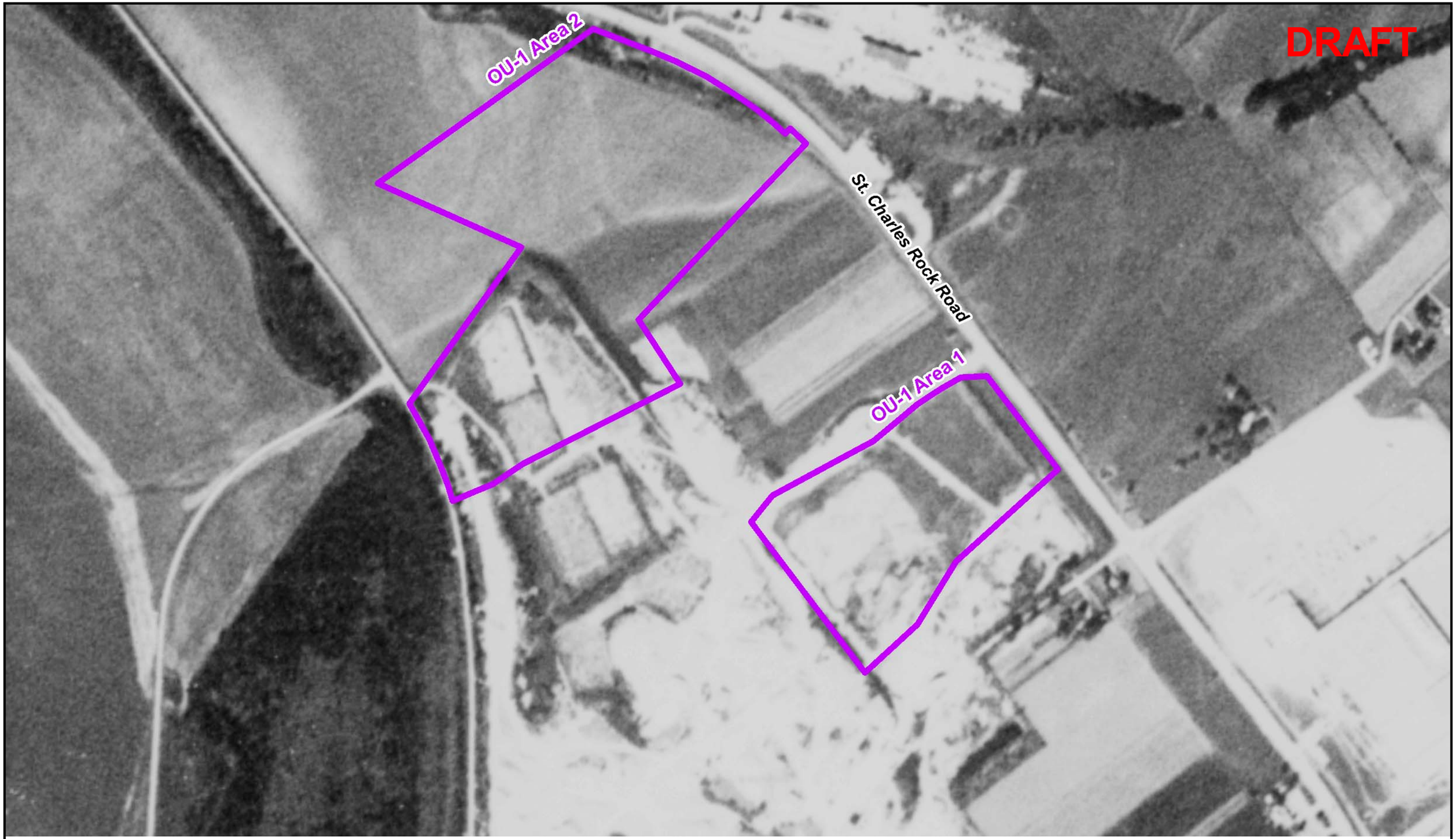


8/11/1966
West Lake Landfill
St. Louis, MO
Photo Source: USGS-Corona

375 0 375 Feet

N

DRAFT

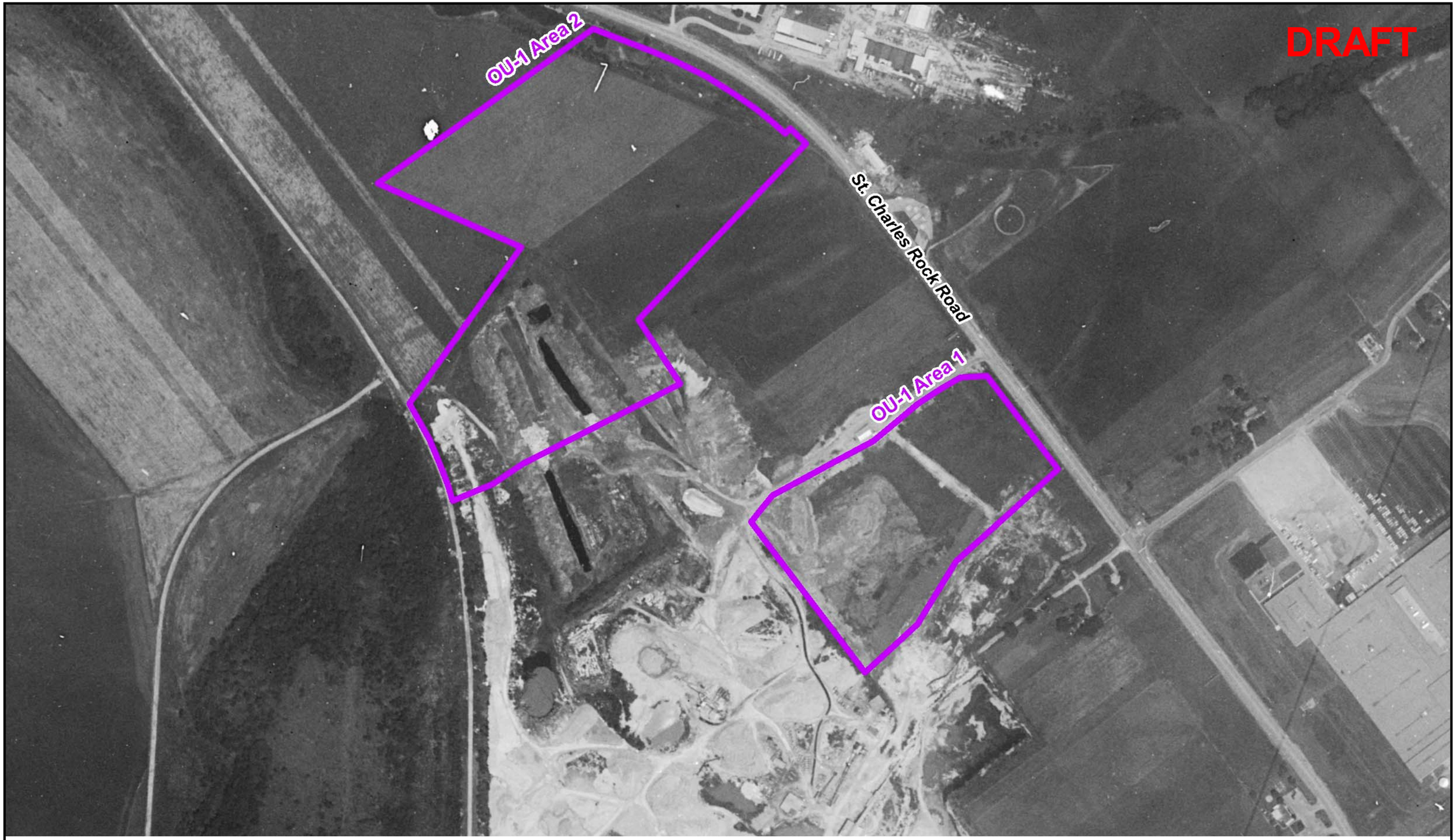


9/23/1966
West Lake Landfill
St. Louis, MO
Photo Source: USGS-Corona

375 0 375 Feet

N

DRAFT



6/11/1967
West Lake Landfill
St. Louis, MO
Photo Source: USGS-KH7

375 0 375 Feet

N

DRAFT

3/7/1968
West Lake Landfill
St. Louis, MO
Photo Source: USGS

375 0 375 Feet

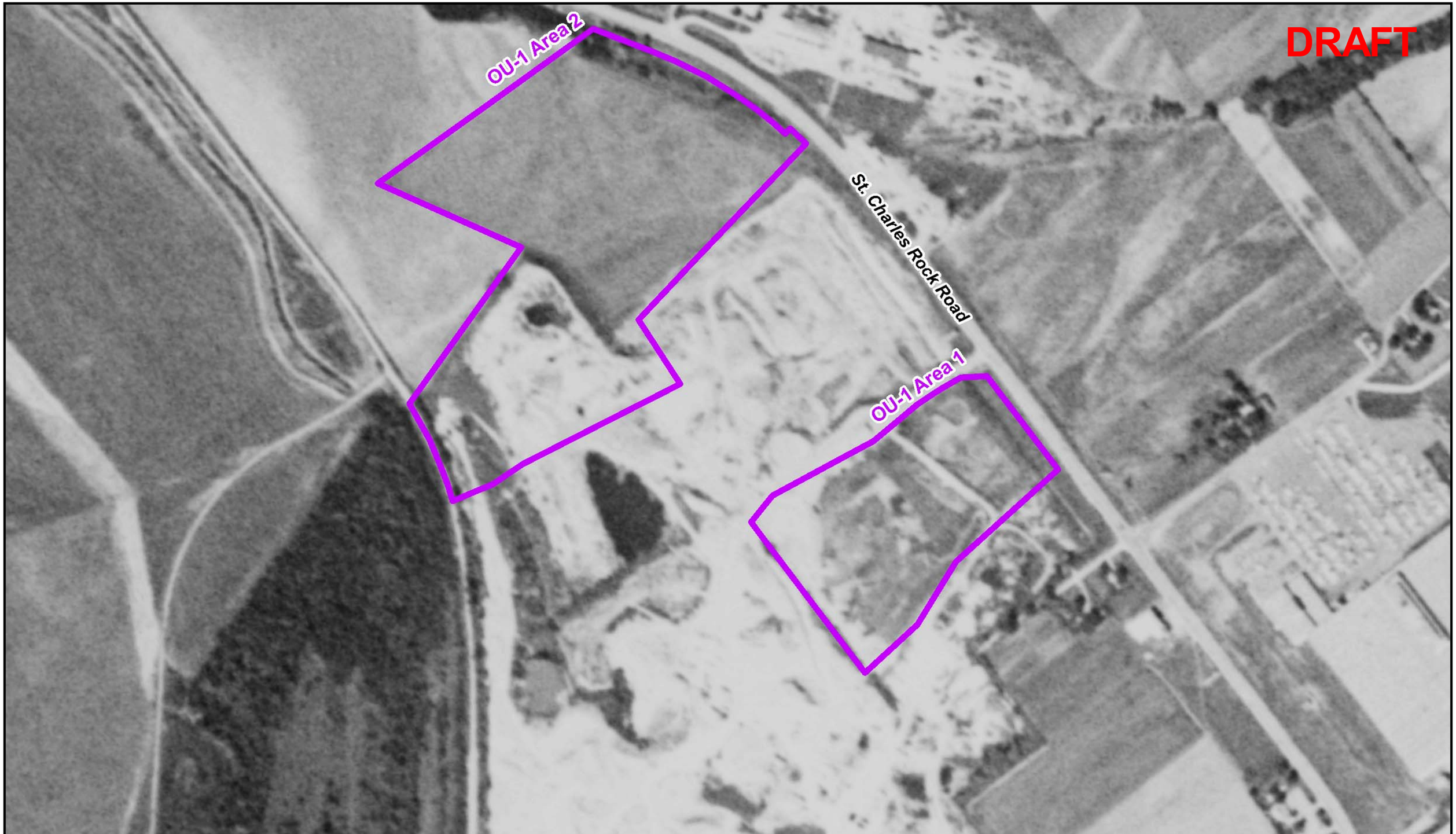
N

DRAFT

3/17/1968
West Lake Landfill
St. Louis, MO
Photo Source: USGS

375 0 375 Feet

N



9/30/1968
West Lake Landfill
St. Louis, MO
Photo Source: USGS-Corona

375 0 375 Feet

N

DRAFT

9/19/1969
West Lake Landfill
St. Louis, MO
Photo Source: NOS

375 0 375 Feet

N

DRAFT

11/24/1969
West Lake Landfill
St. Louis, MO
Photo Source: MODOT

375 0 375 Feet

N

DRAFT

OU-1 Area 2

OU-1 Area 1

St. Charles Rock Road

3/12/1971
West Lake Landfill
St. Louis, MO
Photo Source: Surdex

375 0 375 Feet

N

DRAFT

5/4/1971
West Lake Landfill
St. Louis, MO
Photo Source: USDA

375 0 375 Feet

N

DRAFT

10/5/1971
West Lake Landfill
St. Louis, MO
Photo Source: USDA

375 0 375 Feet

N

DRAFT

4/26/1972
West Lake Landfill
St. Louis, MO
Photo Source: NOS

375 0 375 Feet

N

DRAFT

8/29/1972
West Lake Landfill
St. Louis, MO
Photo Source: MODOT

375 0 375 Feet

N

DRAFT

9/11/1972
West Lake Landfill
St. Louis, MO
Photo Source: USGS

375 0 375 Feet

N

DRAFT

5/4/1973
West Lake Landfill
St. Louis, MO
Photo Source: Surdex

375 0 375 Feet

N

DRAFT

9/19/1973
West Lake Landfill
St. Louis, MO
Photo Source: Photomaps

375 0 375 Feet

N

DRAFT

5/6/1974
West Lake Landfill
St. Louis, MO
Photo Source: USGS

375 0 375 Feet

N

DRAFT

4/6/1975
West Lake Landfill
St. Louis, MO
Photo Source: Surdex

375 0 375 Feet

N

DRAFT

4/12/1976
West Lake Landfill
St. Louis, MO
Photo Source: MODOT

375 0 375 Feet

N

DRAFT

5/9/1976
West Lake Landfill
St. Louis, MO
Photo Source: NOS

375 0 375 Feet

N

DRAFT

8/20/1978
West Lake Landfill
St. Louis, MO
Photo Source: USGS

375 0 375 Feet

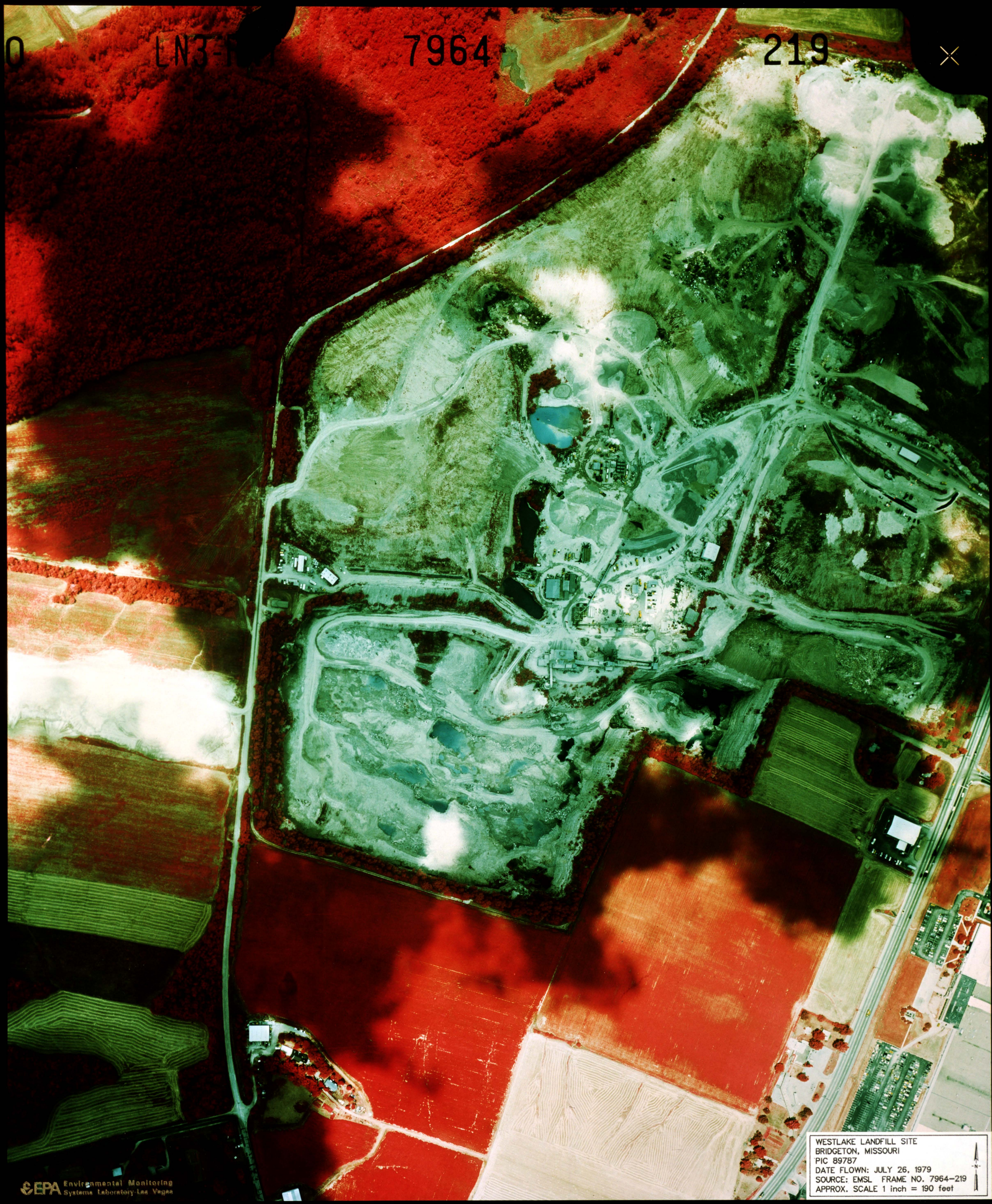
N

DRAFT

5/25/1979
West Lake Landfill
St. Louis, MO
Photo Source: NOS

375 0 375 Feet

N


7964
219
WESTLAKE LANDFILL SITE
BRIDGETON, MISSOURI
PIC 89787
DATE FLOWN: JULY 26, 1979
SOURCE: EMSL FRAME NO. 7964-219
APPROX. SCALE 1 inch = 190 feet
N
EPA Environmental Monitoring
Systems Laboratory-Las Vegas

DRAFT

12/2/1979
West Lake Landfill
St. Louis, MO
Photo Source: USGS

375 0 375 Feet

N

DRAFT

10/8/1980
West Lake Landfill
St. Louis, MO
Photo Source: USDA

375 0 375 Feet

N

DRAFT

6/17/1981
West Lake Landfill
St. Louis, MO
Photo Source: NOS

375 0 375 Feet

N

WESTLAKE LANDFILL SITE
BRIDGETON, MISSOURI
PIC 89787
DATE FLOWN: MARCH 7, 1982
SOURCE: EMSL FRAME NO. 82040-211
APPROX. SCALE 1 inch = 290 feet

-N-

EPA Environmental Monitoring Systems Laboratory-Las Vegas

DRAFT

5/14/1984
West Lake Landfill
St. Louis, MO
Photo Source: MODOT

375 0 375 Feet

N

DRAFT

4/16/1985
West Lake Landfill
St. Louis, MO
Photo Source: USGS

375 0 375 Feet

N

WESTLAKE LANDFILL SITE
BRIDGETON, MISSOURI
PIC 89787
DATE FLOWN: APRIL 16, 1985
SOURCE: EROS FRAME NO. 2-131
APPROX. SCALE 1 inch = 180 feet
(1 OF 2)

EPA Environmental Monitoring Systems Laboratory Las Vegas

WESTLAKE LANDFILL SITE
BRIDGETON, MISSOURI
PIC 89787
DATE FLOWN: APRIL 16, 1985
SOURCE: EROS FRAME NO. 2-83
APPROX. SCALE 1 inch = 180 feet
(2 OF 2)

N

EPA Environmental Monitoring Systems Laboratory

DRAFT

5/9/1985
West Lake Landfill
St. Louis, MO
Photo Source: NOS

375 0 375 Feet

N

3-28-93 800
L 10 1250-195

DRAFT

10/23/1993
West Lake Landfill
St. Louis, MO
Photo Source: USDA

375 0 375 Feet

N

2-25-95 MSD 1: 15, 000
ROLL-1338
13-24

2-24-97 1: 15, 000
1391 13-22

2-24-98 1: 15, 000
1411 13-22

3-1-99
1: 15, 000
1432
13-22

3-17-00 1: 15, 000
1451 13-32

2-10-01 1: 15, 000 MSD 1476 13-22

ENVIRONMENTAL RISK INFORMATION SERVICES

HISTORICAL AERIALS

Project Property:	*West Lake Landfill* *13570 Saint Charles Rock Road* *Bridgeton, MO 63044*
Project No:	*63N-001-001*
Requested By:	*Trihydro Corporation*
Order No:	*20190301185*
Date Completed:	*March 4, 2019*

Environmental Risk Information Services
A division of Glacier Media Inc.
1.866.517.5204 | info@erisinfo.com | erisinfo.com

Search Results Summary

Year	Source	Scale	Comment
2018	**NAIP** - National Agriculture Information Program	1"=700'	
2016	**NAIP** - National Agriculture Information Program	1"=700'	
2014	**NAIP** - National Agriculture Information Program	1"=700'	
2009	**NAIP** - National Agriculture Information Program	1"=700'	
2007	**NAIP** - National Agriculture Information Program	1"=700'	
2004	**NAIP** - National Agriculture Information Program	1"=700'	
1996	**USGS** - US Geological Survey	1"=700'	
1990	**USGS** - US Geological Survey	1"=700'	
1985	**USGS** - US Geological Survey	1"=700'	
1979	**USGS** - US Geological Survey	1"=700'	
1968	**USGS** - US Geological Survey	1"=700'	
1955	**ASCS** - Agriculture and Soil Conservation Service	1"=700'	
1937	**ASCS** - Agriculture and Soil Conservation Service	1"=700'	

Year: **2018**
Source: **NAIP**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Year: **2016**
Source: **NAIP**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Year: **2014**
Source: **NAIP**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Year: **2009**
Source: **NAIP**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Year: **2007**
Source: **NAIP**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Order No: 20190301185

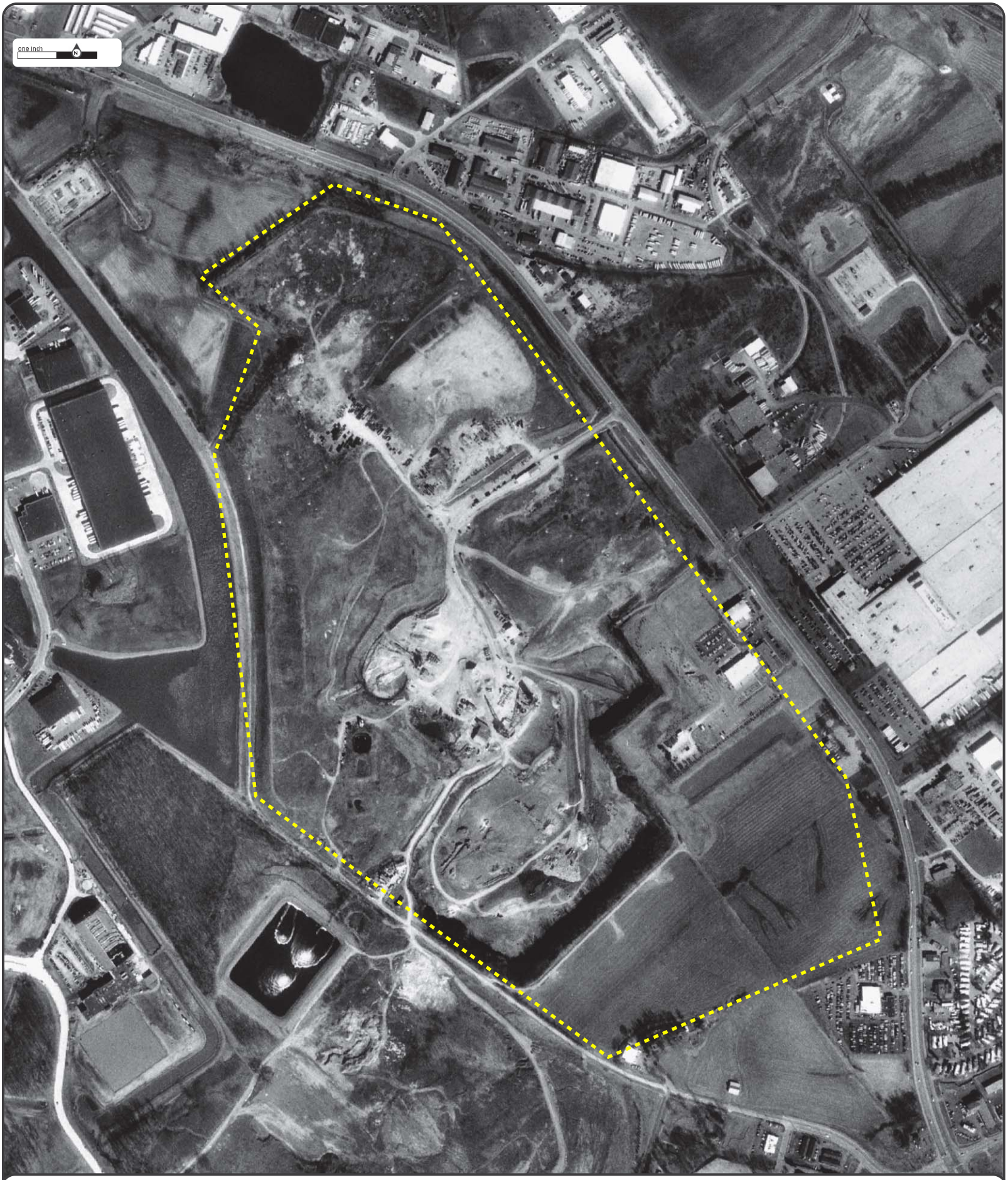
Year: **2004**
Source: **NAIP**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



Year: **1996**
Source: **USGS**
Scale: **1" to 700'**
Comments:

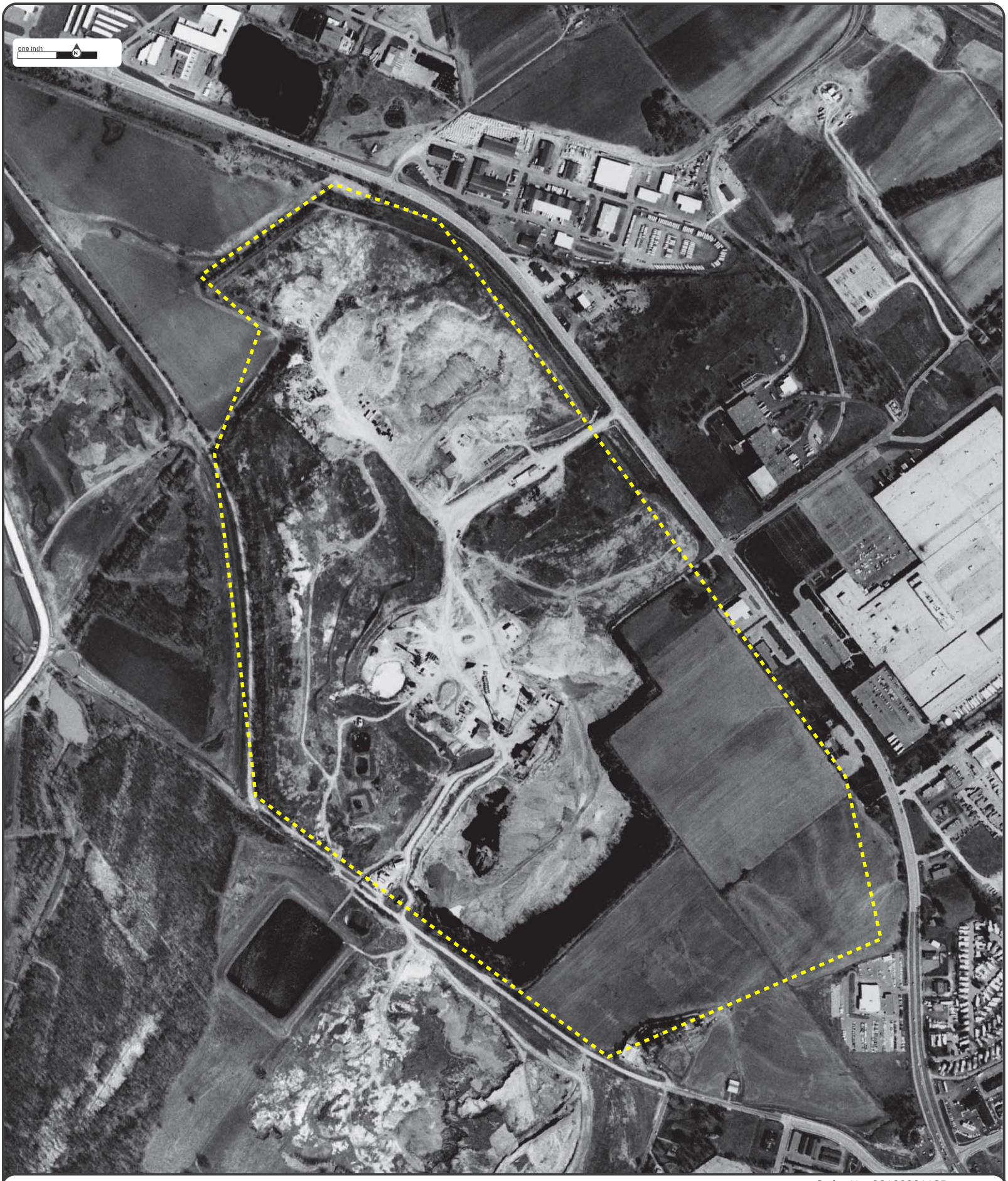
Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



Year: **1990**
Source: **USGS**
Scale: **1" to 700'**
Comments:

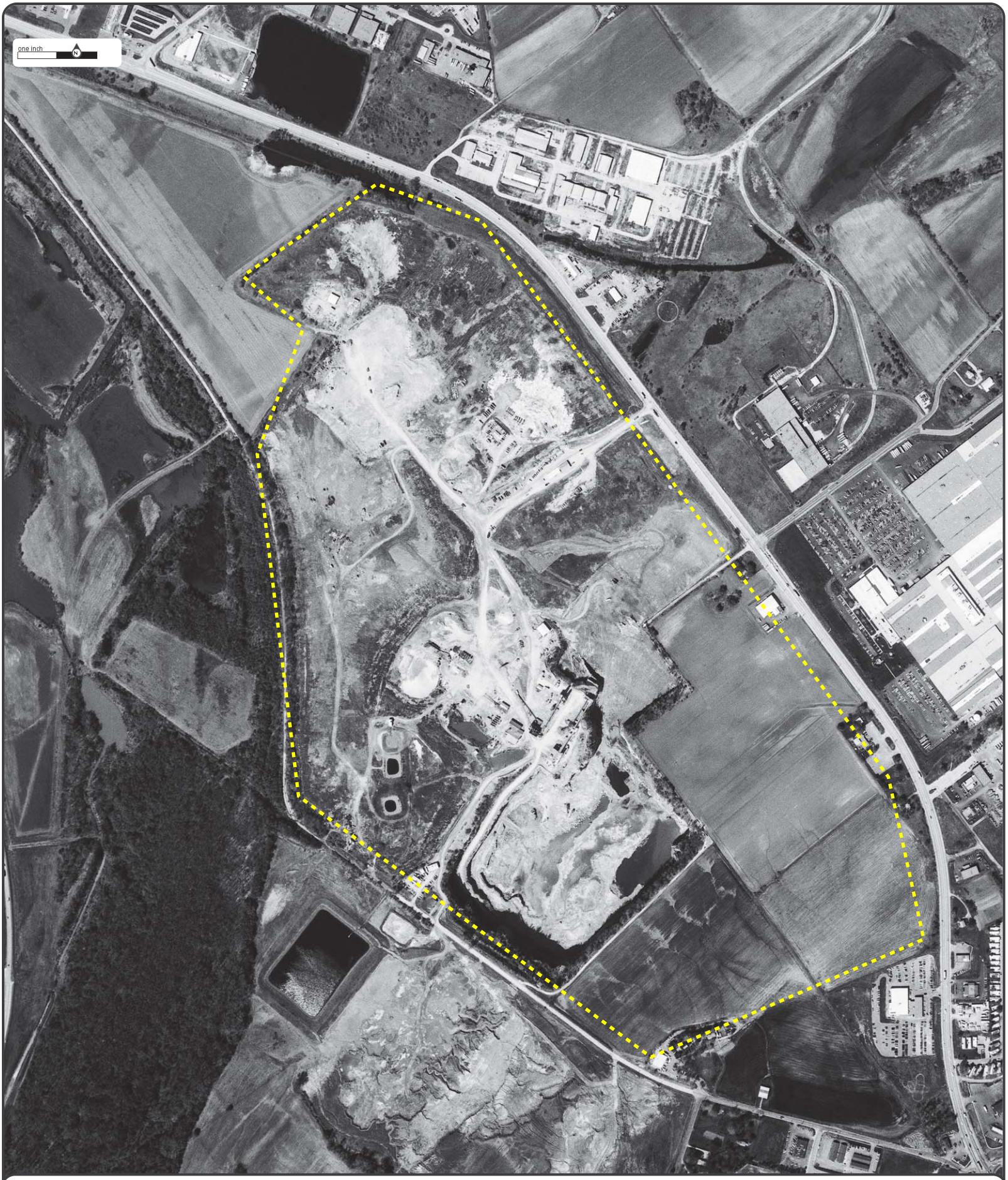
Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



Order No: 20190301185

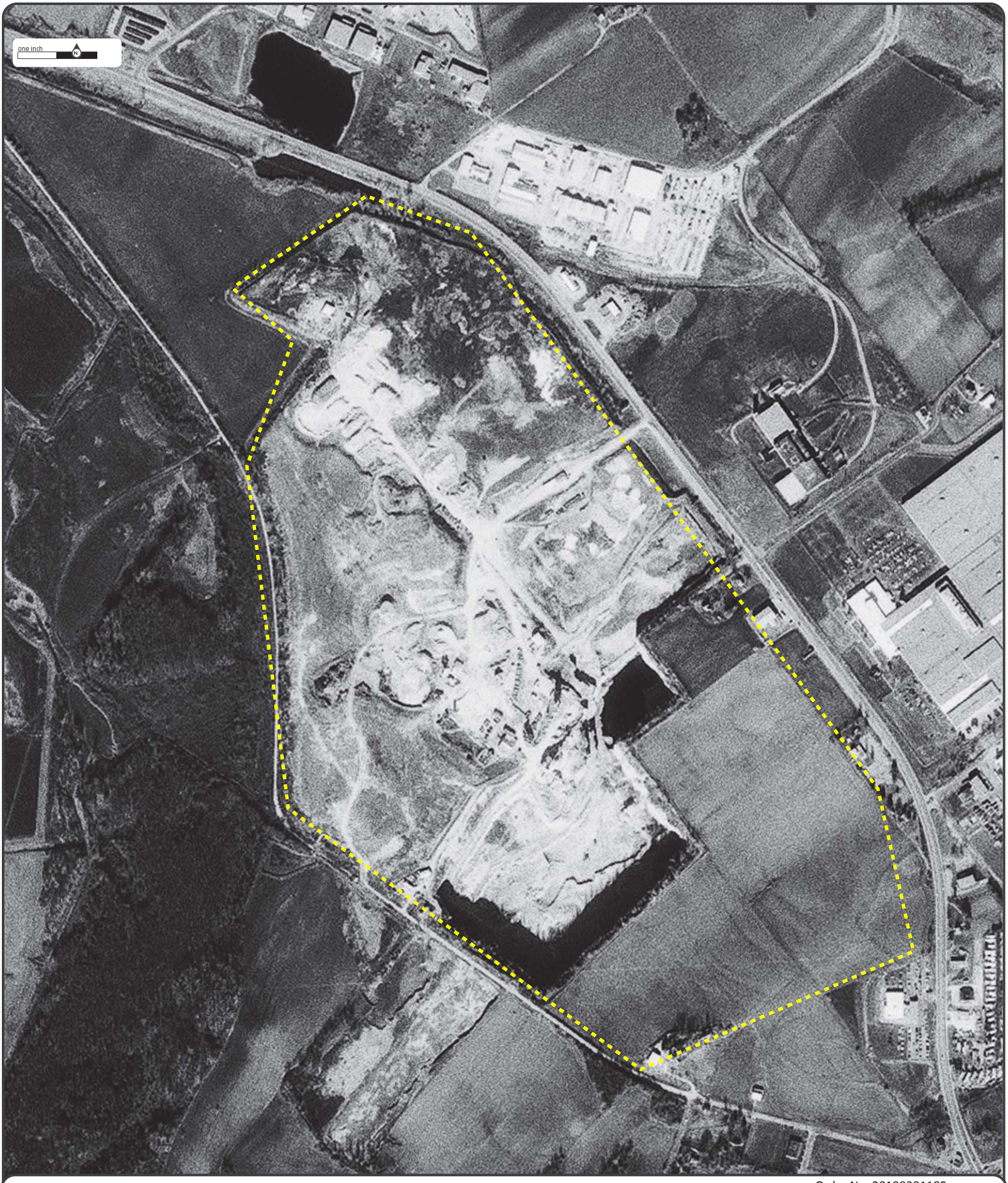
Year: **1985**
Source: **USGS**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



Year: **1979**
Source: **USGS**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Year: **1968**
Source: **USGS**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

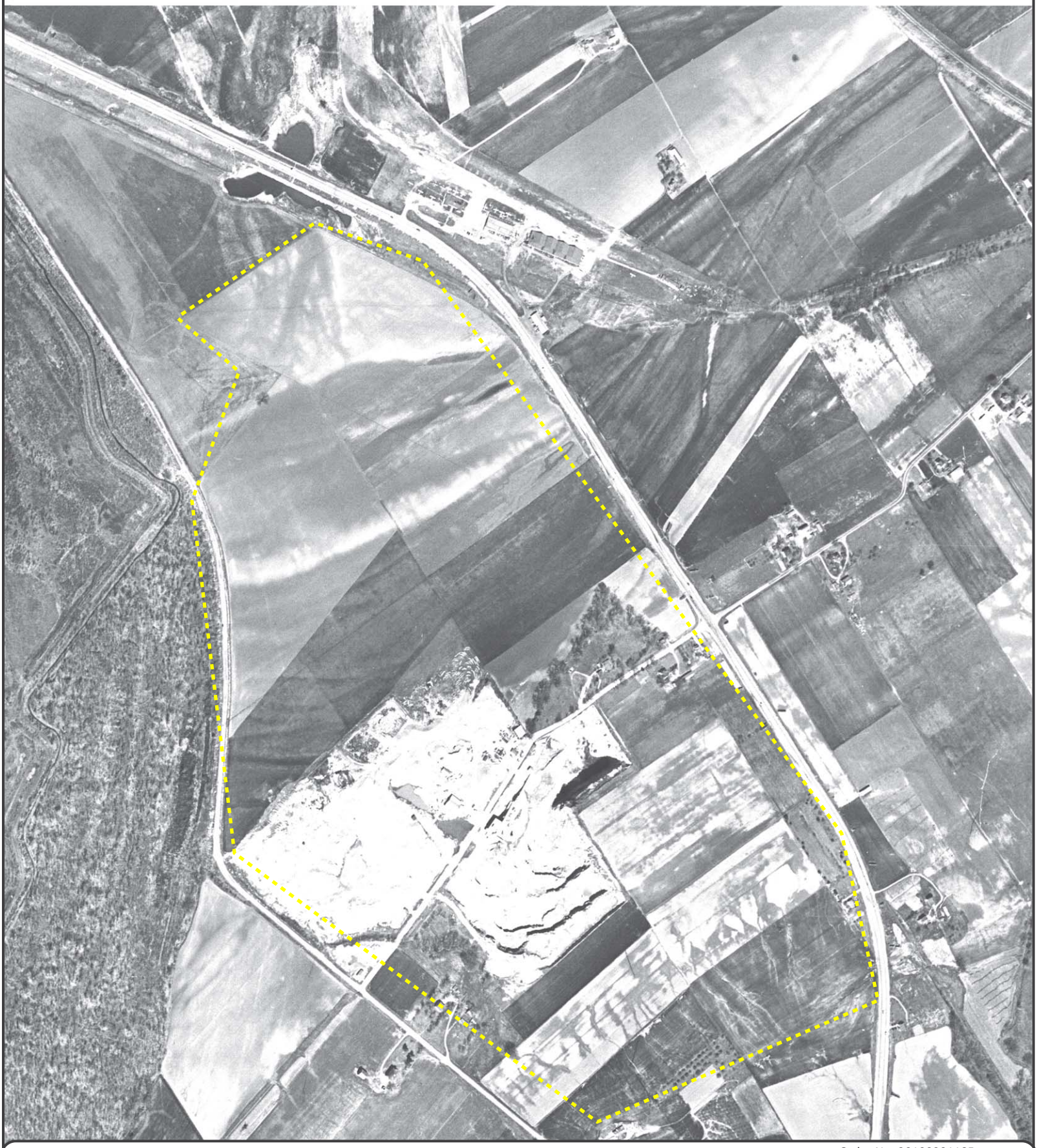
N

Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

one inch



Order No: 20190301185

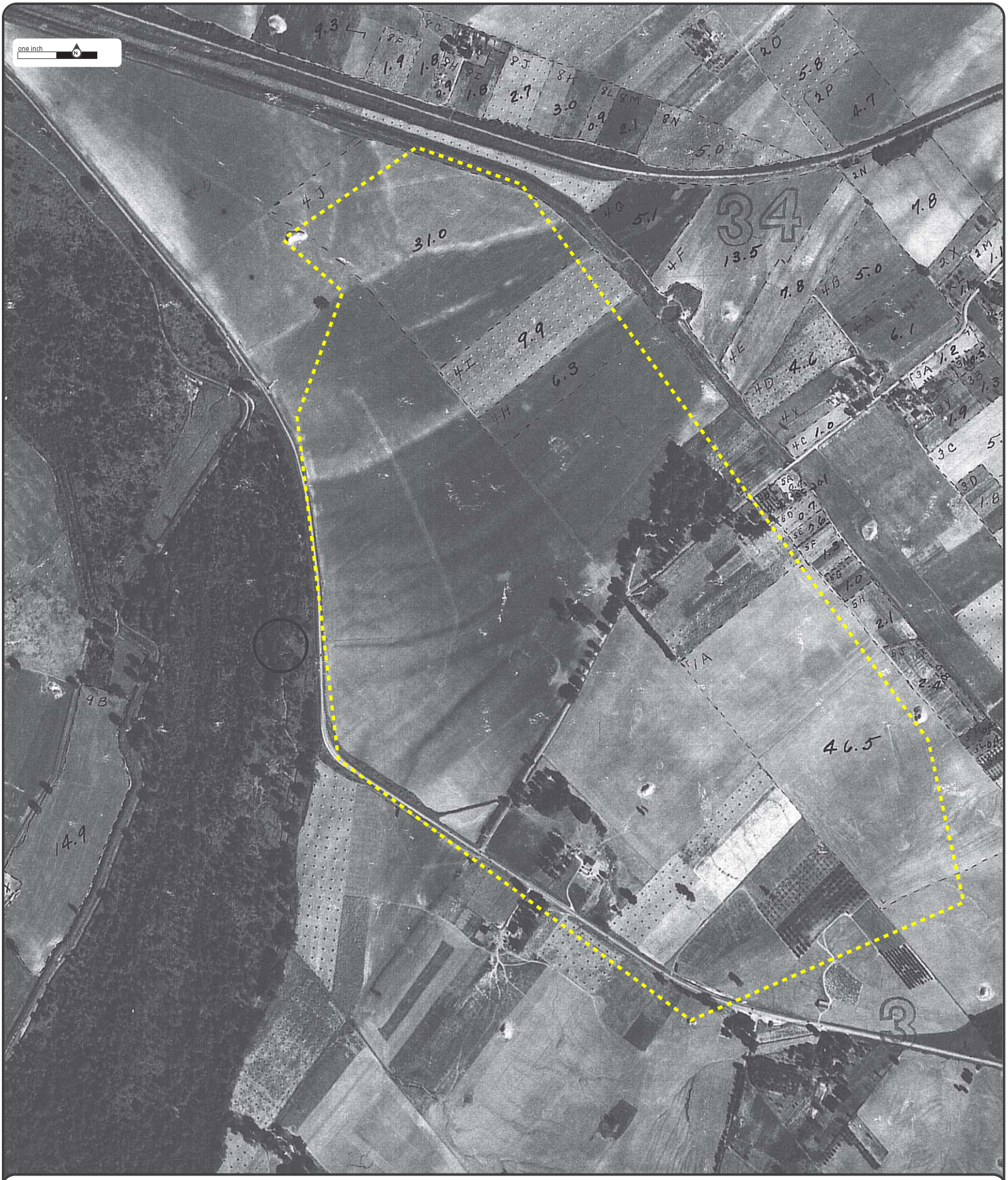
Year: **1955**
Source: **ASCS**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



Year: **1937**
Source: **ASCS**
Scale: **1" to 700'**
Comments:

Site Address: 13570 Saint Charles Rock Road Bridgeton MO
Approx Center: 38.76769 / -90.44429

N

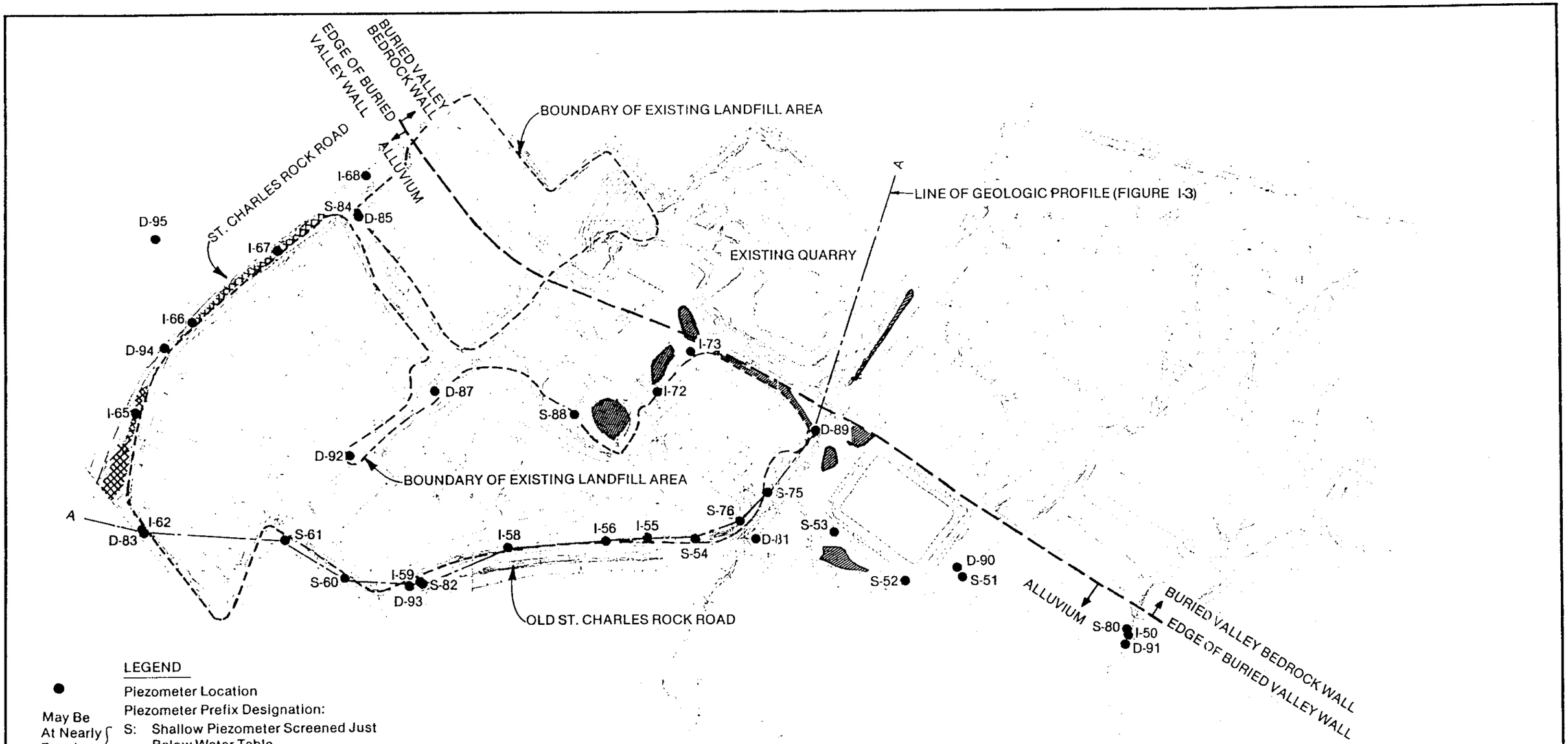
Order No: 20190301185

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

APPENDIX B

HISTORIC MONITORING WELL NETWORKS



LEGEND

- ● Piezometer Location
- Piezometer Prefix Designation: (May Be At Nearly Equal Depths.)
  - S: Shallow Piezometer Screened Just Below Water Table.
  - I: Intermediate Depth Piezometer Screened In Zone Between Shallow And Deep Piezometers.
  - D: Deep Piezometer Screened At Or Near The Top Of Bedrock.
- → Predominant Direction Of Groundwater Flow.
- XXXXXX Surface Water In Drainage Ditch
- Surface Water Feature Which Is Probably Recharging Groundwater As Discussed In Text.

N

-400 0 400 800
SCALE IN FEET

Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS

Figure I-2
SITE PLAN

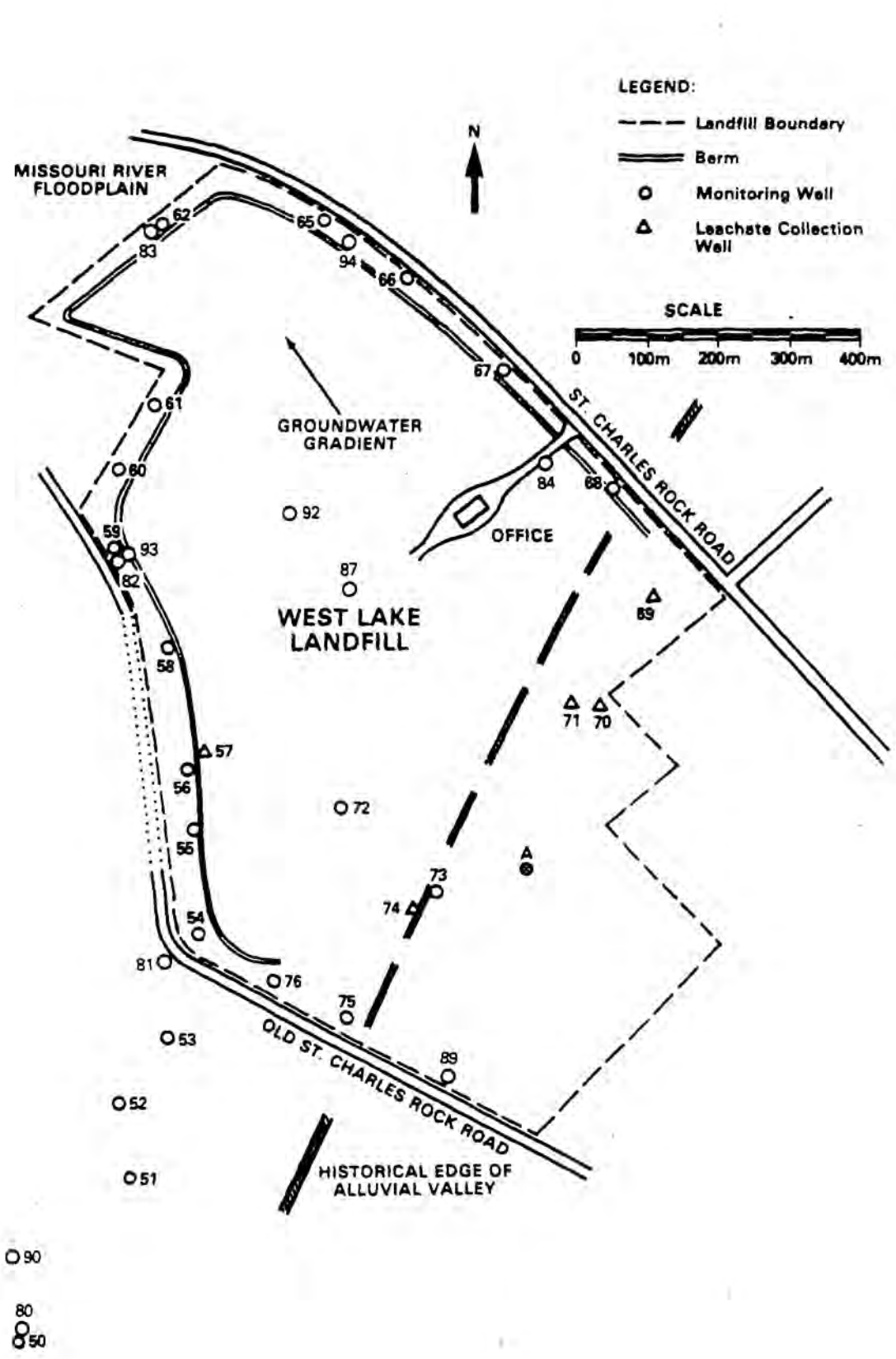


Figure 2.5 Location of monitoring wells

DRAWING NUMBER 556-B018

DRAWN BY: KJP | CHECKED BY:
UPDATED: 11/05/96 | APPROVED BY:

REVISIONS | No. | DESCR. | APPR. BY:

N 1071000 N 1070500 N 1070000 N 1069500 N 1069000 N 1068500 N 1068000 N 1067500 N 1067000 N 1066500

E 517000 E 516500 E 516000 E 515500 E 515000 E 514500 E 514000 E 513500

EDGE OF ALLUVIAL VALLEY

LAIDLAW OFFICE BUILDING

ST. CHARLES ROCK ROAD

AREA 1

AREA 2

NORTH SURFACE WATER

FORD PROPERTY FARMERS FIELD

FLOOD CONTROL CHANNEL

OLD ST. CHARLES ROCK ROAD

RETENTION POND

EDGE OF ALLUVIAL VALLEY

PZ-114-AS
I-68
D-14
I-67
S-84
D-85
PZ-207-AS
MW-F1S
MW-F1D
I-66
MW-F3
S-5
I-4
D-3
PZ-113-AS
PZ-113-AD
D-94 DAMAGED
D-13
PZ-112-AS
PZ-305-AI
I-73
PZ-205-AS
GAGE-5
D-87
S-88
PZ-302-AS
PZ-302-AI
GAGE-1
GAGE-2
GAGE-3
GAGE-4
S-8
S-10
I-11
D-12
S-61
I-62
D-83
D-6
MW-102
MW-101
I-7
S-82
I-9
D-93
S-1
I-2
GAGE-6
GAGE-7
MW-103
PZ-304-AS
PZ-304-AI
MW-F2
MW-104
S-75
D-81
PZ-303-AS
S-53
S-51/D-90
S-52 DAMAGED
PZ-300-AS
PZ-300-AD
S-80
I-50
D-91-M DAMAGED
MW-106
MW-107
MW-105 DAMAGED

LEGEND

- S-1 — REMEDIAL INVESTIGATION MONITORING WELL LOCATION (MONITORING WELL LOCATION NUMBER)
- PZ-113-AD — EXISTING MONITORING WELL LOCATION (LOCATION NUMBER)
- GAGE-6 — STAFF GAGE LOCATION (STAFF GAGE LOCATION NUMBER)
- AREAL EXTENT OF OVERLAND GAMMA SURVEY
- 600 — ELEVATION CONTOUR LINES (FEET MSL)

SCALE
0 300 600 1200 FEET

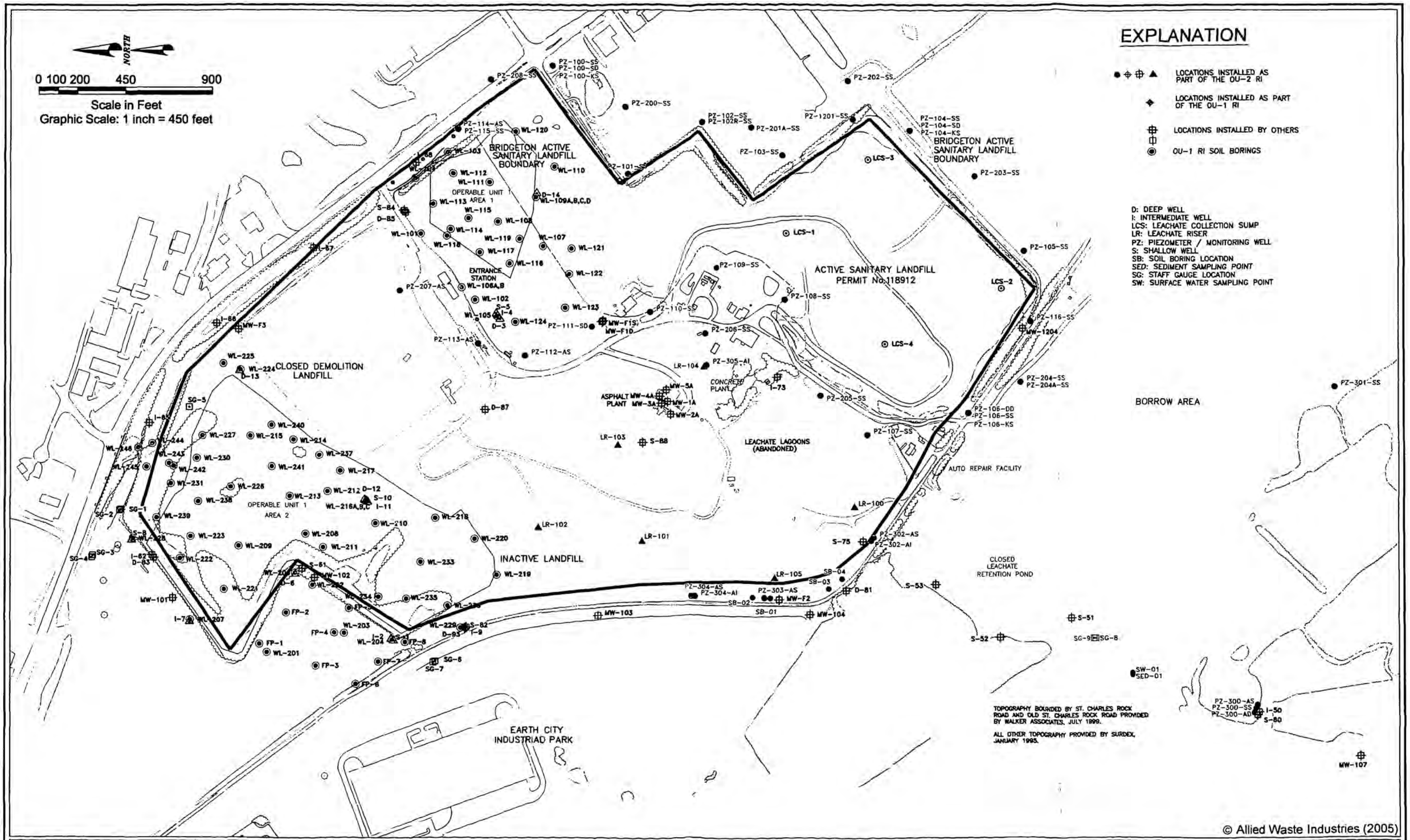
REMEDIAL AND PREVIOUS INVESTIGATIONS MONITORING WELL LOCATION PLAN WEST LAKE LANDFILL BRIDGETON, MISSOURI

PREPARED FOR
WEST LAKE RESPONDENT GROUP

McLaren Hart ENVIRONMENTAL ENGINEERING CORPORATION

DATE: 11/05/96 | SCALE: AS SHOWN | FIGURE 2-1 | DRAWING NUMBER 556-B018

LEGEND
EXISTING MONITORING POINTS
MW-107 MONITORING WELL
OPERABLE UNIT 1 (OU-1) MONITORING POINTS
S-5 MONITORING WELL
SG-1 STAFF GAUGE
OPERABLE UNIT 2 (OU-2) MONITORING POINTS
PZ-113-SS PIEZOMETER
SB-01 SOIL BORING
LR-100 LEACHATE RISER
LSC-1 LEACHATE COLLECTION SUMP
W-2 GAS EXTRACTION WELL
MARYON INDUSTRIES INC. LUST MONITORING POINTS
MW-1A MONITORING WELL
KEY TO PIEZOMETER DESIGNATIONS
PZ = PIEZOMETER
100 = PIEZOMETER NUMBER
AS = SHALLOW ALLUVIAL
AI = INTERMEDIATE ALLUVIAL
AD = DEEP ALLUVIAL
SS = SHALLOW ST. LOUIS/SALEM
SD = DEEP SALEM
KS = SHALLOW KEOKUK
KEY TO MONITORING WELL DESIGNATIONS
MW = MONITORING WELL
S = SHALLOW ALLUVIAL MONITORING WELL
I = INTERMEDIATE ALLUVIAL MONITORING WELL
D = DEEP ALLUVIAL MONITORING WELL
NOTE:
A LEACHATE RISER WAS NOT INSTALLED IN THE BOREHOLE DRILLED AT LR-101. SEE TEXT FOR DETAILS.
OPERABLE UNIT 1 AREA 1
OPERABLE UNIT 1 AREA 2
ACTIVE SANITARY LANDFILL PERMIT No.118912
INACTIVE DEMOLITION LANDFILL
INACTIVE LANDFILL
SITE SURFACE WATER RETENTION POND
ENTRANCE STATION
ASPHALT PLANT
ABANDONED CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
LEACHATE RETENTION POND
BORROW AREA
SOUTHWESTERN BELL SWITCHING STATION
AUTO REPAIR FACILITY
EARTH CITY INDUSTRIAL PARK
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
N. 1,070,000
E. 515,000
E. 514,000
E. 513,000
PZ-208-SS
PZ-100-SS
PZ-100-SD
PZ-100-KS
PZ-202-SS
PZ-200-SS
PZ-102-SS
PZ-102R-SS
PZ-201-SS
PZ-201A-SS
PZ-1201-SS
PZ-104-SS
PZ-104-SD
PZ-104-KS
PZ-203-SS
PZ-103-SS
PZ-101-SS
PZ-105-SS
PZ-109-SS
PZ-108-SS
PZ-116-SS
PZ-110-SS
PZ-206-SS
PZ-111-SD
PZ-111-KS
PZ-113-AS
PZ-113-AD
PZ-113-SS
PZ-112-AS
PZ-305-AI
PZ-204-SS
PZ-204A-SS
PZ-205-AS
PZ-205-SS
PZ-106-SS
PZ-106-SD
PZ-106-KS
PZ-107-SS
PZ-301-SS
PZ-207-AS
PZ-114-AS
PZ-115-SS
PZ-302-AS
PZ-304-AS
PZ-304-AI
PZ-303-AS
MW-F1S
MW-F1D
MW-F2
MW-F3
MW-1A
MW-2A
MW-3A
MW-4A
MW-5A
MW-101
MW-102
MW-103
MW-104
MW-107
MW-1204
LR-100
LR-101
LR-102
LR-104
LR-105
LS-103
SB-01
SB-02
SB-03
SB-04
I-62
I-63
I-65
I-66
I-67
I-68
I-73
D-12
S-10
I-11
D-13
D-14
D-81
D-83
D-85
D-87
D-93
S-82
S-84
S-88
S-51
S-52
S-53
SG-1
SG-2
SG-3
SG-4
SG-5
SG-6
SG-7
LSC-1
LSC-2
LSC-3
LSC-4
NORTH
SCALE IN FEET
0 100 200 400
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995.
REV. DATE DESCRIPTION DR. BY APP. BY
0 9/14/95 ISSUED TO MNDR AAJ CER
CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL
TITLE
MONITORING POINTS LOCATION MAP
Denver, Colorado
Golder Associates
DRAWN TMC
CHECKED MK
REVIEWED CER
APPROVED WEH
FILE NO. 2848D124
DATE AUGUST 1996
SCALE AS SHOWN
JOB NO. 943-2848
DWG. NO. D124
FIGURE 3-1

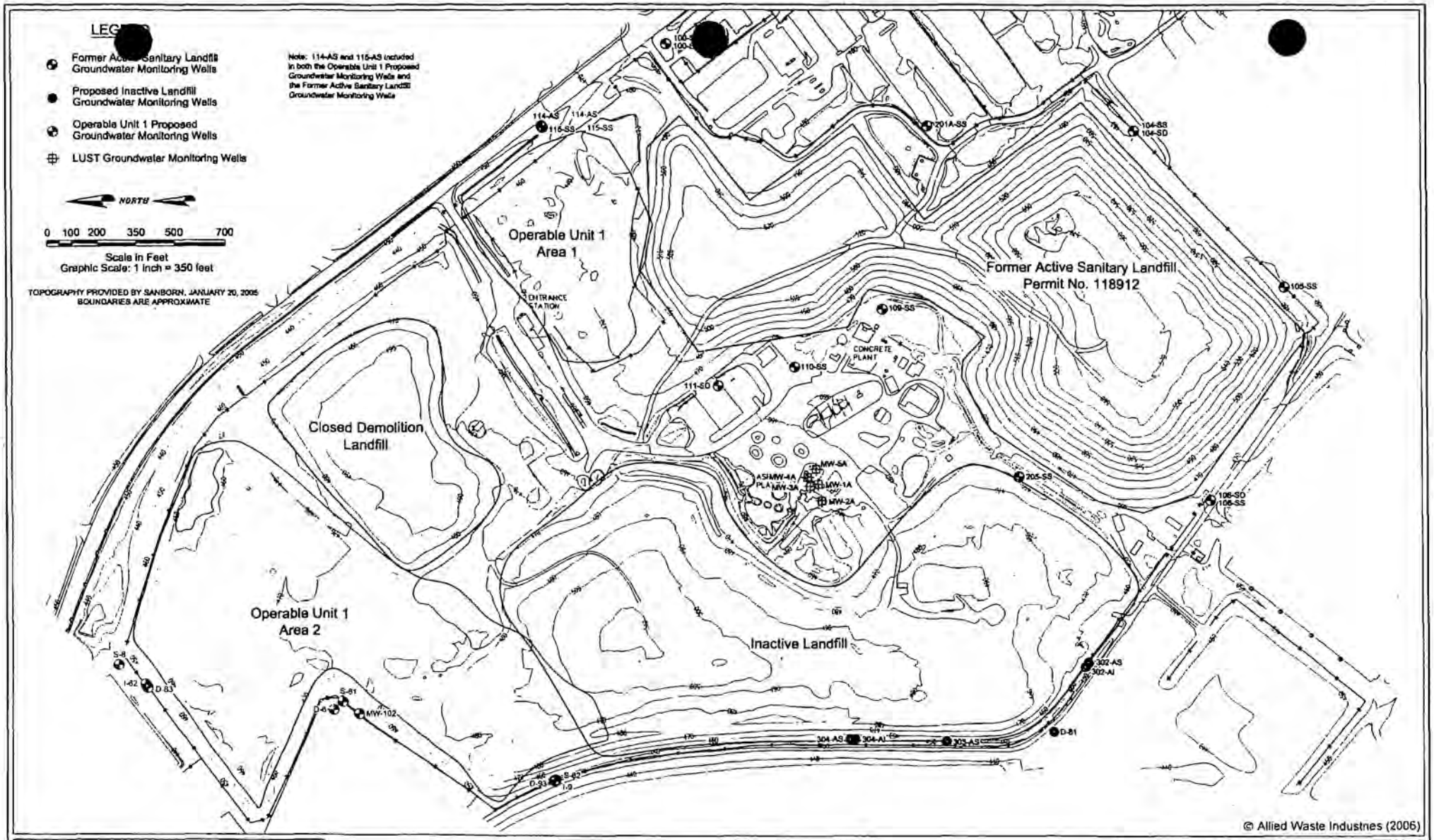


© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-1
Environmental
Sampling Locations

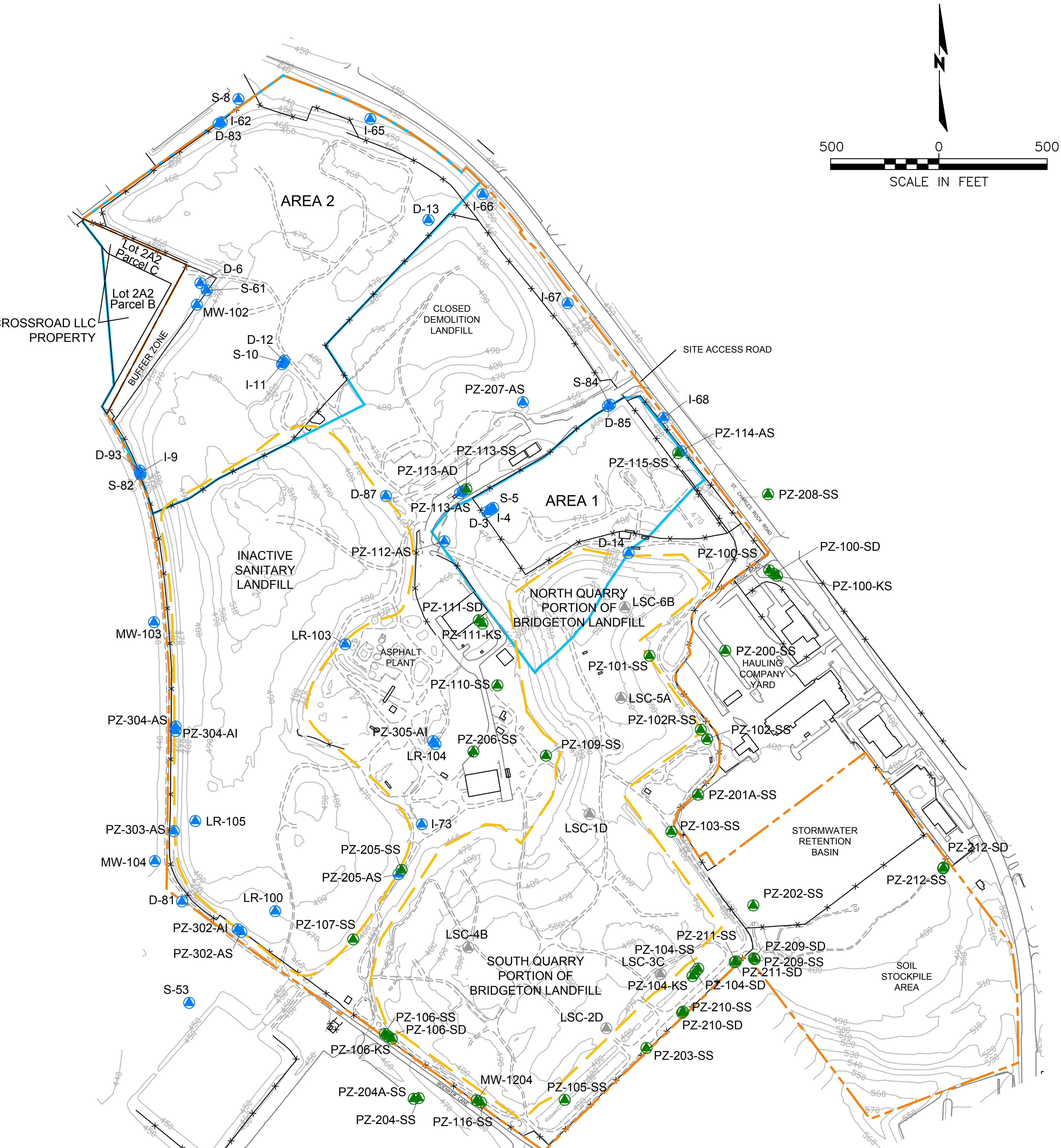


© Allied Waste Industries (2006)

HERST & ASSOCIATES, INC.
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 5-3
Site-Wide Groundwater Monitoring Well Locations



[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible]	
	[illegible]		[illegible]	[illegible]	
M[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	
			[illegible]	[illegible]	
			[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]

LEGEND

- Leachate Collection Sump
- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Property Line
- OU-1 Area Boundary
- 490 Index Contour
- Building/Structure
- Paved Road
- Unpaved Road
- Fence
- Water Body/Stream

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:
- AERIAL TOPOGRAPHY PROVIDED BY COOPER AERIAL SURVEYS CO. AND IS DATED DECEMBER 2, 2016
- ALL ELEVATIONS ARE ABOVE MEAN SEA LEVEL (AMSL)

DRAFT

Source:
EMSI, 2014, Groundwater Monitoring Report, October 2013 Additional Groundwater Sampling Event, West Lake Landfill OU-1, February 21.

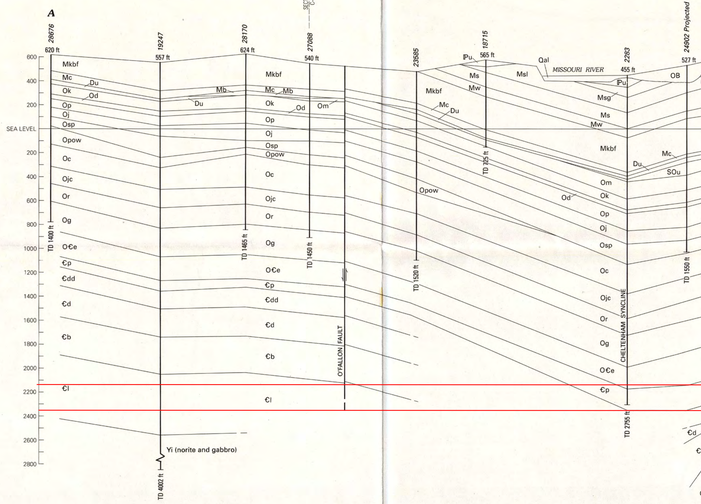
Figure 4-10
Location of Groundwater Monitoring Wells
2012-2013 Monitoring Events
West Lake Landfill OU-1 RI Addendum

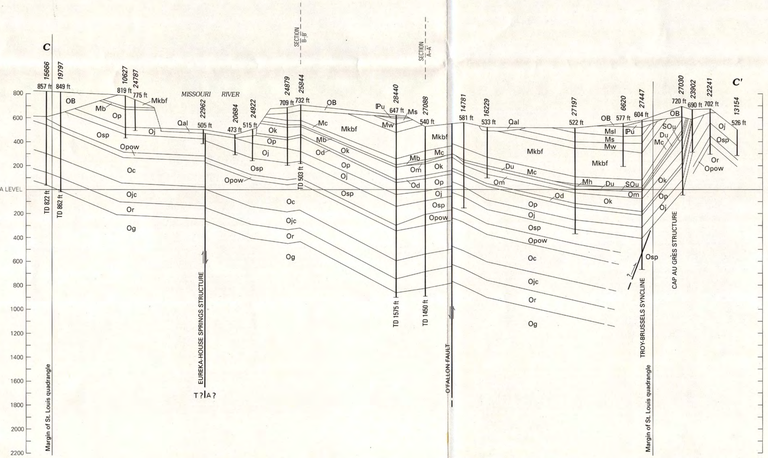
EMSI Engineering Management Support, Inc.

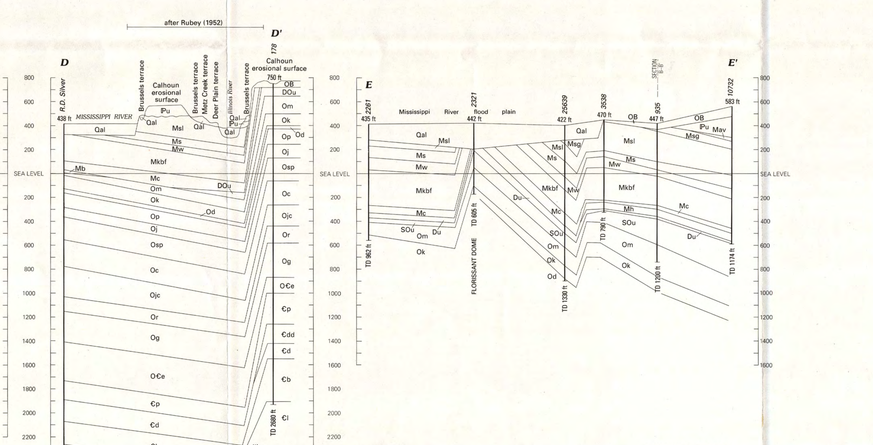
APPENDIX C

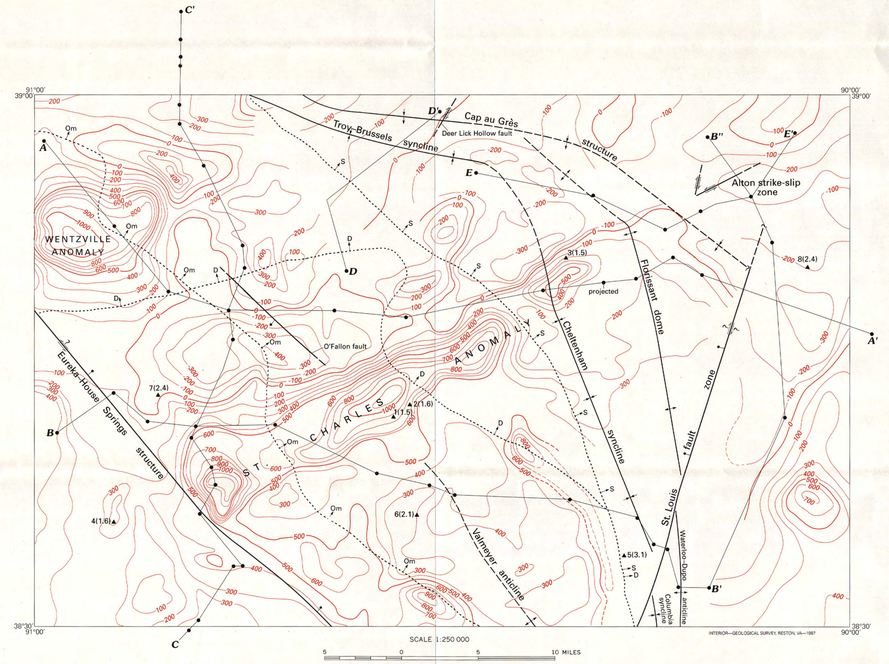
REGIONAL GEOLOGIC CROSS SECTIONS

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I–2533 (SHEET 2 OF 2)
Explanatory pamphlet accompanies map









Regional magnetic anomaly map of the St. Louis 30′ X 60′ quadrangle, and generalized cross sections. Map shows major structural features, pinch-out lines related to major unconformities, and locations of recent earthquake epicenters. Approximate positions of cross sections and selected drill holes (solid dots along cross-section traces) are also indicated. On cross sections: OB, overburden (includes loess and surficial deposits); TD, total depth; T, toward observer; A, away from observer; vertical exaggeration x 42.

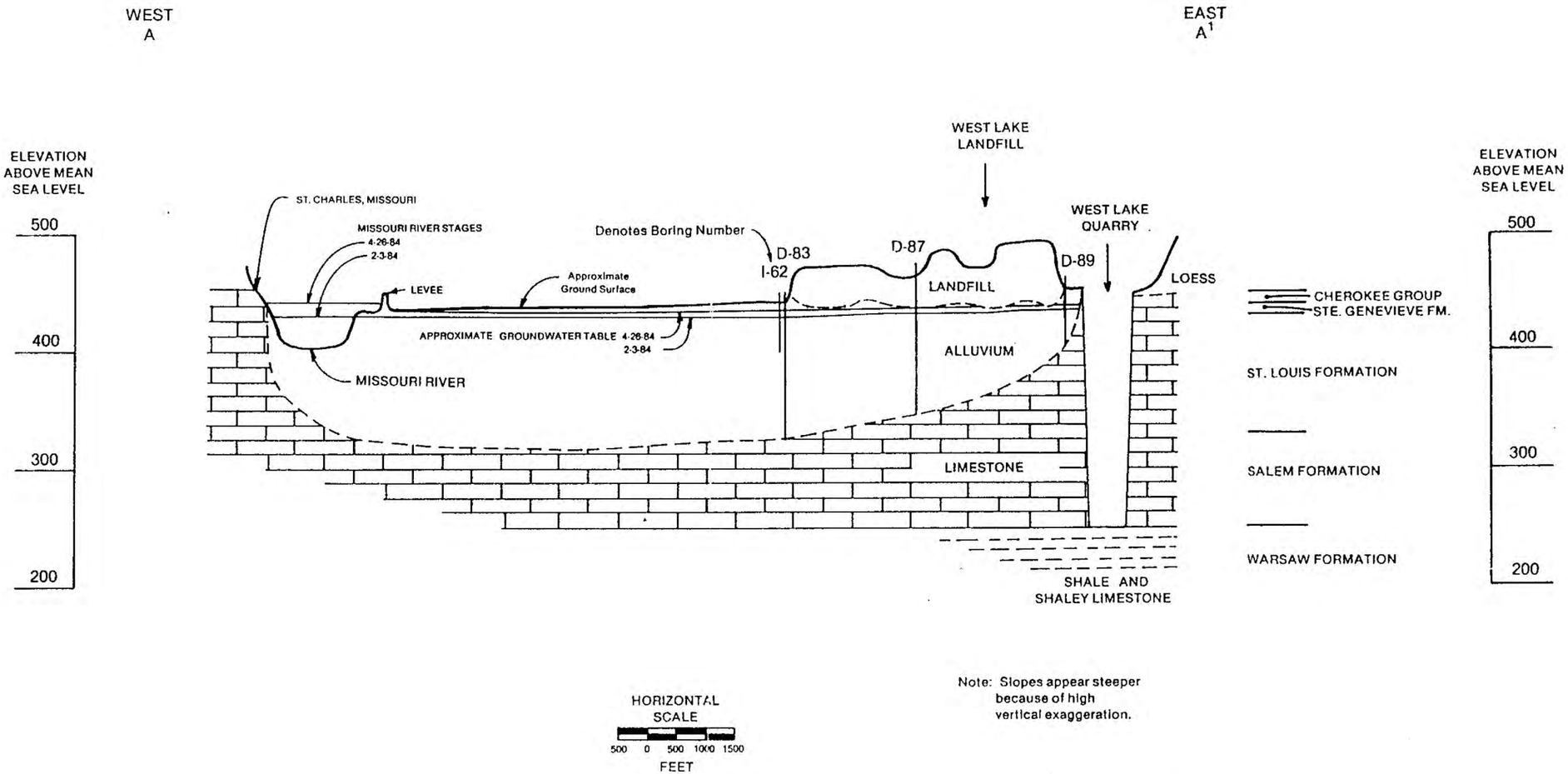
BEDROCK GEOLOGIC MAP OF THE ST. LOUIS 30′ × 60′ QUADRANGLE, MISSOURI AND ILLINOIS

Compiled by
Richard W. Harrison
1997

U.S. GEOLOGICAL SURVEY
RESTON, VA
JUIN 18 1998
LIBRARY

USGS LIBRARY-RESTON
3 1818 00257420 8

M(200)
I
no. 2533
Sheet 2
c. 2



HORIZONTAL SCALE

500 0 500 1000 1500

FEET

Note: Slopes appear steeper because of high vertical exaggeration.

Burns & McDonnell

Figure I-1
GEOLOGIC PROFILE
ACROSS RIVER VALLEY

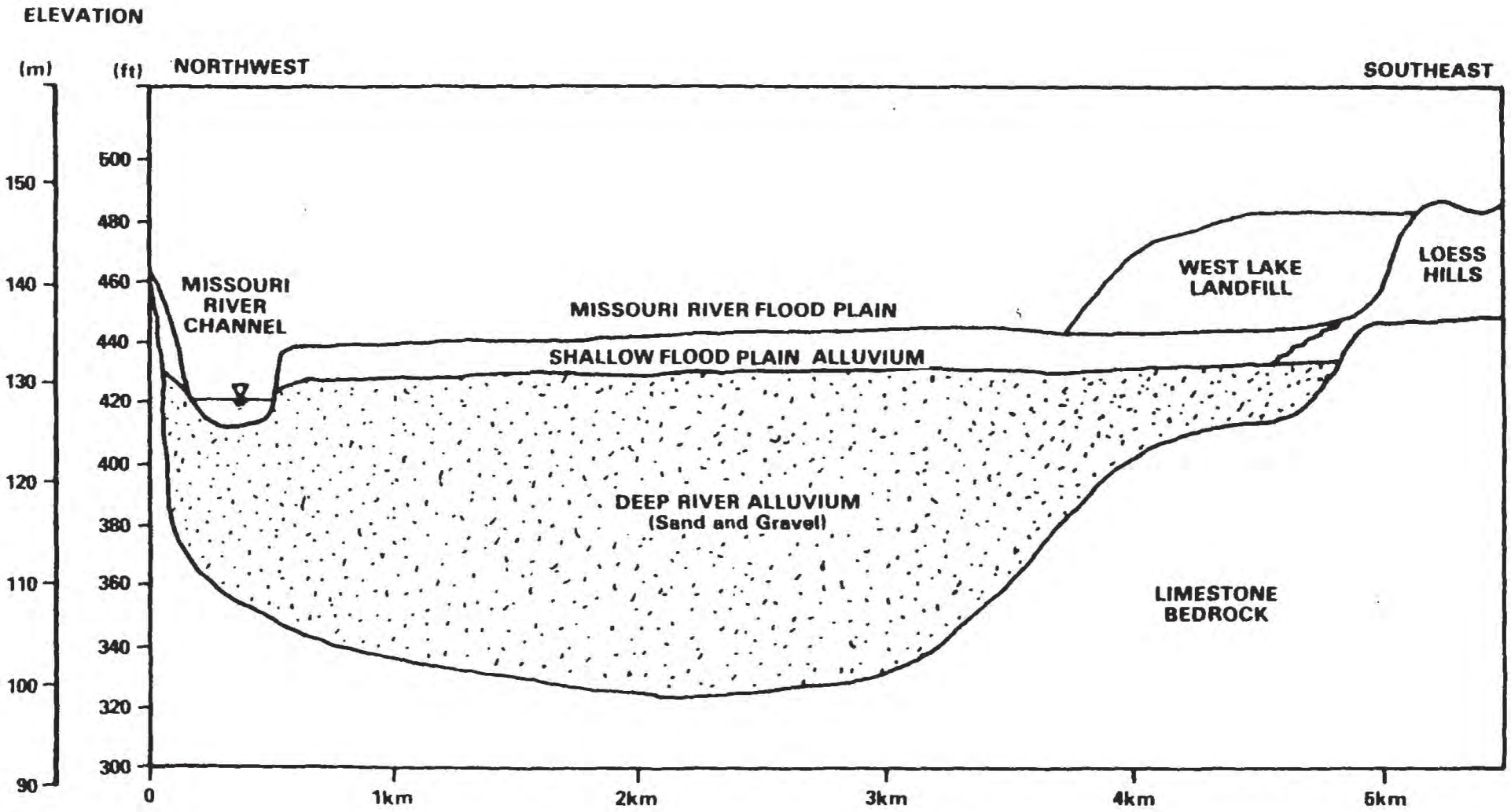


Figure 2.7 Cross-section of Missouri River alluvial valley

APPENDIX D

BOREHOLE LOGS AND WELL CONSTRUCTION DIAGRAMS

INTERIOR LANDFILL GAS EXTRACTION WELLS

American Environmental Group Ltd.

Well Log

DATE: 7/8/2004

PROJECT NAME _____

PROJECT# _____

DRILLING

GEW 2	WELL NUMBER OR NAME
136'	LINEAR FEET OF DRILLING
136'	LINEAR FEET OF COMPLETION
0'	LINEAR FEET OF ABANDONMENT

Time in: _____ Time out: _____

Weather conditions: Sunny

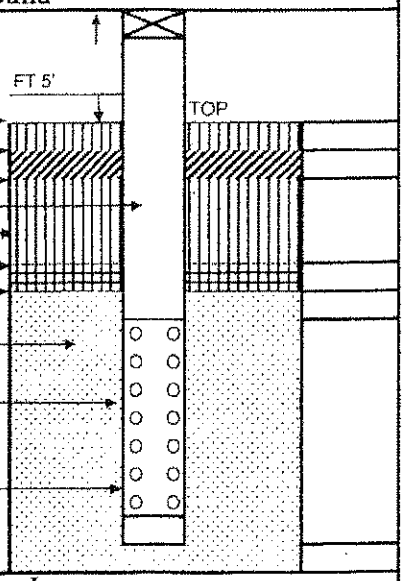
Site conditions: _____

Rig hrs: _____

Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

Well Asbuild



Top of ground elv.	511.63
Backfill Material	2'
Bentonite plug	2'
Length of Solid	25'
Backfill Material	16'
Isolation Layer	1'
Length of Gravel Pack	113'
Length of Perf. Pipe	111'
Style of Pipe	6"SCH80 PVC
Bottom of bore	
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO	
7:00	20.9	0	0	0	GEW 2
8:00	"	0	0	0	
9:00	"	0	0	0	
10:00	"	0	0	0	
11:00	21.1	0	0	0	
12:00	"	0	0	0	
1:00	"	0	0	0	
2:00	20.9	0	0	0	
3:00	"	0	0	0	
4:00	"	0	0	0	
5:00	"	0	0	0	
6:00	"	0	0	0	

Notes

northing 1068816

easting 516765

Well Boring Log

Depth	Composition	Degree of Decomp	Degree of Moisture	Temp
0-10	DIRT-MSW	LIGHT	DRY	70
10-20	MSW	LIGHT	DRY	70
20-30	MSW	LIGHT	DRY	74
30-40	MSW	LIGHT	DRY	78
40-50	MSW	LIGHT	DRY	82
50-60	MSW	LIGHT	DRY	86
60-70	MSW	LIGHT	DRY	91
70-80	MSW	LIGHT	DRY	91
80-90	DIRT	LIGHT	DRY	95
90-100	DIRT	LIGHT	Moisture	98
100-110	MSW	HEAVY	WET	106
110-120	MSW	HEAVY	WET	110
120-130	MSW	HEAVY	WET	116
130-140	MSW	HEAVY	WET	TD 136
140-150				

_____ _____

CLIENT REPRESENTATIVE DATE

BRETT WILLIS 7/8/2004

AEGL SITE SUPERVISOR DATE

_____

NAME & TITLE

American Environmental Group Ltd.

Well Log

DATE: 6/25/2004

PROJECT NAME BRIDGETON

PROJECT# 1-04-028

DRILLING

GEW 3 WELL NUMBER OR NAME

115' LINEAR FEET OF DRILLING

100' LINEAR FEET OF COMPLETION

0' LINEAR FEET OF ABANDONMENT

Time in: Time out:

Weather conditions: Sunny

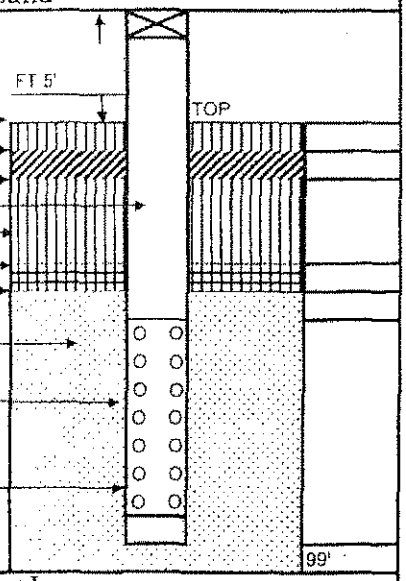
Site conditions:

Rig hrs:

Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

Well Asbuild



Top of ground elv.	517.98
Backfill Material	2'
Bentonite plug	2'
Length of Solid	25'
Backfill Material	15'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	77'
Length of Perf. Pipe	75'
Style of Pipe	6"SCH80 PVC
Bottom of bore	100'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO	
7:00	20.9	0	0	0	GEW 52
8:00	20.9	0	0	0	GEW 4
9:00	"	0	0	0	
10:00	"	0	0	0	
11:00	"	0	0	0	
12:00	20.9	0	0	0	GEW 3
1:00	"	0	0	0	
2:00	"	0	0	0	
3:00	"	0	0	0	
4:00	20.9	0	0	0	GEW 2
5:00	20.9	0	0	0	6-24-04
6:00	"	0	0	0	

Notes

northing 1068810

easting 516606

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-HHT	LIGHT	DRY	64
10-20	HHT	LIGHT	DRY	68
20-30	HHT	LIGHT	DRY	70
30-40	HHT	LIGHT	DRY	76
40-50	HHT	LIGHT	DRY	83
50-60	HHT	HEAVY	WET	88
60-70	HHT	HEAVY	WET	96
70-80	HHT	HEAVY	WET	101
80-90	HHT-WOOD	HEAVY	WET	108
90-100	"	HEAVY	WET	TD 100'
100-110				
110-120				
120-130				
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

BRETT WILLIS 6/25/2004

AEGL SITE SUPERVISOR DATE

NAME & TITLE

American Environmental Group Ltd.

Well Log

DATE: 6/25/2004

PROJECT NAME BRIDGETON

PROJECT# 1-04-028

DRILLING

GEW 4 WELL NUMBER OR NAME

72' LINEAR FEET OF DRILLING

72' LINEAR FEET OF COMPLETION

0' LINEAR FEET OF ABANDONMENT

Time in: Time out:

Weather conditions: Sunny

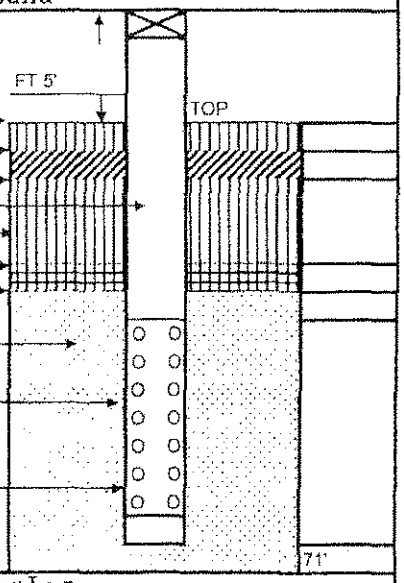
Site conditions:

Rig hrs:

Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

Well Asbuild



Top of ground elv.	522.11
Backfill Material	2'
Bentonite plug	2'
Length of Solid	22'
Backfill Material	18'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	51'
Length of Perf. Pipe	49'
Style of Pipe	6"SCH80 PVC
Bottom of bore	72'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S	LEL / CO
7:00	20.9	0 0	0 GEW 52
8:00	20.9	0 0	0 GEW 4
9:00	"	0 0	0
10:00	"	0 0	0
11:00	"	0 0	0
12:00	20.9	0 0	0 GEW 3
1:00	"	0 0	0
2:00	"	0 0	0
3:00	"	0 0	0
4:00	20.9	0 0	0 GEW 2
5:00	20.9	0 0	0 6-24-04
6:00	"	0 0	0

Notes

northing 1068787

easting 516510

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-HHT	LIGHT	DRY	64
10-20	HHT	LIGHT	DRY	72
20-30	HHT	LIGHT	DRY	72
30-40	HHT	LIGHT	DRY	76
40-50	HHT	LIGHT	DRY	81
50-60	HHT	HEAVY	WET	85
60-70	HHT	HEAVY	WET	93
70-80	HHT	HEAVY	WET	TD 72'
80-90				
90-100				
100-110				
110-120				
120-130				
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

BRETT WILLIS 6/25/2004

AEGL SITE SUPERVISOR DATE

NAME & TITLE

Aquaterra Drilling Log

HOLE NO. GEW-5 | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG well/Header C&A	DRILLING SUBCONTRACTOR: AEG
CT NUMBER: 1,52.10	NAME OF DRILLER(S): B. Willis
TY: Bridgeton	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-5	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in. Bucket
SURFACE ELEVATION: 525.29	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 8/1/05 — DRILLING END DATE: 8/1/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: —	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

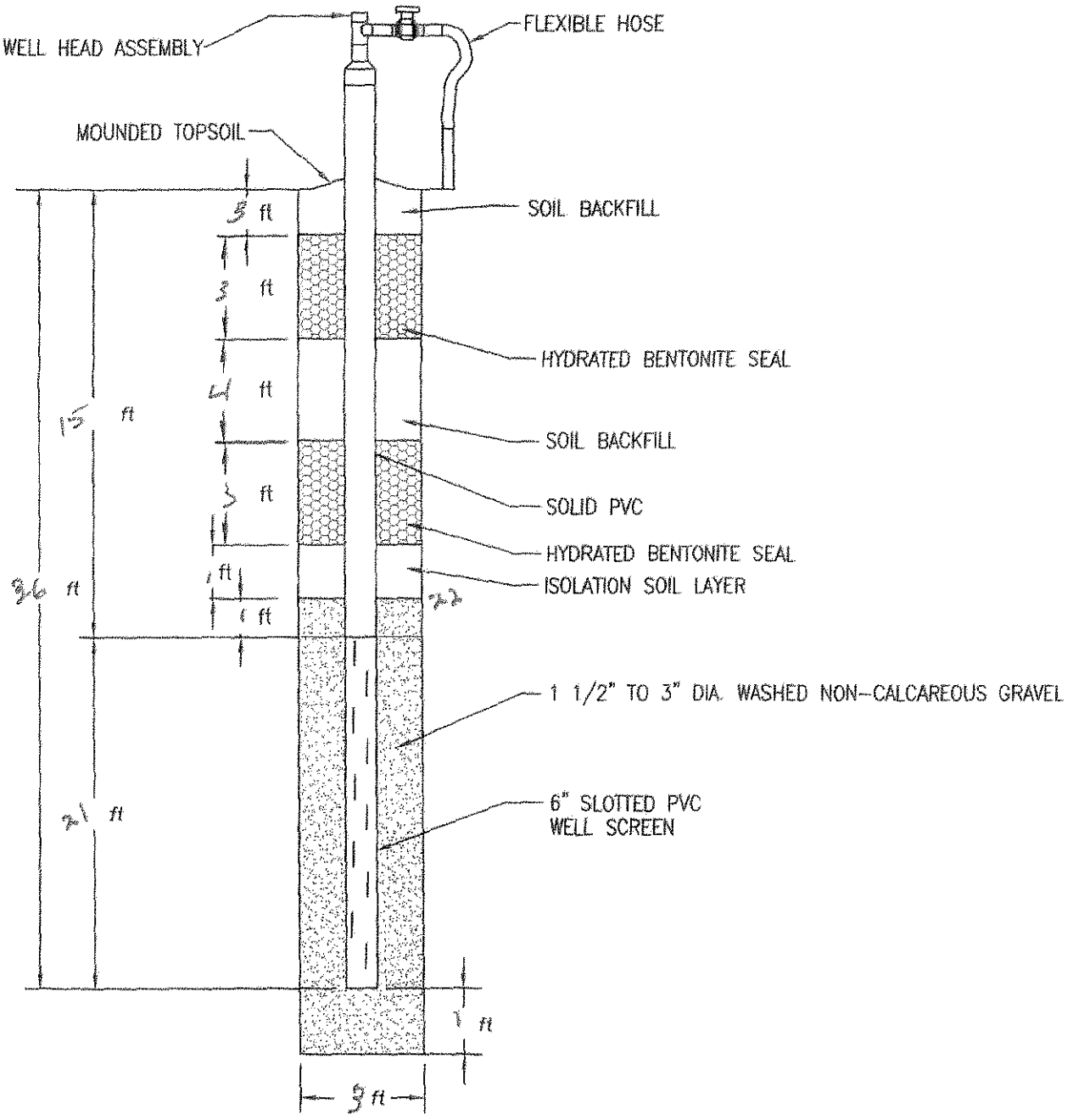
DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO	TIME	REMARKS
0	1FT Soil				920	
	waste				935	
30	waste				1025	End of Drilling 8/1/05 Total Depth 37' no PCBs detected
40						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10 PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-5 WELL LOCATION: Top of Landfill
INSTALLATION START DATE: 8/1/05 COMPLETION DATE: 8/1/05
DRILLER: AEG (B. Wilis) INSPECTOR: J. Jordan

COMMENTS: No PCM observed



Aquaterra Drilling Log

HOLE NO. GEW-6A | SHEET 1 OF 1 SHEETS

PROJECT NAME: 05 LFG Wells/Header CQA
DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10
NAME OF DRILLER(S): B. Willis
LOCATION: Bridgeton Landfill, LLC
MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-6A
SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 inch bucket
SURFACE ELEVATION:
OVERBURDEN THICKNESS: —
DRILLING START DATE: 8/12/05
DRILLING END DATE: 8/12/05
DEPTH DRILLED INTO ROCK: —
DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 45 ft
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Hagg

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	Waste (~25ft soil)				1400	Drilling began 8/12/05
30	dark					
40	white					Drilling was terminated at 45 ft.
50	End of boring at 45 ft					No materials containing Materials observed

PROJECT NAME: 2006 LFG Wells/Header CQA
HOLE NO: GEW-6A

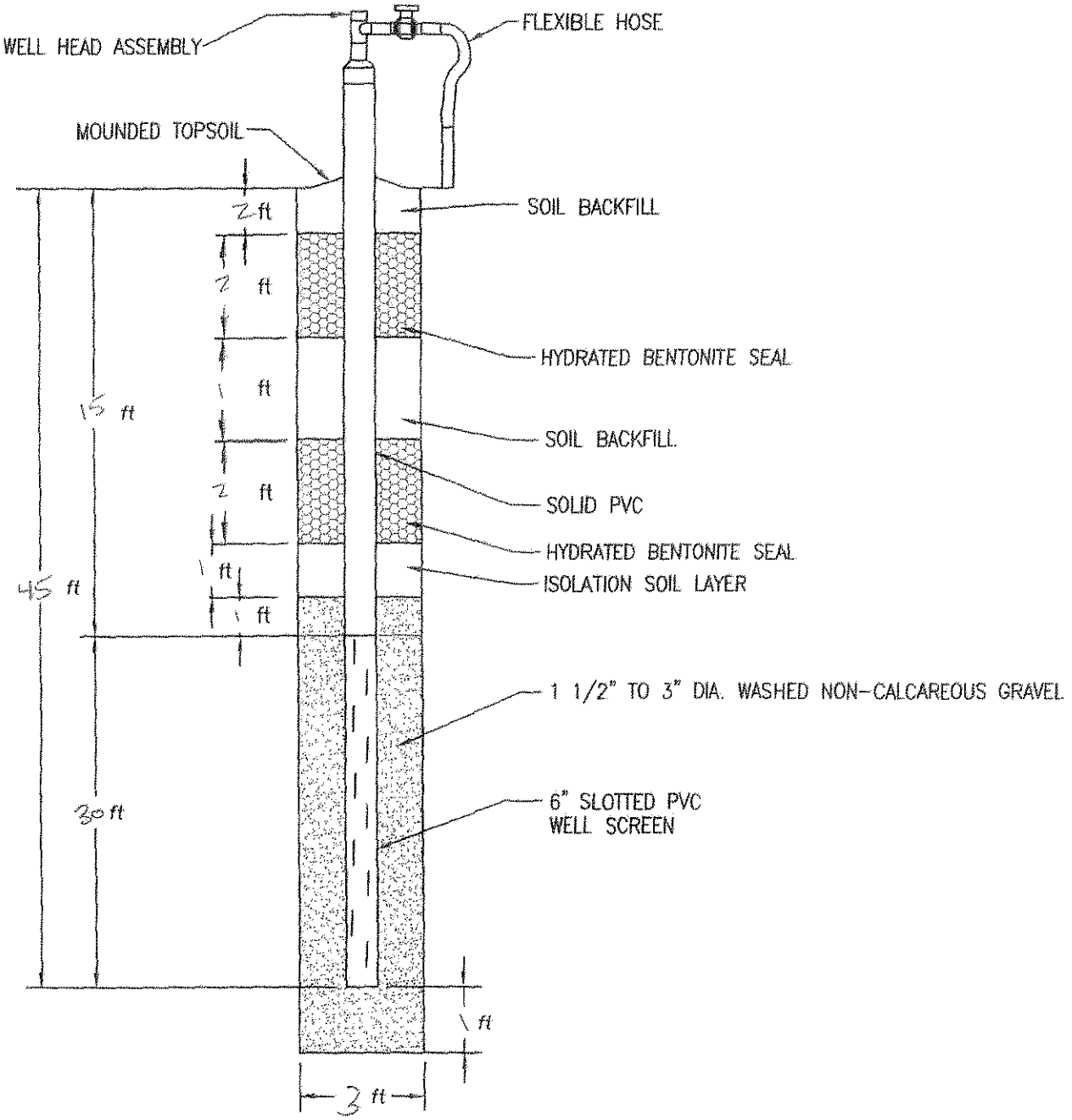
QUATERRA ENVIRONMENTAL SOLUTIONS, INC.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-6A
WELL LOCATION:
INSTALLATION START DATE: 8/12/05
COMPLETION DATE: 8/12/05
DRILLER: AEG-B Willis
INSPECTOR: Nathan Huggerson

COMMENTS:

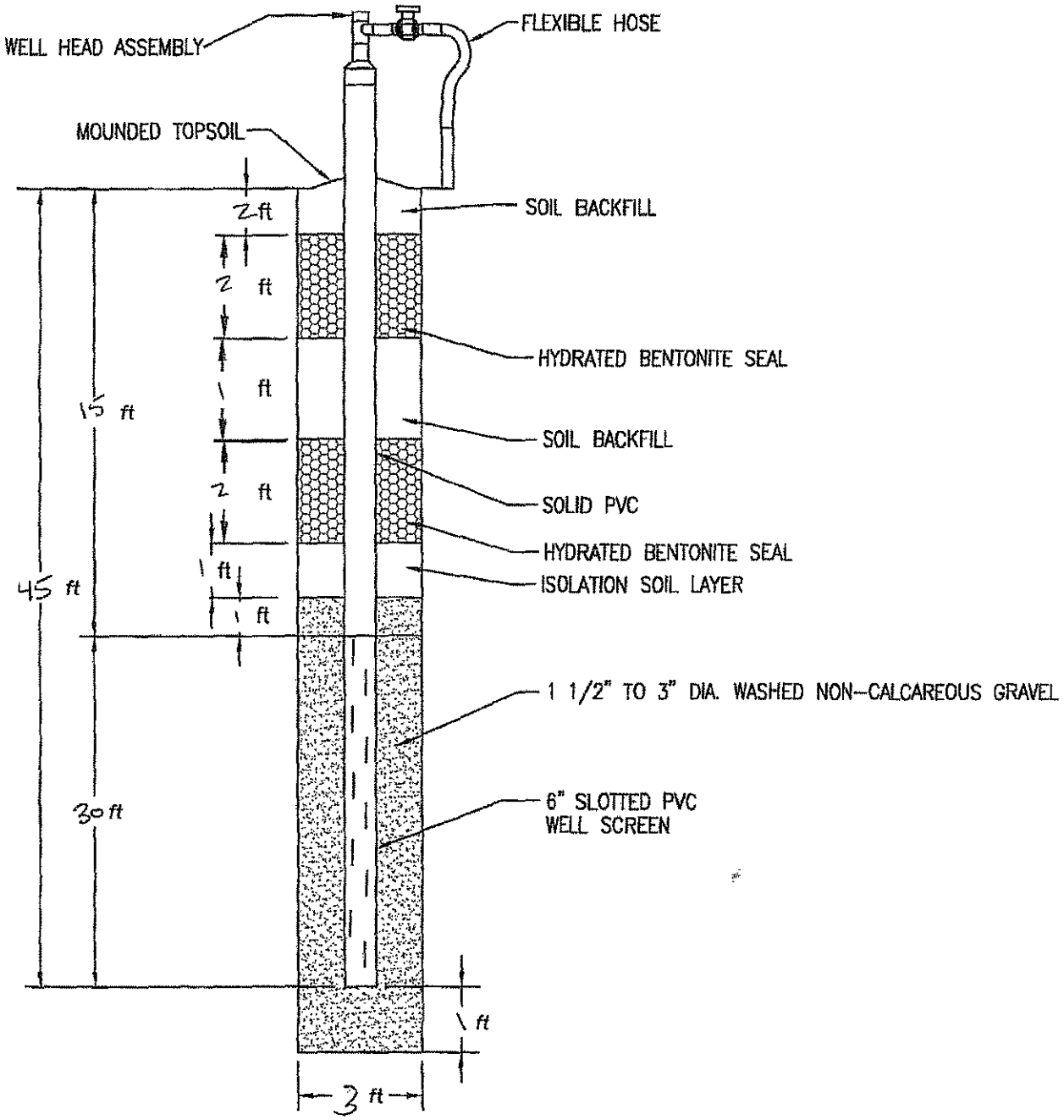


AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-6A
WELL LOCATION:
INSTALLATION START DATE: 8/12/05
COMPLETION DATE: 8/12/05
DRILLER: AEG: D. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



American Environmental Group Ltd.

Well Log

DATE: 7/14/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GEW 7	WELL NUMBER OR NAME
67'	LINEAR FEET OF DRILLING
67'	LINEAR FEET OF COMPLETION
0'	LINEAR FEET OF ABANDONMENT

Time in: _____ Time out: _____

Weather conditions: Sunny

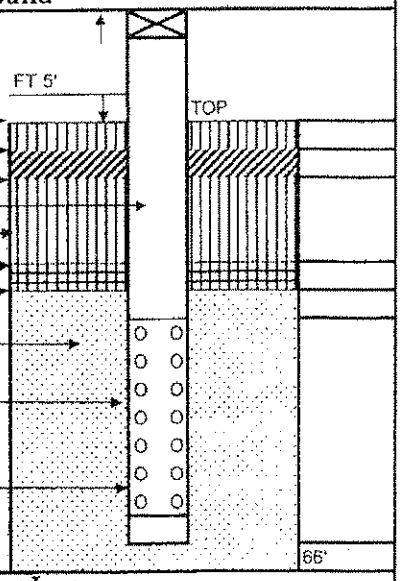
Site conditions: _____

Rig hrs: _____

Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

Well Asbuild



Top of ground elv.	479.04
Backfill Material	2'
Bentonite plug	2'
Length of Solid	19'
Backfill Material	10'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	50'
Length of Perf. Pipe	47'
Style of Pipe	6"SCH80 PVC
Bottom of bore	67'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO
7:00				
8:00	20.9	0	0	0 GEW 13
9:00	"	0	0	0
10:00	"	0	0	0
11:00	"	0	0	0
12:00	"	0	0	0
1:00	"	0	0	0
2:00	"	0	0	0
3:00	"	0	0	0
4:00	20.9	0	0	0 GEW 7
5:00	"	0	0	0
6:00	"	0	0	0

Notes

northing 1008231

easting 516129

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-MSW	LIGHT	DRY	64
10-20	MSW	LIGHT	DRY	64
20-30	MSW	LIGHT	DRY	72
30-40	MSW	LIGHT	DRY	87
40-50	MSW	LIGHT	DRY	91
50-60	MSW	LIGHT	DRY	94
60-70	MSW	LIGHT	DRY	TD 67'
70-80				
80-90				
90-100				
100-110				
110-120				
120-130				
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

BRETT WILLIS 7-14-04

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO: GEW-8 | SHEET 1 OF SHEETS

PROJECT NAME: 2005 LFG wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-8	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in bucket
SURFACE ELEVATION: 491.55	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/30/05 — DRILLING END DATE: 7/30/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 65 Ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	David Hamrick

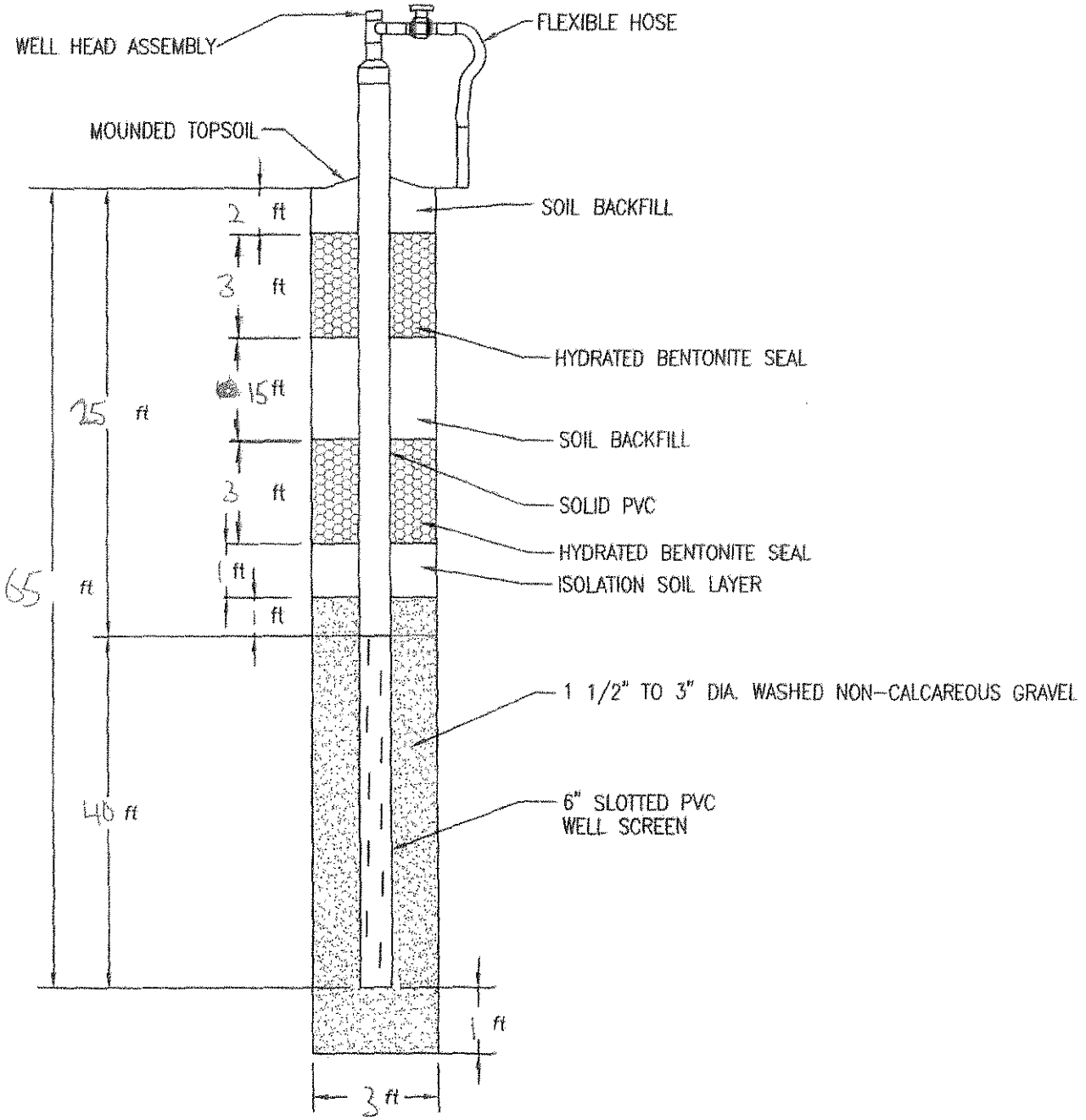
DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO	TIME	REMARKS
0	~4 Ft of Soil				1130	
	Waste					
10						
	Waste					
20		153.5°F			1400	Drilling stopped due to high temp
						No asbestos containing material found
30						
40						
50						
60						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-8
WELL LOCATION: Bridgeton, Missouri
INSTALLATION START DATE: 7/30/05
COMPLETION DATE: 7/30/05
DRILLER: AFG B. Willis
INSPECTOR: Derrick Hermesch

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-9 | SHEET 1 OF SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
CT NUMBER: 1652.10	NAME OF DRILLER(S): R. Wills
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-9	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 487 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/30/05 — DRILLING END DATE: 7/30/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 50 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	David Hermsen

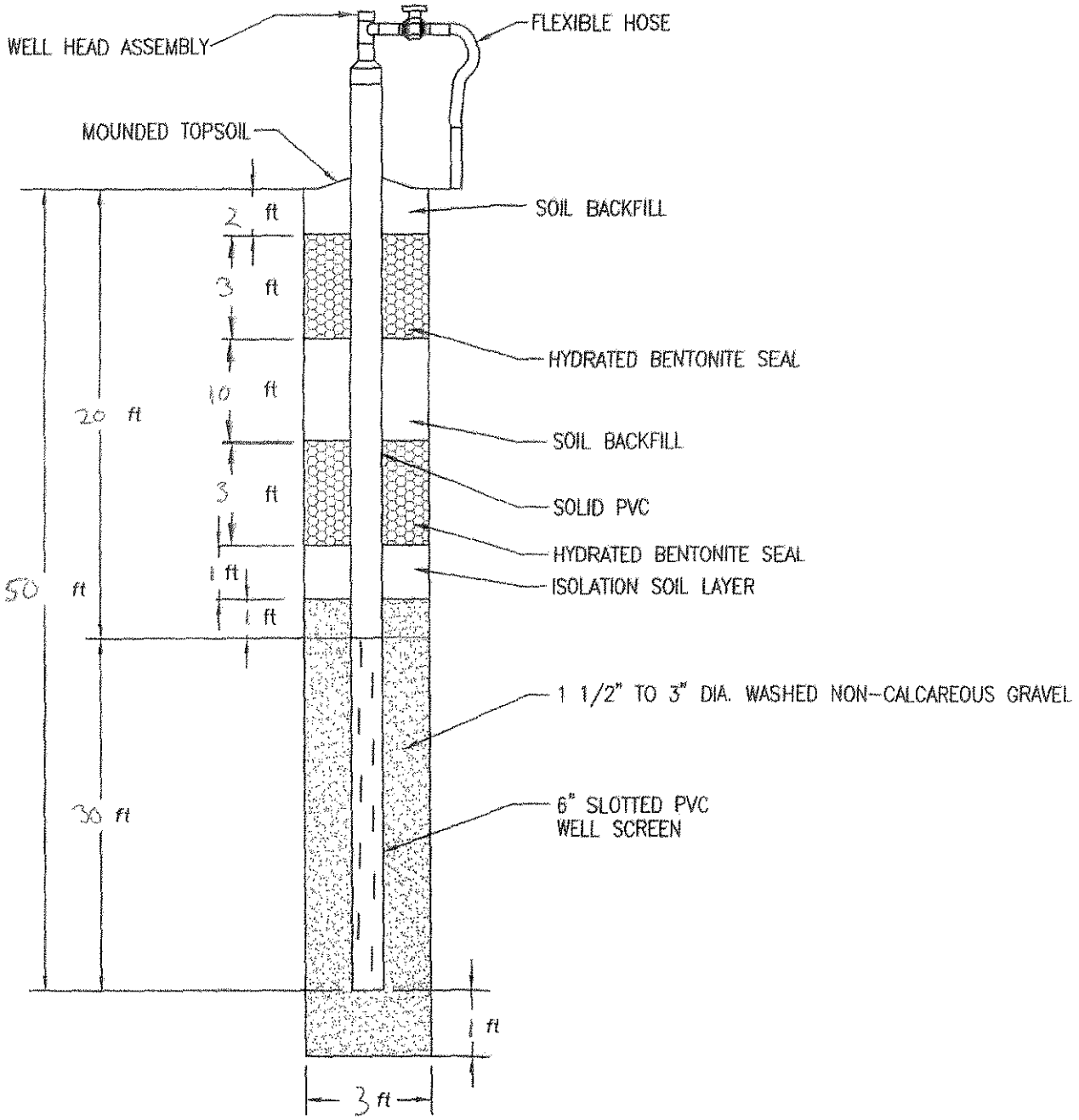
DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	4 ft Soil				0815	
	waste					
10	waste	154°F			0845	Drilling stopped due to high temp.
20						No asbestos containing material observed
30						
40						
50						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-9
WELL LOCATION: Bridgeton, Missouri
INSTALLATION START DATE: 7/30/05
COMPLETION DATE: 7/30/05
DRILLER: AEG B. Willis
INSPECTOR: Derrick Hermesch

COMMENTS:



Aquaterra Drilling Log

HOLE NO: GEW-10 | SHEET 1 OF SHEETS

PROJECT NAME: 2005 LFG Wells/Header @ CQA	DRILLING SUBCONTRACTOR: AEG
CT NUMBER: 1652.10	NAME OF DRILLER(S): B Willis
LOCATION: Bridgeton Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar TMT 4F10
HOLE LOCATION: GEW-10	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: HK 3.58	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/28/05 — DRILLING END DATE: 7/30/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 55 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Derrick Kennedy

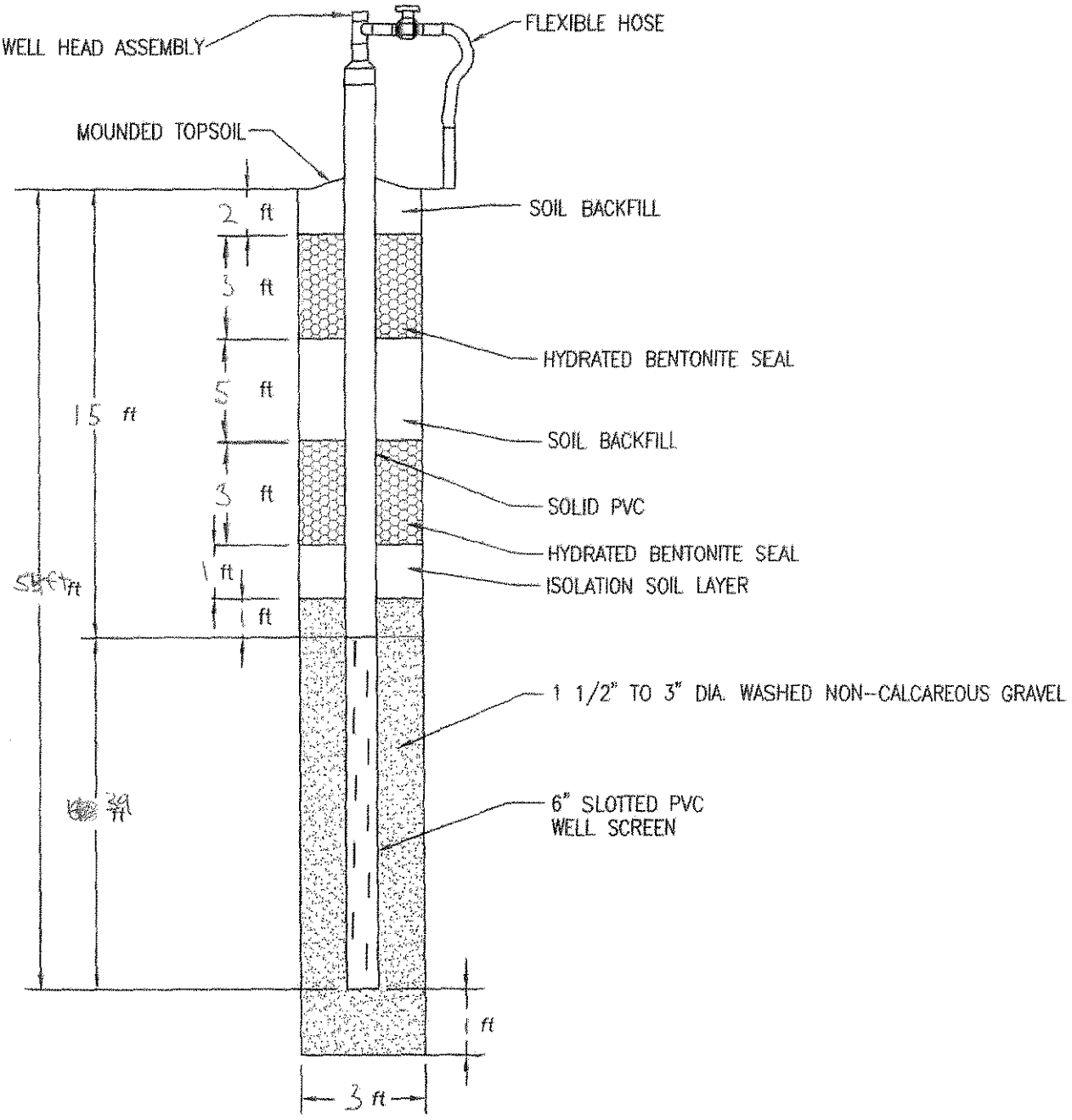
DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Lots soil				1330	
10	Waste					
20	Waste					
					1600	end of day 7/28/05
					0700	Drilling resumes 7/29/05
		161° F			0730	Drilling stopped due to high temp
						No asbestos materials observed

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-16
WELL LOCATION: Bridgeton, Missouri
INSTALLATION START DATE: 7/28/05
COMPLETION DATE: 7/30/05
DRILLER: AEG B. Wills
INSPECTOR: Derrick Hermesch

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-11 | SHEET 1 OF SHEETS

PROJECT NAME: 2005 LFG Wells / Header CQA	DRILLING SUBCONTRACTOR: AEG
CT NUMBER: 1652.10	NAME OF DRILLER(S): B Willis
LC: Bridgeton Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF1D
HOLE LOCATION: GEW-11	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 465'	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/28/05 — DRILLING END DATE:
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 55 Ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Kenneth Nowack

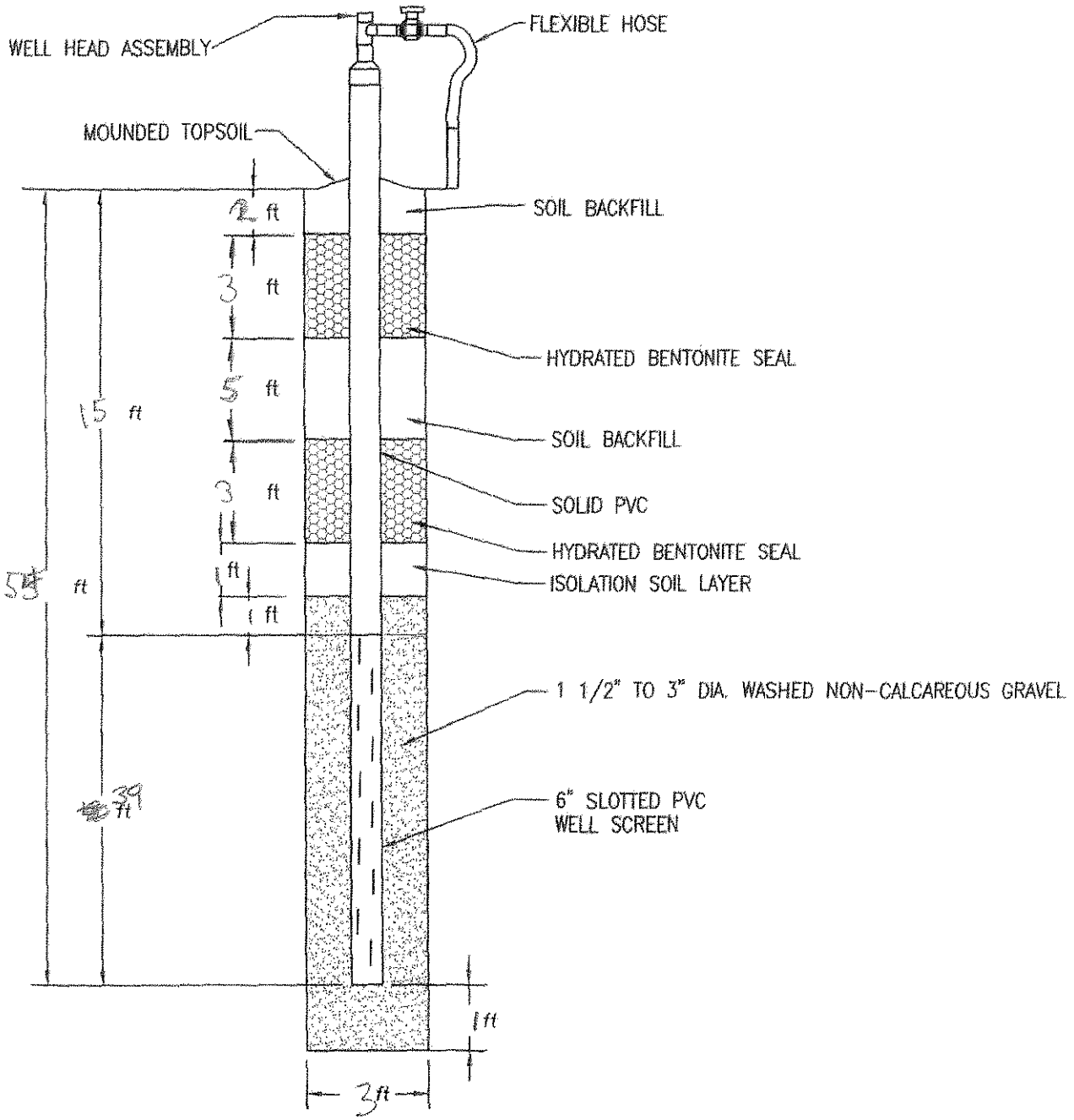
DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	36" of soil				1030	
10	Waste					
20	waste					
30					1300	End of drilling on 7/28/05 55 ft (appropriate well depth reached)
						No asbestos containing materials observed.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW 11
WELL LOCATION: Bridgeton Missouri
INSTALLATION START DATE: 7/28/05
COMPLETION DATE: 7/28/05
DRILLER: AEG - B. Wills
INSPECTOR: Derrick Hermesch

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-12A | SHEET 1 OF 2 SHEETS

PROJECT NAME: GEW-12A Installation CQA	DRILLING SUBCONTRACTOR: PDI
ECT NUMBER: 1944.10	NAME OF DRILLER(S): Mitch
LOCATION: Bridgeton, ~~AB~~ Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Western Bore 200
HOLE LOCATION: Near GEW-12	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3 4" core bucket
SURFACE ELEVATION:	
OVERBURDEN THICKNESS:	DRILLING START DATE: 6/13/06 — DRILLING END DATE:
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE:	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	1½' of soil cover				645	Drilling begins on 6/13/06
	Waste					
20						
30	Waste				800	
40					905	
50						
	Waste				1000	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: GEW-12A Installation CQA | HOLE NO.: GEW-12A

Aquaterra Drilling Log

HOLE NO. GEW-12A | SHEET 2 OF 2 SHEETS

PROJECT NAME: GEW-12A Installation CQA

INSPECTOR: Nathan Higgerson

TH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	Waste				1000	
70						
80	Waste				1105	
90					1220	
		135°F				
100	Waste - heavily decomposed				1300	
		140°F				
	Moist Waste					
110					1420	End of drilling 6/13/06
	End of Boring @ 111 ft					No asbestos containing materials observed during drilling
120						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: GEW-12A Installation CQA

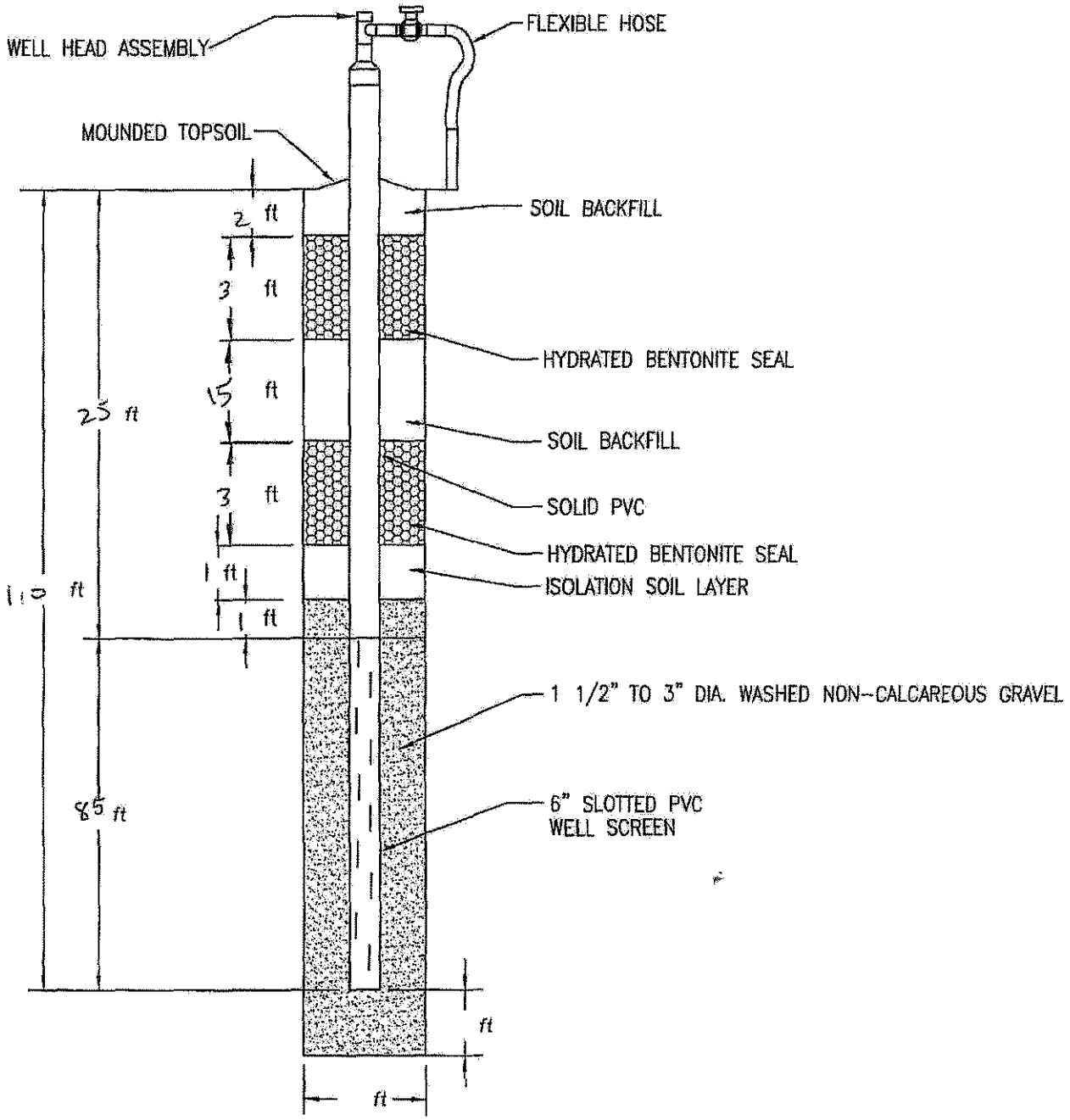
HOLE NO.: GEW-12A

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1944.10
PROJECT NAME: GEW-12A Installation
GAS WELL NO.: GEW-12A
WELL LOCATION: Near GEW-12
INSTALLATION START DATE: 6/13/06
COMPLETION DATE: 6/13/06
DRILLER: ~~Matrix~~ PDI / Landmark
INSPECTOR: N. Higgerson

COMMENTS:



American Environmental Group Ltd.

Well Log

DATE: 7/14/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GEW 13	WELL NUMBER OR NAME
100'	LINEAR FEET OF DRILLING
100'	LINEAR FEET OF COMPLETION
0'	LINEAR FEET OF ABANDONMENT

Time in: Time out:

Weather conditions: Sunny

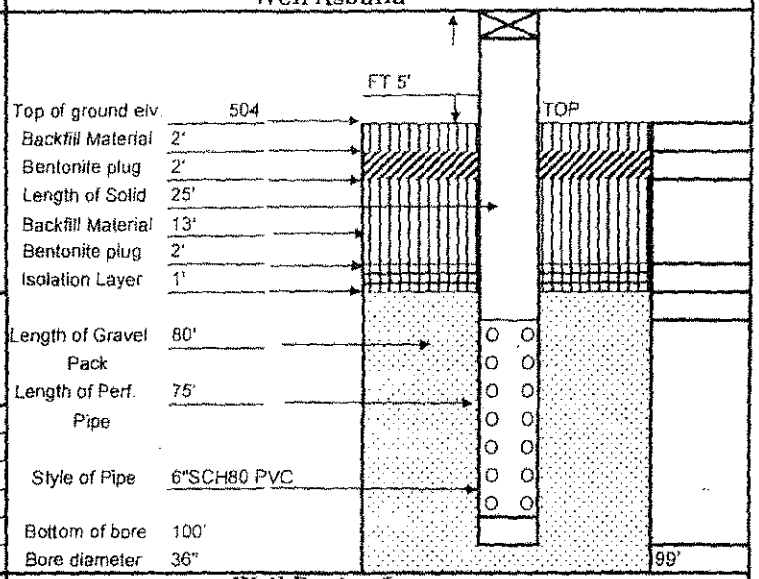
Site conditions:

Rig hrs:

Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

Well Asbuild



Top of ground elv.	504
Backfill Material	2'
Bentonite plug	2'
Length of Solid	25'
Backfill Material	13'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	80'
Length of Perf. Pipe	75'
Style of Pipe	6"SCH80 PVC
Bottom of bore	100'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S	LEL / CO
7:00	20.9	0	0
8:00	"	0	0
9:00	"	0	0
10:00	"	0	0
11:00	"	0	0
12:00	"	0	0
1:00	"	0	0
2:00	"	0	0
3:00	"	0	0
4:00	"	0	0
5:00	"	0	0
6:00	"	0	0

Notes

northing 1067463

easting 515985

Well Boring Log

Depth	Composition	Degree of Decomp	Degree of Moisture	Temp
0-10	DIRT-MSW	LIGHT	DRY	70
10-20	MSW	LIGHT	DRY	71
20-30	MSW	LIGHT	DRY	78
30-40	MSW	LIGHT	DRY	82
40-50	MSW	LIGHT	DRY	88
50-60	MSW	LIGHT	DRY	92
60-70	MSW	LIGHT	DRY	99
70-80	MSW	LIGHT	DRY	108
80-90	SLUGE	HEAVY	WET	116
90-100	SLUGE	HEAVY	WET	TD 100'
100-110				
110-120				
120-130				
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

BRETT WILLIS 7/14/2004

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO. GEW 14A | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG well/Header C2A	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 11652.10	NAME OF DRILLER(S): B Willis
LOCATION: Bridgeton MO	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar 1 mT AF10
HOLE LOCATION: GEW 14A	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 493 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/6/05 — DRILLING END DATE: 7/9/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 85 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Soil 4ft				730	
10	Waste 15ft				815	Drilling stopped due to Rig Breakdown 7/6/05 815hrs
30	Waste					7/9/05 1430 Drilling Resumes on GEW 14A.
50	Waste					
70	Waste					
80	Wet Waste					
90	Endof boring at 85 ft				700 900 700	Endof drilling on 7/9/05 at 85 ft
110						Drilling Resumes 7/9/05 After 2 hours of drilling with no progress total depth was set. No rubber containing materials observed.

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

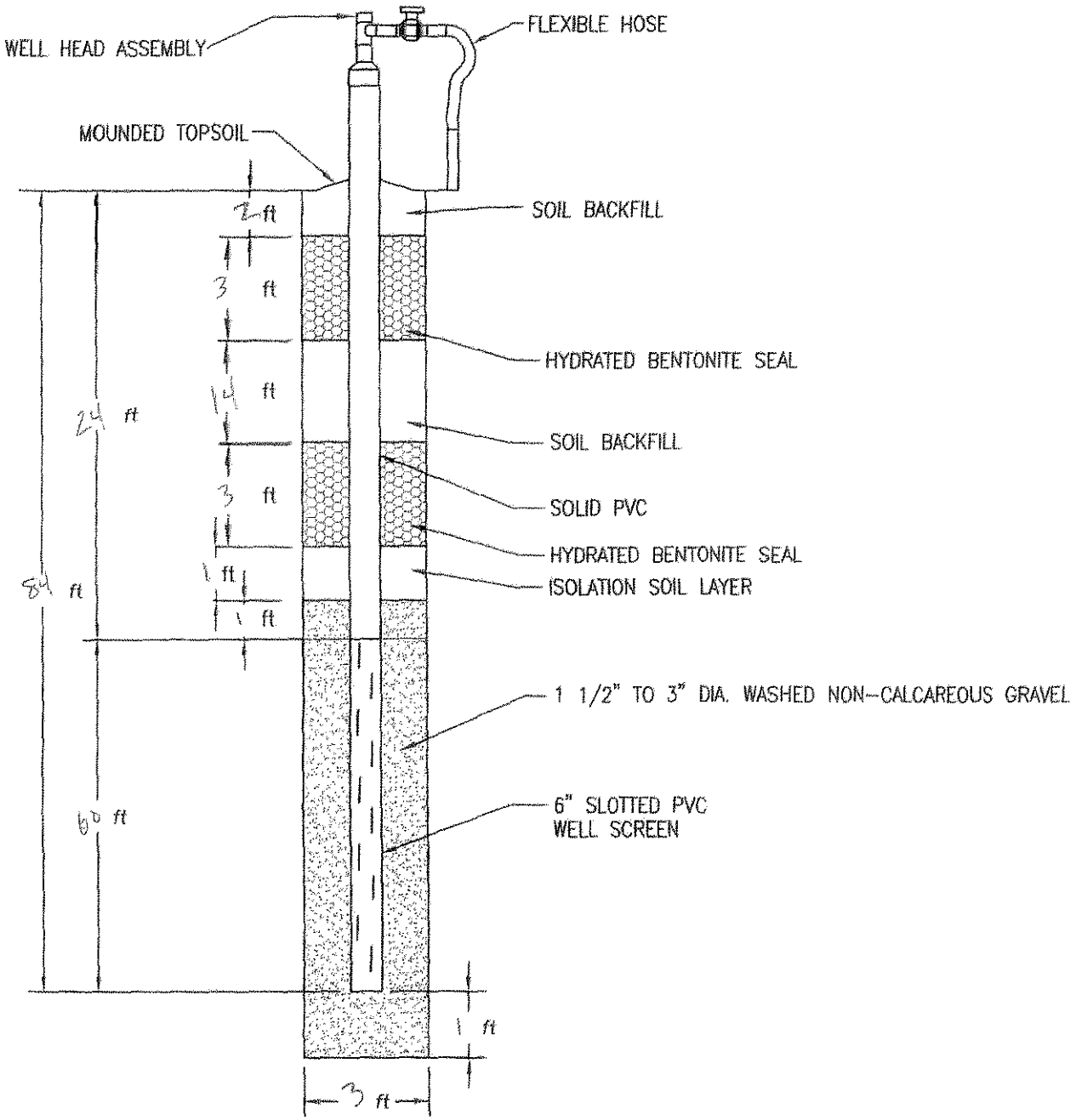
PROJECT NAME: 2005 LFG well/Header C2A | HOLE NO.: 14A

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW 14A
WELL LOCATION:
INSTALLATION START DATE: 7/6/05
COMPLETION DATE: 7/19/05
DRILLER: AEG B Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO: GEW-15 | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PT NUMBER: 165210	NAME OF DRILLER(S): B. Willis
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-15	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36in bucket
SURFACE ELEVATION:	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/26/05 — DRILLING END DATE: 7/27/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 64 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	2 ft of soil Wash				1530	Drilling begin 7/26/05
30	Wash					
40						
50	Wash					
60					1730	Drilling stopped for the day at 60 ft
	Wash				1030	Resume drilling on 7/27/05
70	Drilling stopped at 64 ft due to something undrillable in the hole					Moving over to redrill
80						
90						
100						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.	PROJECT NAME: 2005 LFG Wells/Header CQA	HOLE NO.: GEW-15

Aquaterra Drilling Log

HOLE NO. GEW-15 | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
JECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
ON: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar 3MT AP10
HOLE LOCATION: GEW-15	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in bucket
SURFACE ELEVATION:	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/27/05 — DRILLING END DATE: 7/27/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 80 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Higgs

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	Waste 7 ft of Soil				1200	Drilling began 7/27/05
30	Waste					
40						
50	Waste					
60		130°F			1330	
70	Waste					
80		158°F 156°F			1430	End of drilling on 7/27/05 at 80ft due to high temperatures
	End of boring at 80ft					No asbestos containing materials observed
90						
100						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

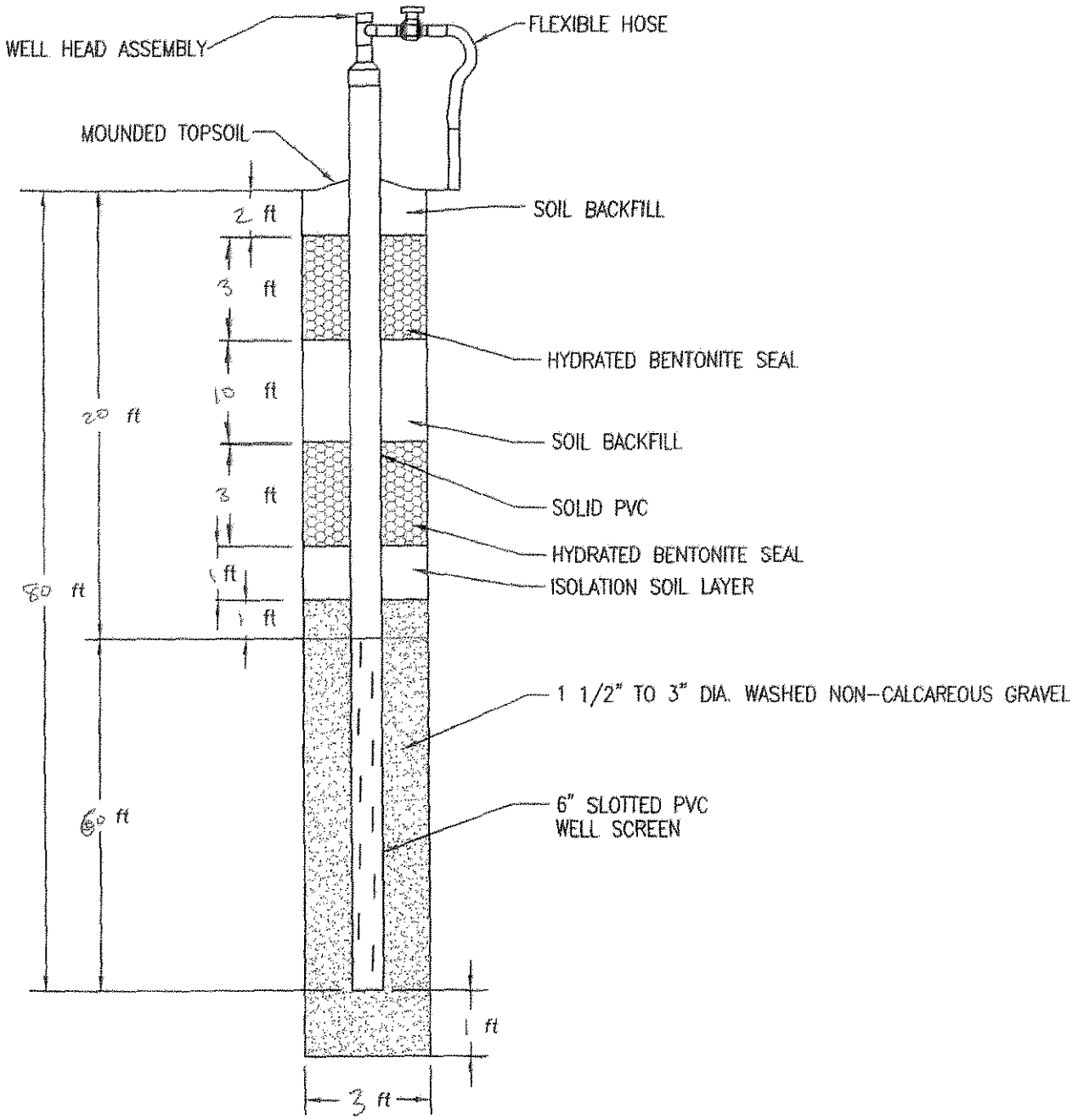
PROJECT NAME: 2005 LFG Wells/Header CQA | HOLE NO.: GEW-15

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: QEW - 15
WELL LOCATION: Bridgeton, Missouri
INSTALLATION START DATE: 7/27/05
COMPLETION DATE: 7/27/05
DRILLER: AEG - B. Willis
INSPECTOR: Nathan Hyggerson

COMMENTS:



Gas Extraction Well Drilling Summary — Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 16R | Elevation: Ground 507.5

Exact Location (Coordinates): N:1067385.1 E:515724.6

Date Started: 9/12/2009 | Date Completed: 9/12/2009

Boring Size: 36 inch | Total Depth: 56

Length of Perforated Pipe: 35 | Length of Solid Pipe: 20

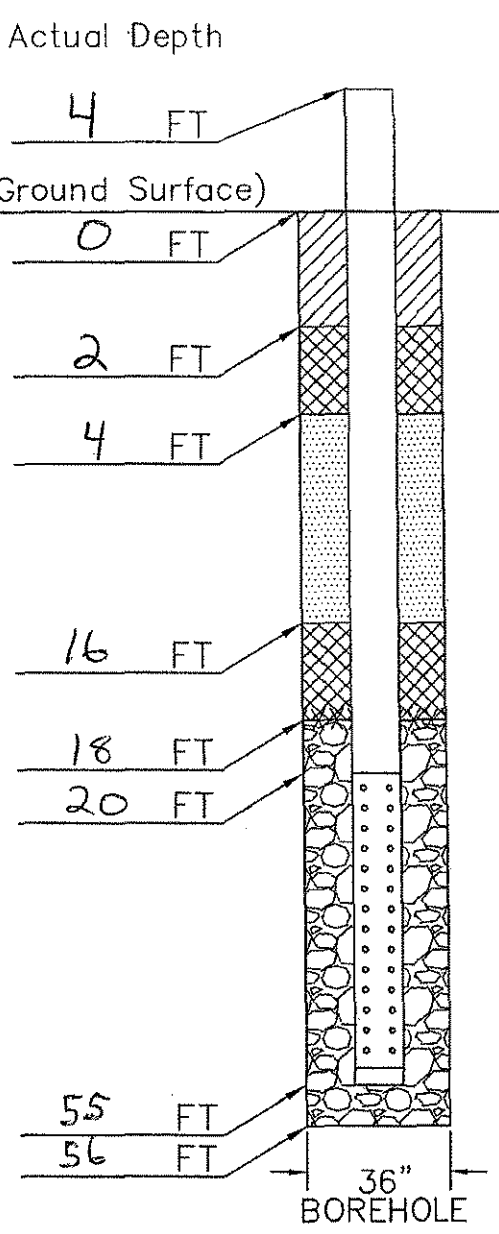
Comments:

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	94	
2-4	soil/dry	94	
4-6	soil/dry	97	
6-10	soil/dry	98	
10-15	soil/trash/dry	98	
15-20	trash/dry	98	
20-25	trash/dry	100	
25-30	trash/dry	101	
30-35	trash/dry	101	
35-40	trash/dry	104	
40-45	trash/dry	106	
45-50	trash/dry	109	
50-55	trash/dry	111	
55-60	trash/dry	115	
60-65			
65-70			
70-75			
75-80			
80-85			
85-90			
90-95			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 16R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-12-09 Completed Install.: 9-12-09
Time: 12:30pm Time: 3:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 527.5 Location: N 1067385.1 E 515724.6



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 35
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 17R | Elevation: Ground 501.0

Exact Location (Coordinates): N:1067204.8 E:515576.6

Date Started: 9/15/2009 | Date Completed: 9/15/2009

Boring Size: 36 inch | Total Depth: 95

Length of Perforated Pipe: 74 | Length of Solid Pipe: 20

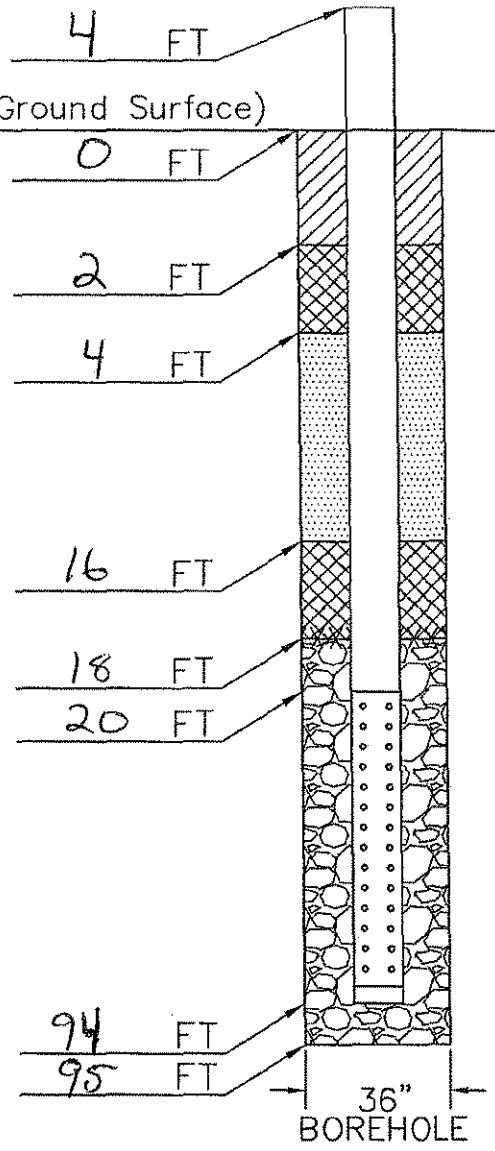
Comments: 15 feet NE of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	95	
2-4	soil/dry	95	
4-6	soil/dry	95	
6-10	soil/dry	95	
10-15	trash/dry	100	
15-20	trash/dry	101	
20-25	trash/dry	102	
25-30	trash/dry	104	
30-35	trash/dry	106	
35-40	trash/dry	108	
40-45	trash/dry	109	
45-50	trash/dry	111	
50-55	trash/dry	112	
55-60	trash/dry	112	
60-65	trash/dry	115	
65-70	trash/dry	116	
70-75	trash/dry	117	
75-80	trash/dry	117	
80-85	trash/dry	117	
85-90	trash/dry	119	
90-95	trash/dry	121	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 17R
Drilling Contractor: A.E.&L. Observed By: Joshua Ross
Started Install.: 9-15-09 Completed Install.: 9-15-09
Time: 6:00am Time: 10:00am

Top of Flange Elevation: _____
Ground Surface Elevation: 501.0 Location: N 1067209.8 E 515576.6



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 74
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

roject Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 18R | Elevation: Ground 483.3

Exact Location (Coordinates): N:1067089.9 E:515454.3

Date Started: 9/12/2009 | Date Completed: 9/12/2009

Boring Size: 36 inch | Total Depth: 94

Length of Perforated Pipe: 73 | Length of Solid Pipe: 20

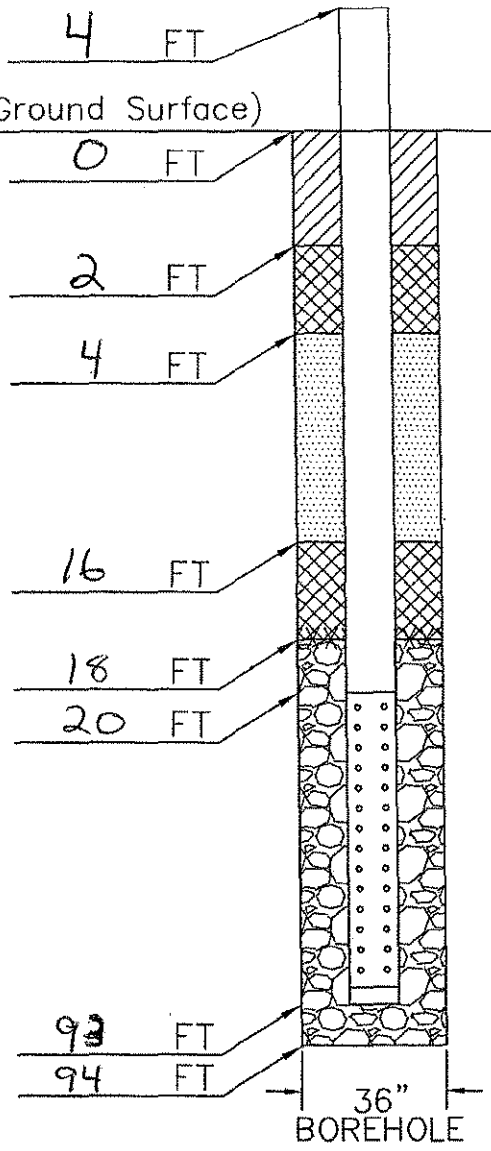
Comments: 20 feet north of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	92	
2-4	soil/dry	92	
4-6	soil/dry	92	
6-10	soil/trash/dry	96	
10-15	soil/trash/dry	96	
15-20	trash/dry	97	
20-25	trash/dry	98	
25-30	trash/dry	98	
30-35	trash/dry	103	
35-40	trash/dry	104	
40-45	trash/dry	104	
45-50	trash/dry	107	
50-55	trash/damp	109	
55-60	trash/moist	109	
60-65	trash/sludge/wet	111	
65-70	sludge/wet	119	
70-75	sludge/wet	120	
75-80	sludge/wet	121	
80-85	sludge/wet	121	
85-90	sludge/wet	126	
90-95	sludge/wet	128	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 18R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-12-09 Completed Install.: 9-12-09
Time: 6:00am Time: 12:00 pm

Top of Flange Elevation: _____
Ground Surface Elevation: 483.3 Location: N 1067089.9 E 515454.3



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 73
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Aquaterra Drilling Log

HOLE NO. GEW-19A | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
T N Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT 4710
HOLE LOCATION: GEW-19A	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36in Bucket
SURFACE ELEVATION: 487 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 6/30/05 — DRILLING END DATE: 7/1/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 85 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
✓	✓	—	—	Nathan Hogg

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	1.5ft of soil Waste				1430	Drilling begins on 6/30/05
30	Waste					
40						
50	Waste				1530	End of drilling on 6/30/05 at approximate depth of 55 ft
60	Wet Waste				700	Resume drilling on 7/1/05
70	Waste					Waste is wet at this depth End of borehole on 7/1/05 at approx. 85 ft.
80	End of the boring at 85 ft.					No asbestos containing materials observed
90						
100						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

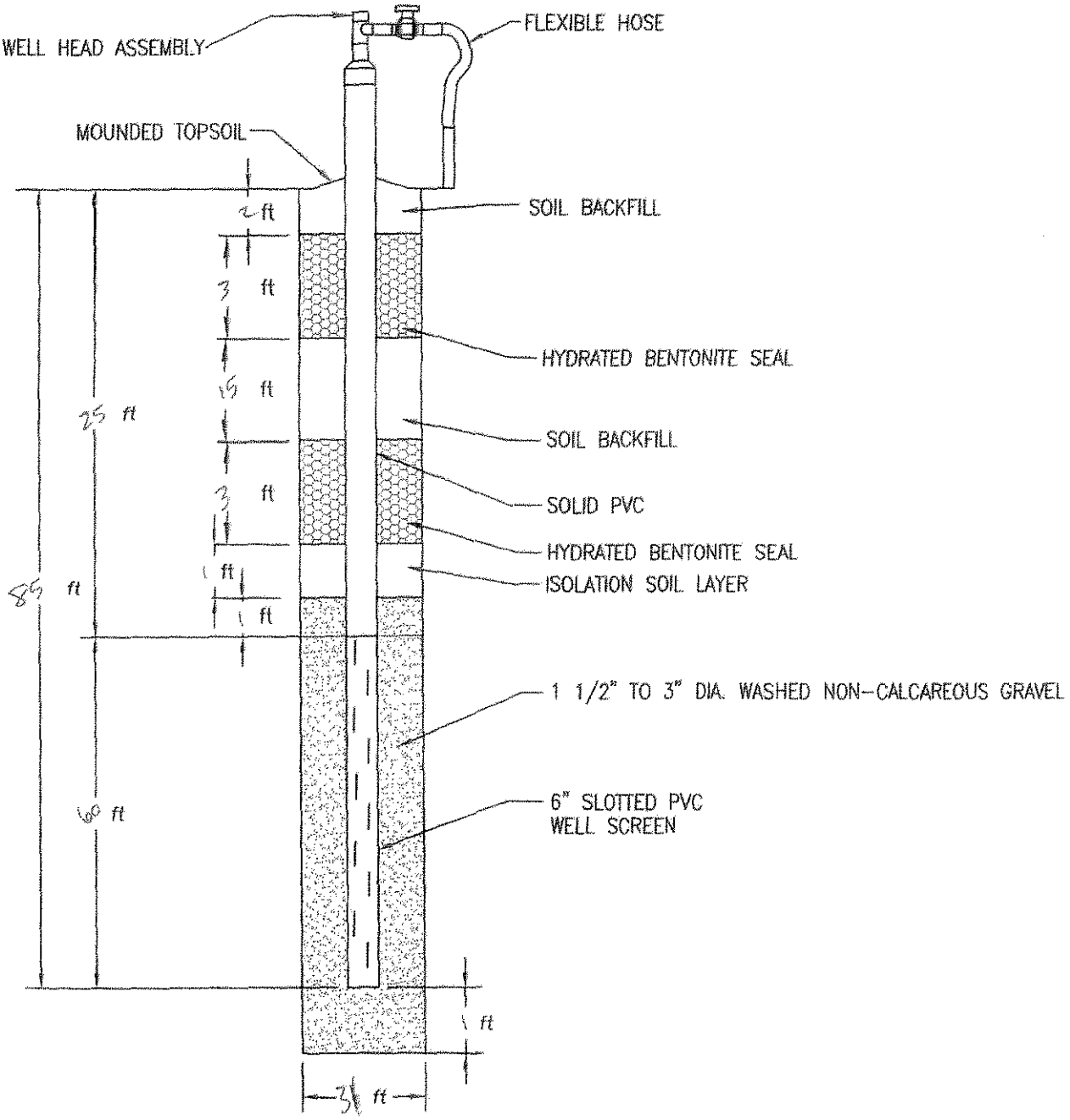
PROJECT NAME: 2005 LFG Wells/Header CQA | HOLE NO.: GEW-19A

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-19A
WELL LOCATION:
INSTALLATION START DATE: 6/30/05
COMPLETION DATE: 7/1/05
DRILLER: B Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-20A | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-20A	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36in bucket
SURFACE ELEVATION: +480	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 6/30/05 — DRILLING END DATE: 6/30/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: —	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Riggs

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
1'	Waste — 3ft of 30:1				730	Drilling began on 6/30/05
3'	Waste					
5'						
6'	Waste				930	
7'	Wet					Wet Waste at approximately 70 ft.
8'						
9'	Waste				1130	End of the drilling on 6/30/05
10'	End of the boring at 94 ft				1230	No asbestos containing materials observed.

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

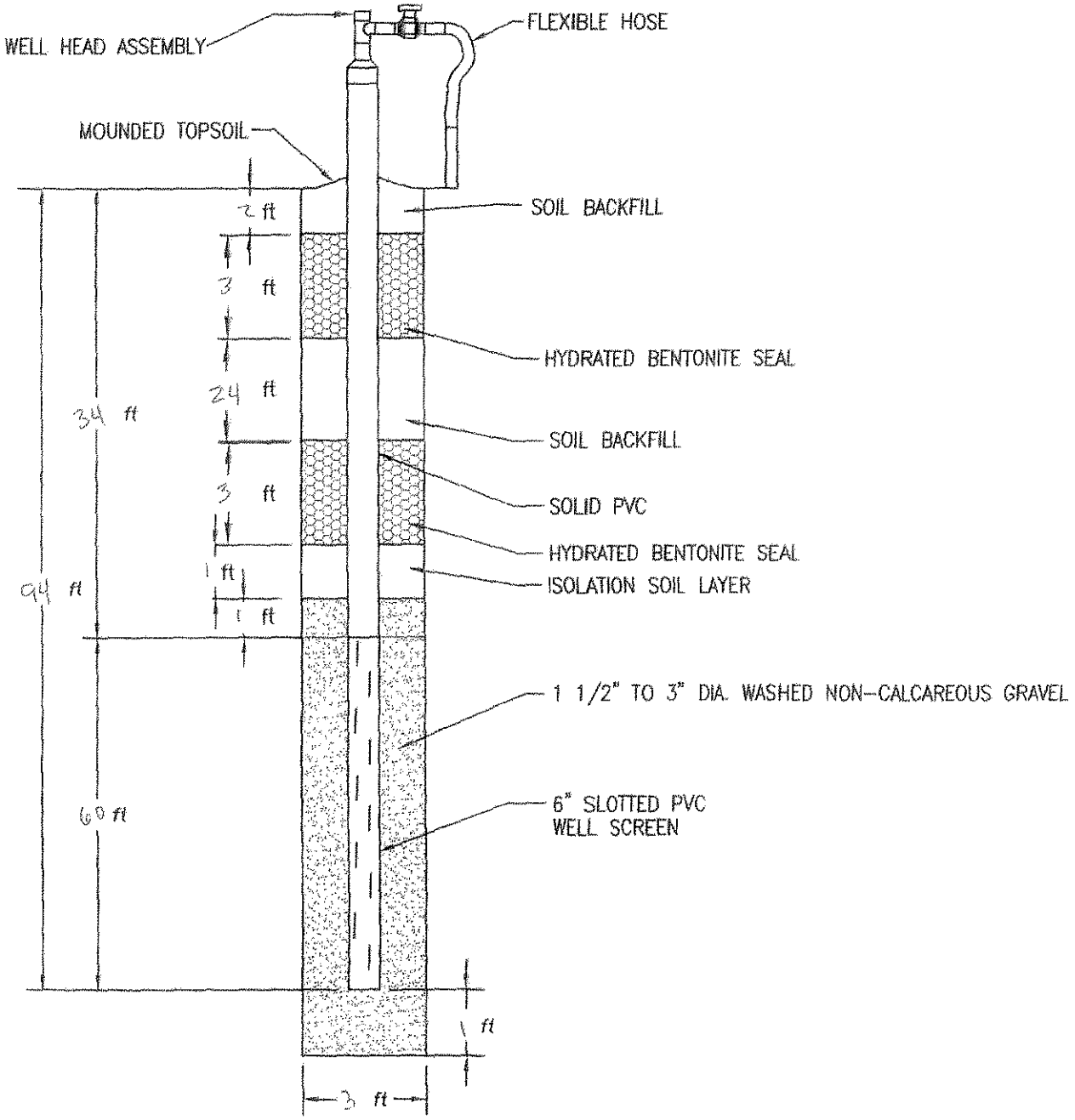
PROJECT NAME: 2005 LFG Wells/Header CQA | HOLE NO.: GEW-20A

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW - 20A
WELL LOCATION:
INSTALLATION START DATE: 6/30/05
COMPLETION DATE: 6/30/05
DRILLER: AEG B Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-21A | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Well/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652 10	NAME OF DRILLER(S): B. Willis
ON: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-21A	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in. Bucket
SURFACE ELEVATION: 506.47 CL	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/2/05 — DRILLING END DATE: 7/5/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE:	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	Waste — End of soil 4 ft of soil				1515	
30	Waste					
40					1615	End of drilling on 7/2/05 at 40 ft. Drilling begins 7/5/05 1330
50						
60						
70						wet waste
80	Waste				1385	
90						
100						
110	Waste — End of Borehole 110 ft				1630	Drilled to depth no asbestos containing material observed

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

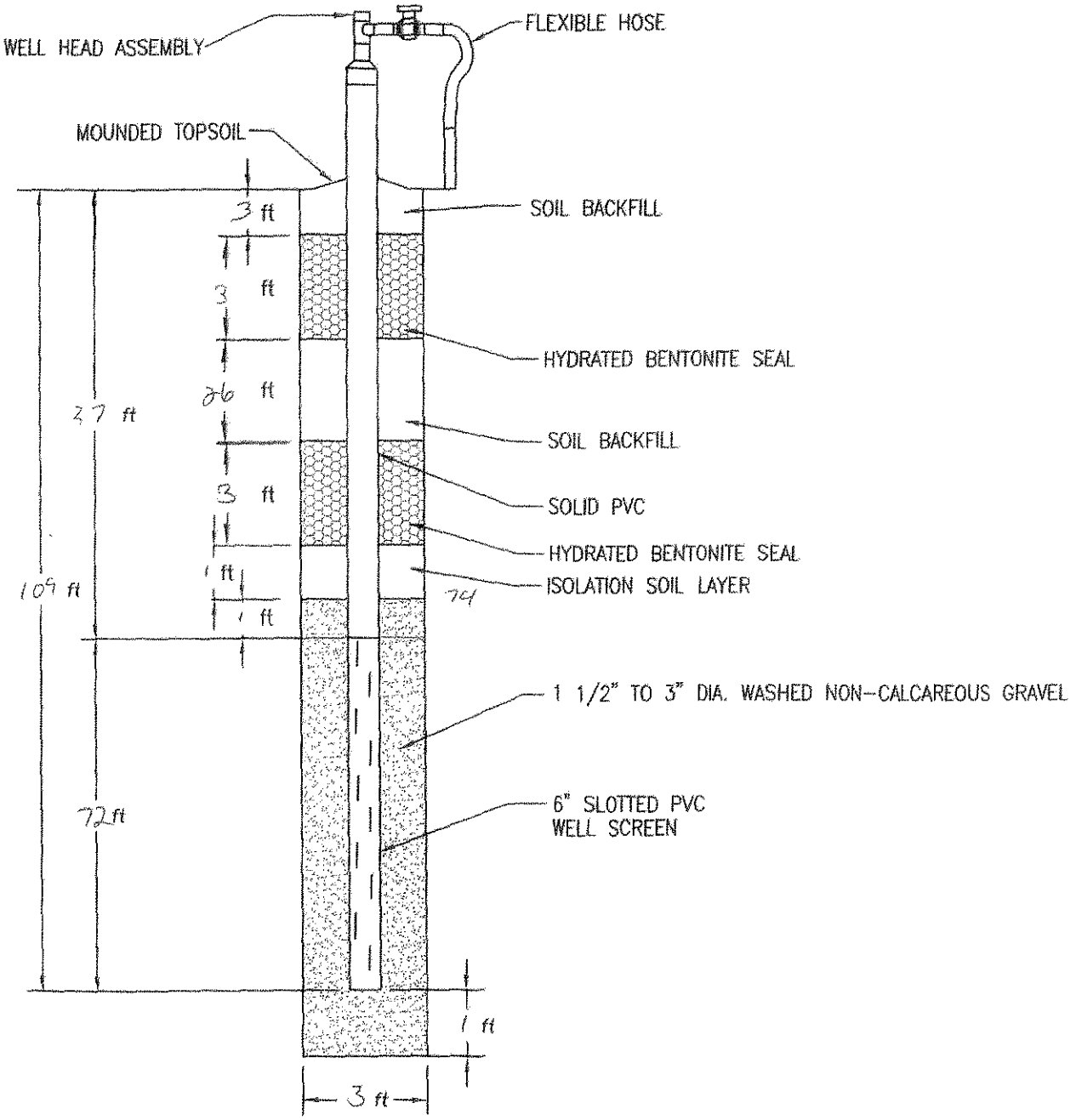
PROJECT NAME: 2005 LFG Well / Header CQA | HOLE NO.: GEW-21A

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10 PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: 21A WELL LOCATION: South SWPF
INSTALLATION START DATE: 7/8/05 COMPLETION DATE: 7/5/05
DRILLER: AEG (B. Wills) INSPECTOR: J. Jordan

COMMENTS: No ACM observed



Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 22R | Elevation: Ground 497.6

Exact Location (Coordinates): N:1066784.5 E:515579.1

Date Started: 9/11/2009 | Date Completed: 9/11/2009

Boring Size: 36 inch | Total Depth: 94

Length of Perforated Pipe: 73 | Length of Solid Pipe: 20

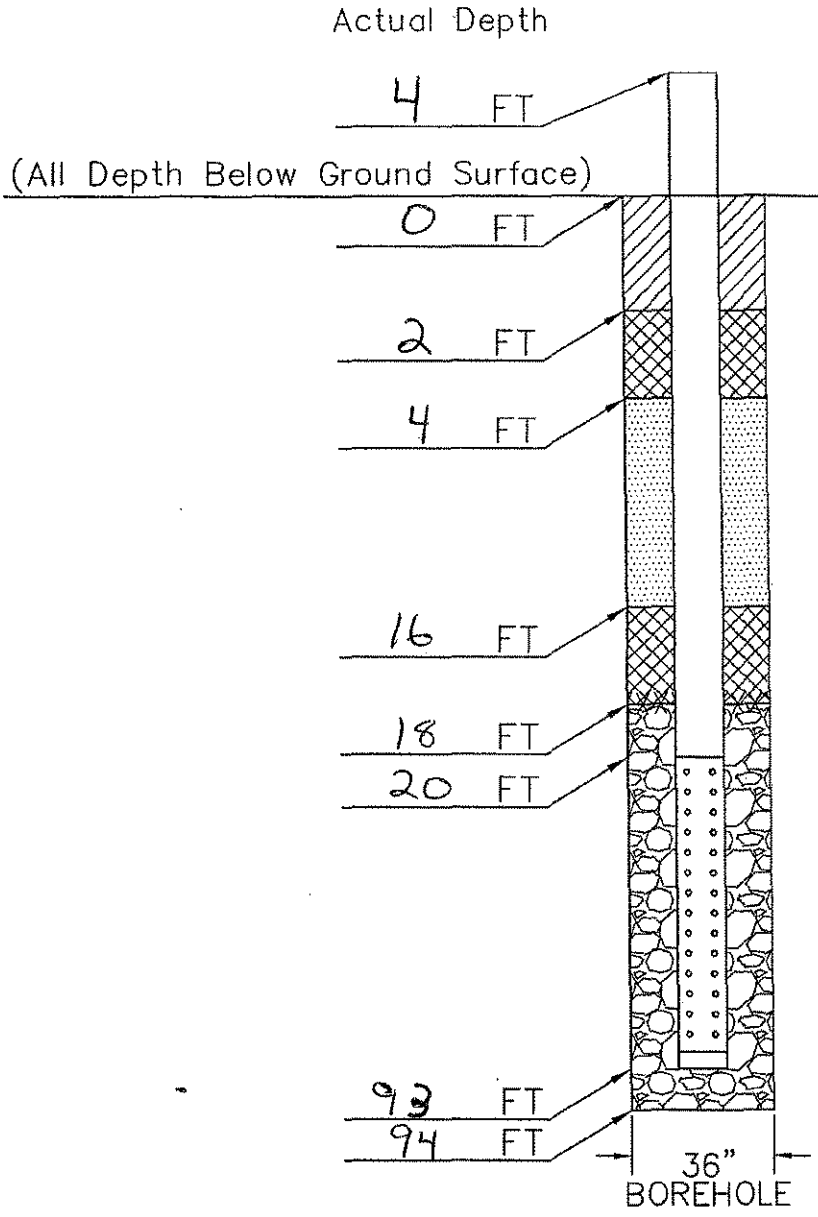
Comments:

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry		
2-4	soil/dry		
4-6	soil/dry	94	
6-10	soil/dry	94	
10-15	soil/trash/dry	94	
15-20	trash/dry	97	
20-25	trash/dry	99	
25-30	trash/dry	99	
30-35	trash/dry	103	
35-40	trash/dry	105	
40-45	trash/dry	108	
45-50	trash/dry	108	
50-55	trash/dry	109	
55-60	trash/dry	113	
60-65	trash/dry	113	
65-70	trash/dry	113	
70-75	trash/damp	117	
75-80	trash/moist	118	
80-85	trash/sludge/wet	118	
85-90	sludge/wet	123	
90-95	sludge/wet	125	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 22R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-11-09 Completed Install.: 9-11-09
Time: 6:00am Time: 5:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 497.6 Location: N1066784.5 E 515579.1



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 73
Diameter: 6in
Plug: 6in cap

Aquaterra Drilling Log

HOLE NO. GEW-23A | SHEET 1 OF 2 SHEETS

PROJECT NAME: GEW 23A & 27A CQA	DRILLING SUBCONTRACTOR: PDI
PROJECT NUMBER: 2048.10	NAME OF DRILLER(S): MITCH WILKENSON
LOCATION: BRIDGETON, MISSOURI	MANUFACTURER'S DESIGNATION OF DRILL: WESTERN BORE 200 CRAWLER DRILL
HOLE LOCATION: 25' NORTH OF GEW 23 MIDDLE OF SOUTHWEST SLOPE OF 2006 FINAL COVER	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 24" BUCKET; 2 OVERSTONES FROM LANDMARK; 35" DIAMETER HOLE
SURFACE ELEVATION: 505 ±	
OVERBURDEN THICKNESS: 7' ±	DRILLING START DATE: 10-2-06 / DRILLING END DATE: 10-2-06
DEPTH DRILLED INTO ROCK: NO	DEPTH GROUNDWATER ENCOUNTERED: NO
TOTAL DEPTH OF HOLE: 103'	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NO

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
FILLED	GRAVEL, BENTONITE, SOIL	—	GAS WELL	TERRY L. MUELLER

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	0+00				0900	
	CL	0+02		SOIL		
	0+07	0+05	SOLID 6" PVC	BENTONITE	0910	
10				SOIL		
		0+17		BENTONITE		
20	WASTE	0+20 / 0+21		SOIL		DRY
				0+22		
30						WASTE TEMPERATURE 75°-80°F
	0+38				1000	
40	WASTE		GRAVEL / PERFORATED 6" PVC / GRAVEL			
50	0+53				1100	
	WASTE					
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: GEW 23A & 27A CQA | HOLE NO.: GEW 23A

Aquaterra Drilling Log

HOLE NO. GEW-23A | SHEET 2 OF 2 SHEETS

PROJECT NAME: GEW 23A & 27A CQA

INSPECTOR: [signature] (Terry L. Mueller)

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	WASTE					
	0+64				1200	
70	WASTE					
	0+76				1300	WASTE TEMPERATURE 95°-100°F
80	WASTE					
	0+88				1400	DRY
						0+92 DAMP
90	WASTE					
	1+00				1500	0+98 WET
	1+03 WASTE		GRAVEL / PERFORATED 6" PVC / GRAVEL; 1+02		1515	1+03 SATURATED
	Bottom					COULD NOT REMOVE ANY MORE AS IT WAS TOO SOUPY.
110	WASTE					
						NO ASBESTOS MATERIALS OBSERVED
						[signature]

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: GEW 23A & 27A CQA

HOLE NO.: GEW-23A

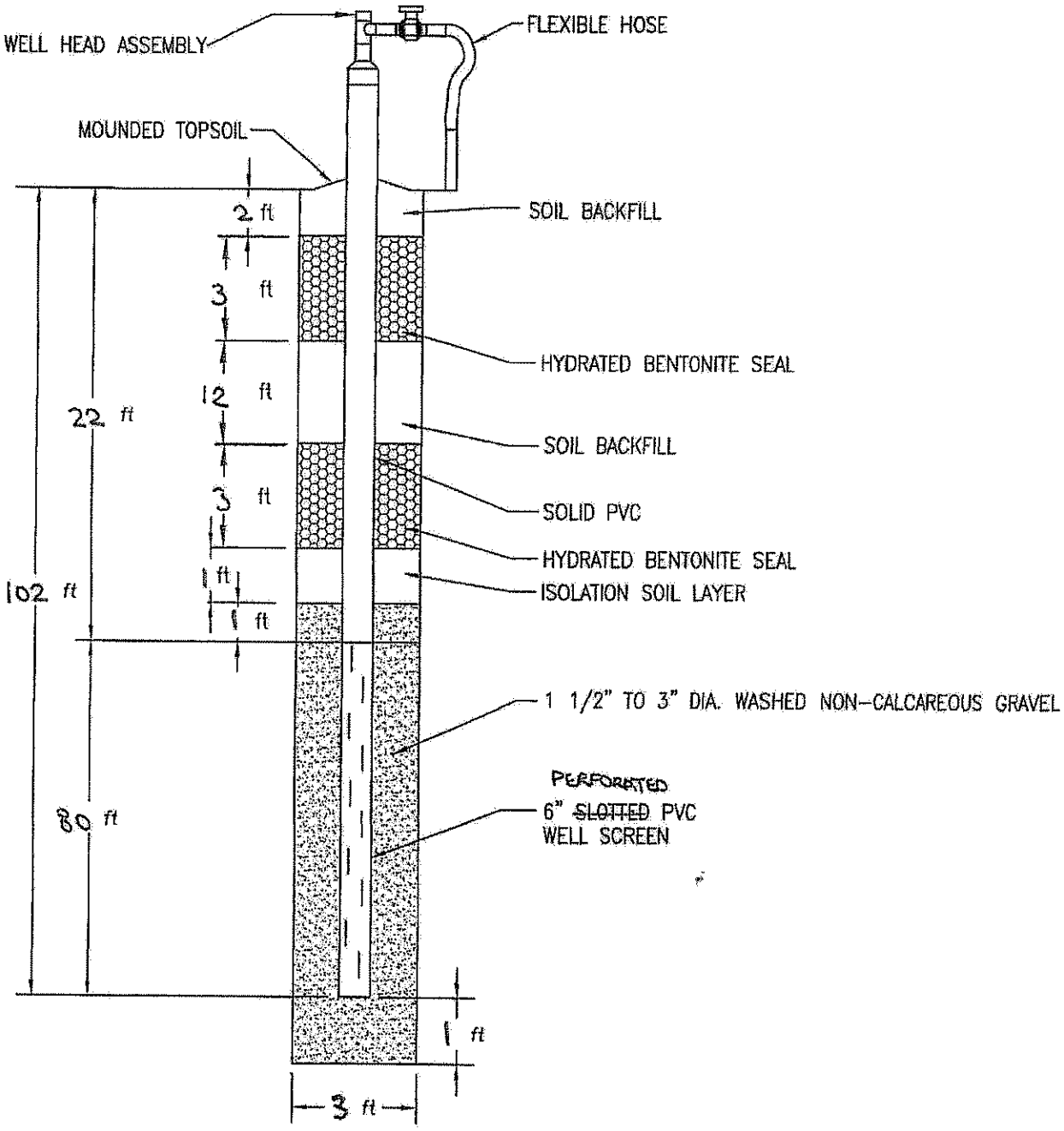
AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 2048.10
GAS WELL NO.: 23A
INSTALLATION START DATE: 10-2-06
DRILLER: Mitch Wilkerson PDI

PROJECT NAME: GEW 23A & 23A COA
WELL LOCATION: Middle of Southwest Slope of 2006 Final Cover 25' North of GEW 23
COMPLETION DATE: 10-2-06
INSPECTOR: Terry L. Mueller

COMMENTS: Soupy material past 102 foot depth.



Aquaterra Drilling Log

HOLE NO. 24A | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 Gas Wells / Hooker COA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
N: Bridgeton Landfill, LLC	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar AF 10 (IMT)
HOLE LOCATION: South Slope	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36in. bucket
SURFACE ELEVATION: 510.50	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 6/27/05 — DRILLING END DATE: 6/27/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: —	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Soil				745	Soil to 4'
					800	
10	waste					Dry waste
30						
40						
50						
60						
70					1030	wet waste
80	waste					
90					1100	very wet waste
100	waste					
110						
	Drilling Complete Bore hole 117'				1415	no ACM Observed

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

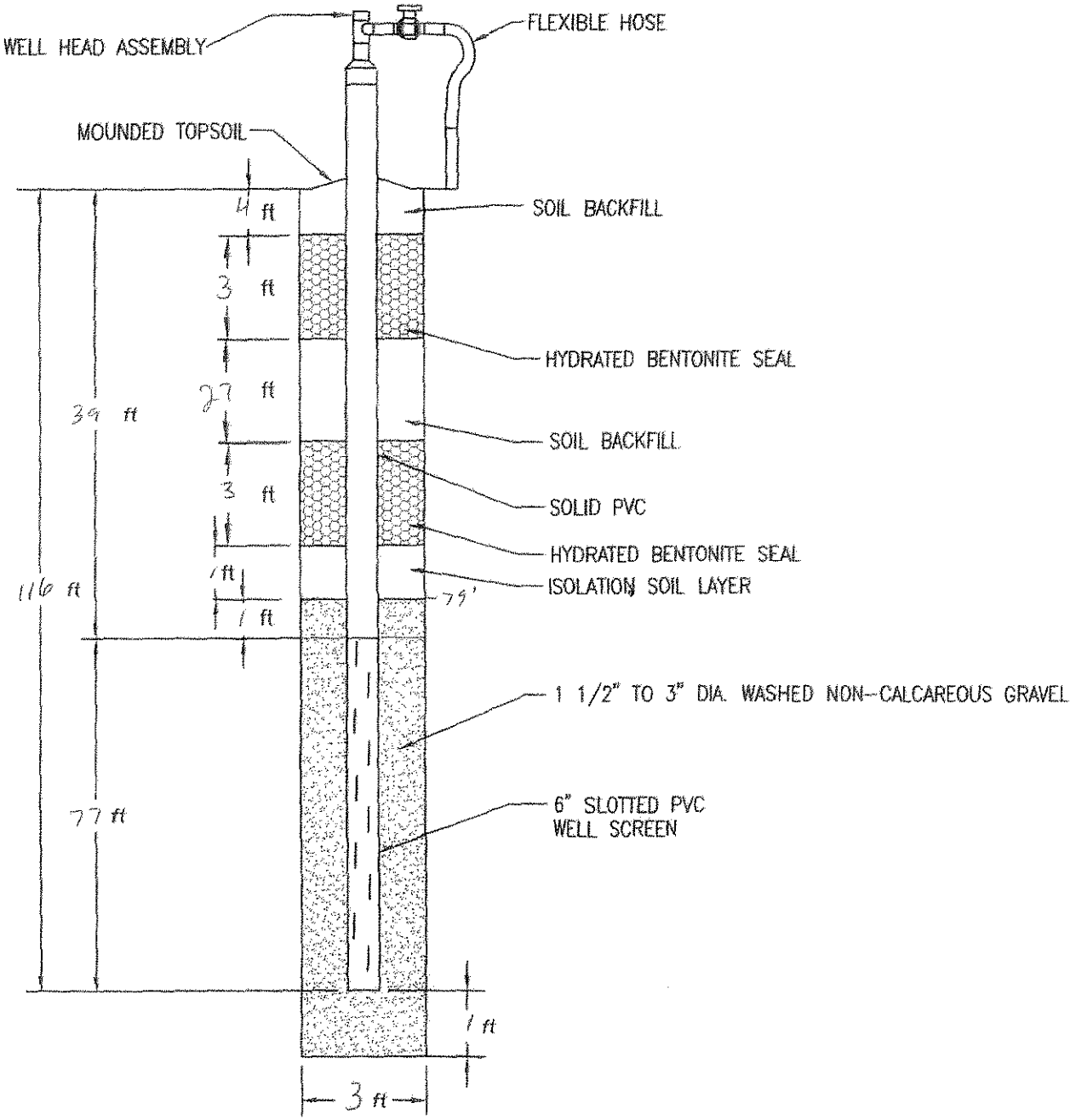
PROJECT NAME: 1652.10 | HOLE NO.: 24A

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: 24A
WELL LOCATION: South Slope
INSTALLATION START DATE: 6/27
COMPLETION DATE: 6/27
DRILLER: AEG (B. Wilis)
INSPECTOR: J. Jordan

COMMENTS: No Acm Observed



Aquaterra Drilling Log

HOLE NO. 25A | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 Gas well / Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Wills, K. Hickman
N: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar AE-10 (Mini)
HOLE LOCATION: South Slope	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36" Bucket
SURFACE ELEVATION: 521.20	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 6/27/05 — DRILLING END DATE:
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE:	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

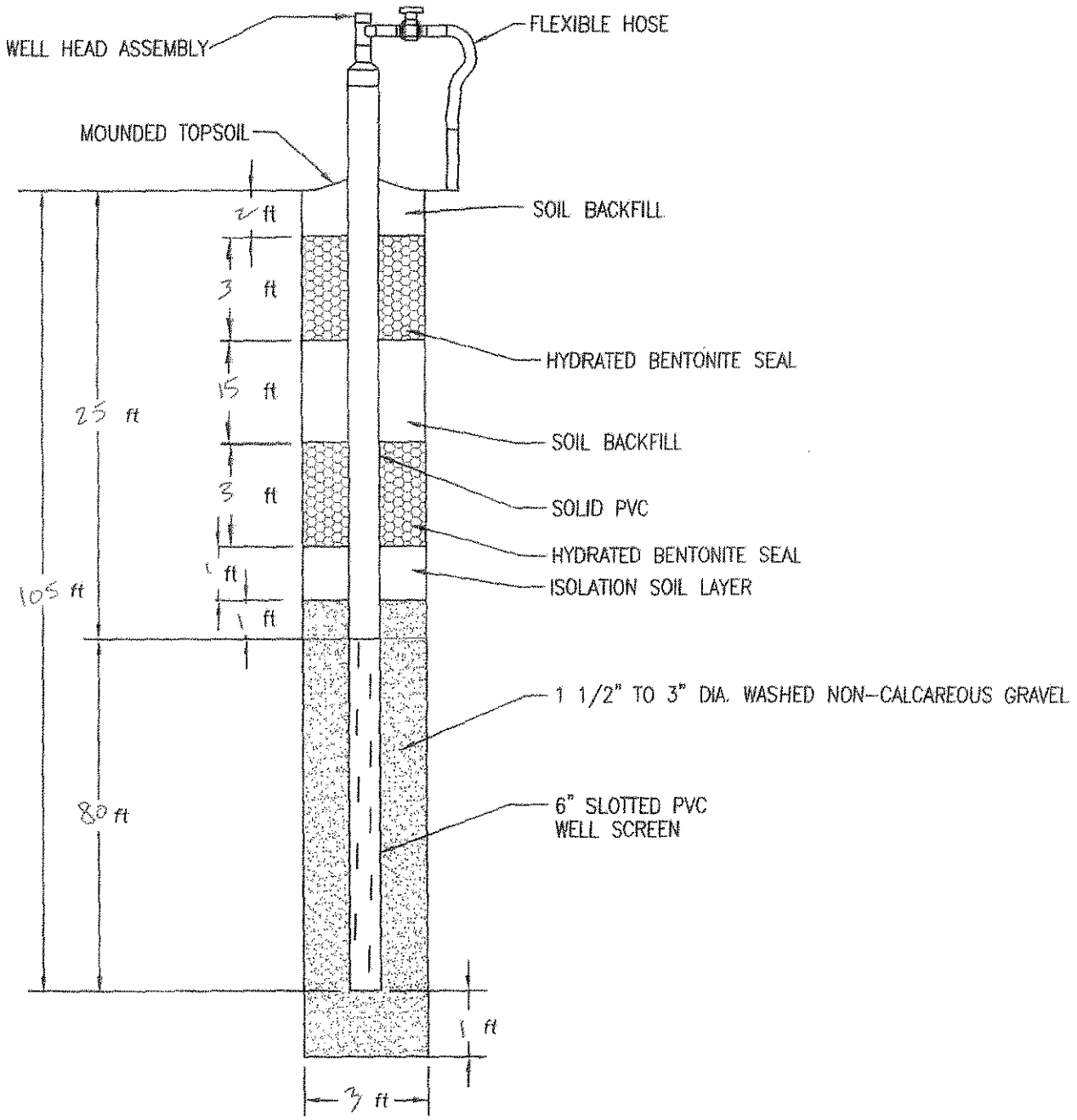
DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Soil				1600	4' Soil
10					1620	Dry waste
	waste					
30						
40						
50					1710	Drilling stopped
	waste					
60					1050	Drilling Resumed 6/28
70	Waste					
80						Wet waste
90	Waste					
					1420	End of boring on 6/28/05 due to wet waste clogging the borehole. No asbestos containing materials observed.
105	waste End of Boring at 105 ft					

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-25A
WELL LOCATION:
INSTALLATION START DATE: 6/28/05
COMPLETION DATE: 6/28/05
DRILLER: B. Wills
INSPECTOR: Nathan Higgerson

COMMENTS:



Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 26R
Elevation: Ground 518.4
Exact Location (Coordinates): N:1066515.7 E:516006.9
Date Started: 9/1/2009
Date Completed: 9/1/2009
Boring Size: 36 inch
Total Depth: 105
Length of Perforated Pipe: 84
Length of Solid Pipe: 20
Comments: 20 feet East of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	95	
2-4	soil/dry	95	
4-6	soil/dry	95	
6-10	soil/dry	96	
10-15	trash/dry	99	
15-20	trash/dry	100	
20-25	trash/dry	102	
25-30	trash/dry	106	
30-35	trash/dry	107	
35-40	trash/dry	110	
40-45	trash/dry	115	
45-50	trash/dry	115	
50-55	trash/dry	115	
55-60	trash/dry	118	
60-65	trash/dry	119	
65-70	trash/dry	119	
70-75	trash/dry	121	
75-80	trash/dry	122	
80-85	trash/dry	124	
85-90	trash/dry	124	
90-95	trash/dry	128	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

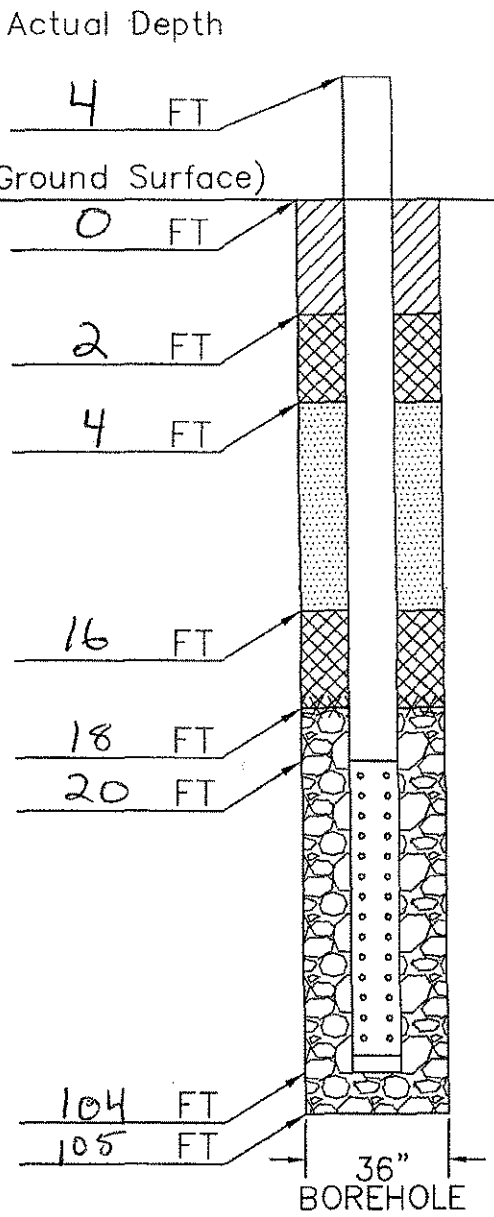
QA/QC Monitor: Joshua Ross

95-100	trash/dry	128	
100-105	trash/dry	129	
105-110			
110-115			
115-120			
120-125			
125-130			
130-135			
135-140			
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 26R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-1-09 Completed Install.: 9-1-09
Time: 10:00am Time: 4:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 518.4 Location: N 1066515.7 E 516006.9



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 84
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Aquaterra Drilling Log

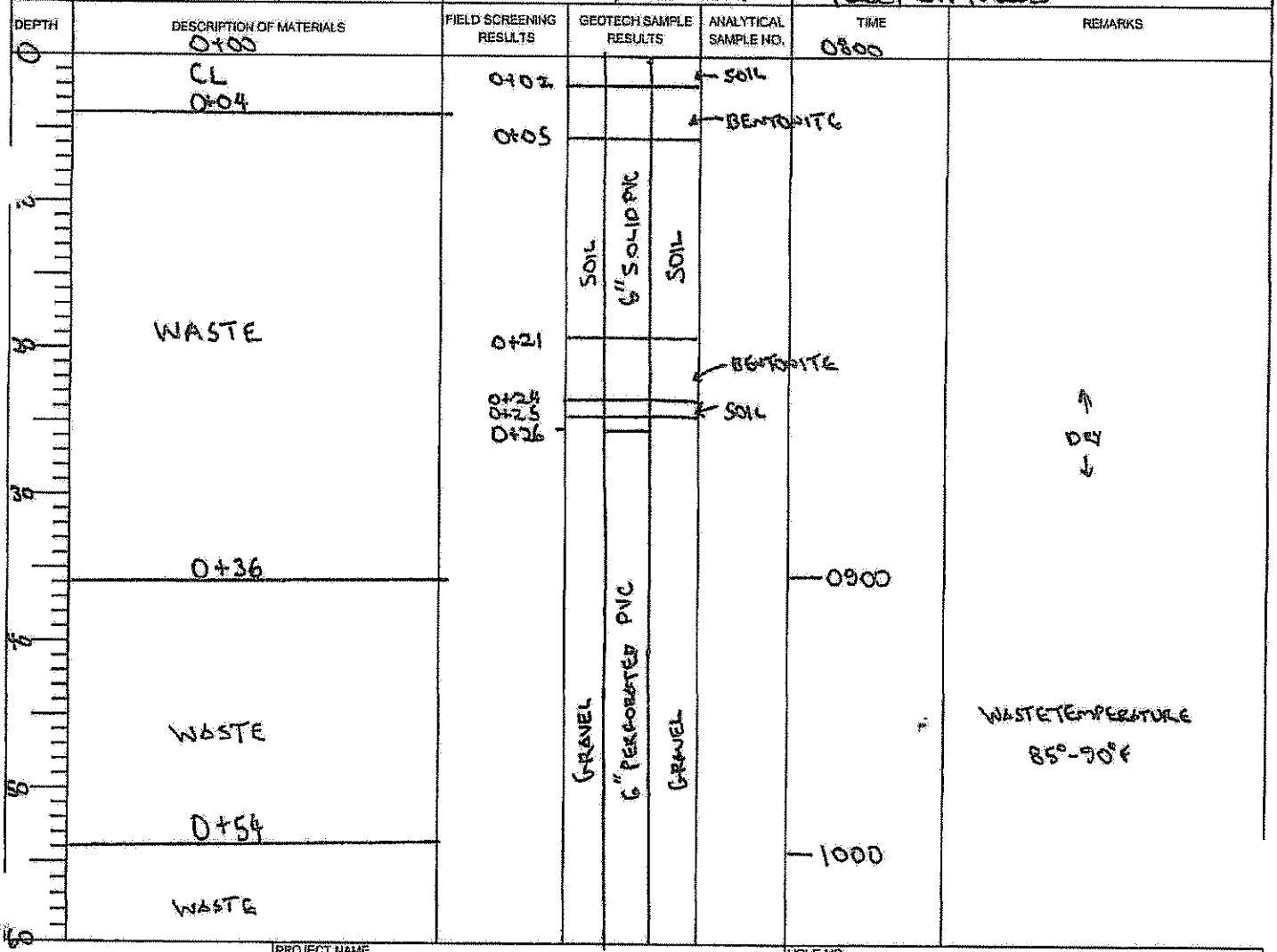
HOLE NO. GEW-27A | SHEET 1 OF 2 SHEETS

PROJECT NAME: GEW 23A & 27A CQA	DRILLING SUBCONTRACTOR: PDI
PROJECT NUMBER: 2048.10	NAME OF DRILLER(S): MITCH WILKENSON
LOCATION: BRIDGETON, MISSOURI	MANUFACTURER'S DESIGNATION OF DRILL: WESTERN RIDGE 250 CRAWLER DRILL
HOLE LOCATION: 25' WEST OF GEW 27 MIDDLE OF SOUTHWEST SLOPE OF 2006 FINAL COVER	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 24" BUCKET; 2 OPERATORS FROM LANDMARK; 35" DIAMETER HOLE
SURFACE ELEVATION: 525 ±	
OVERBURDEN THICKNESS: 4'	DRILLING START DATE: 10-3-06
DEPTH DRILLED INTO ROCK: NA	DRILLING END DATE: 10-3-06
TOTAL DEPTH OF HOLE: 107'	DEPTH GROUNDWATER ENCOUNTERED: NA
	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
FILLED	SOIL, GRAVEL, BENTONITE	—	GAS WELL	TERRY L. MUELLER



AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.	PROJECT NAME: GEW 23A & 27A CQA	HOLE NO.: GEW 27A

Aquaterra Drilling Log

HOLE NO. GEW 27A | SHEET 2 OF 2 SHEETS

PROJECT NAME: GEW 23A & 27A CQA

INSPECTOR: (Terry L. Mueller)

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	WASTE					
	0+67				1100	
70	WASTE					↑ DRY ↓
	0+80				1200	
80	WASTE		GRAVEL / 6" PERFORATED PVC / GRAVEL			
	0+90				1300	
90	WASTE					WASTE TEMPERATURE 95°-100°F
	0+99				1400	1400 —
100	WASTE					↑ MOIST ↓
	1+07	1+06			1500	
110	WASTE		UNABLE TO PENETRATE PAST 107'			
120						
130						NO ASBESTOS MATERIALS OBSERVED

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: GEW 23A & 27A CQA

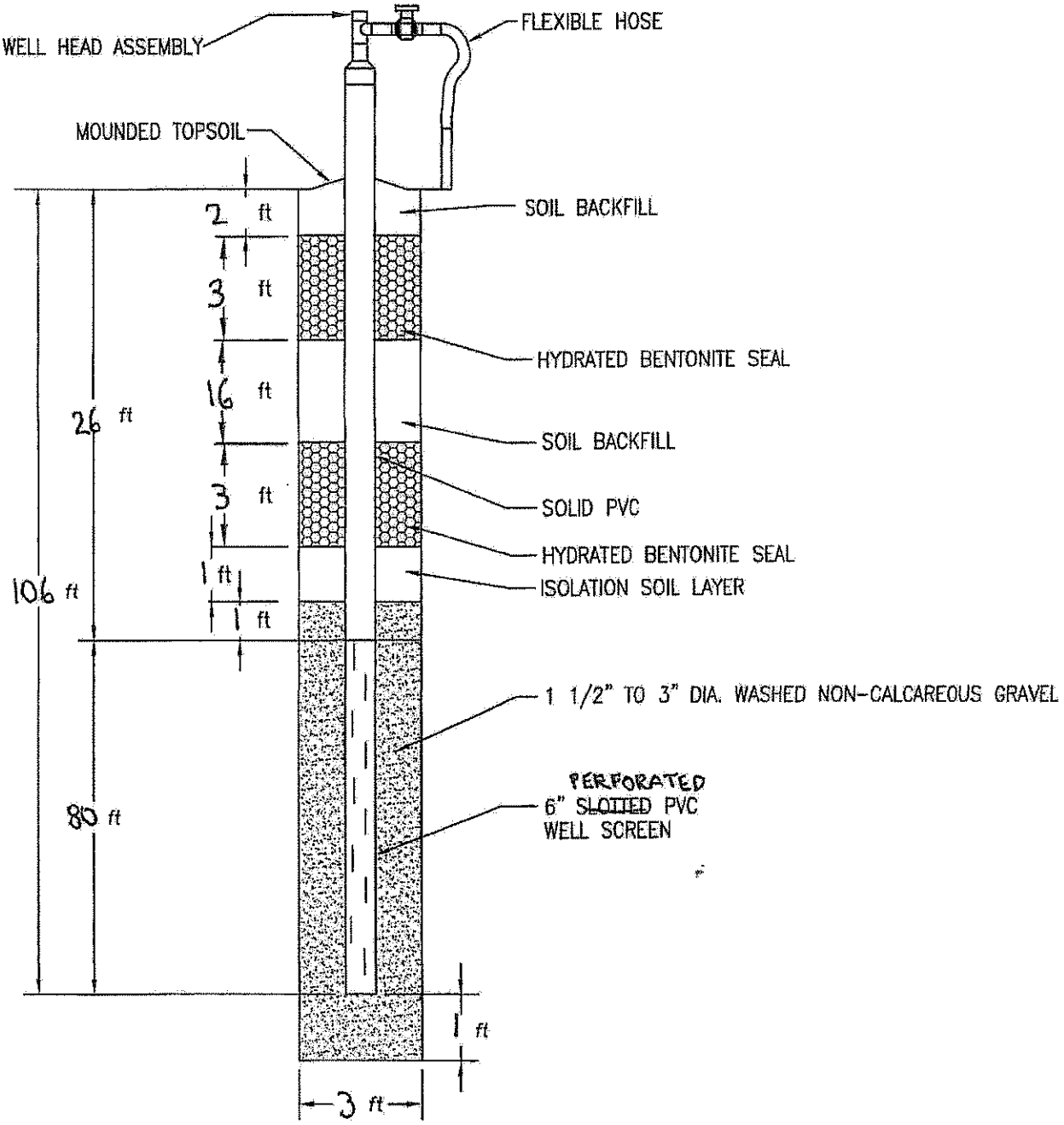
HOLE NO.: GEW-27A

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 2048.10
PROJECT NAME: GEW 23A & 27A CDA
GAS WELL NO.: 27A
WELL LOCATION: 25' WEST OF GEW 27 MIDDLE OF SOUTHERLY SLOPE OF 2006 FINAL COVER
INSTALLATION START DATE: 10-3-06
COMPLETION DATE: 10-3-06
DRILLER: MITCH WILKERSON PDI
INSPECTOR: TERRY L. MUELLER

COMMENTS: UNABLE TO PENETRATE PAST 107 FEET.



Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

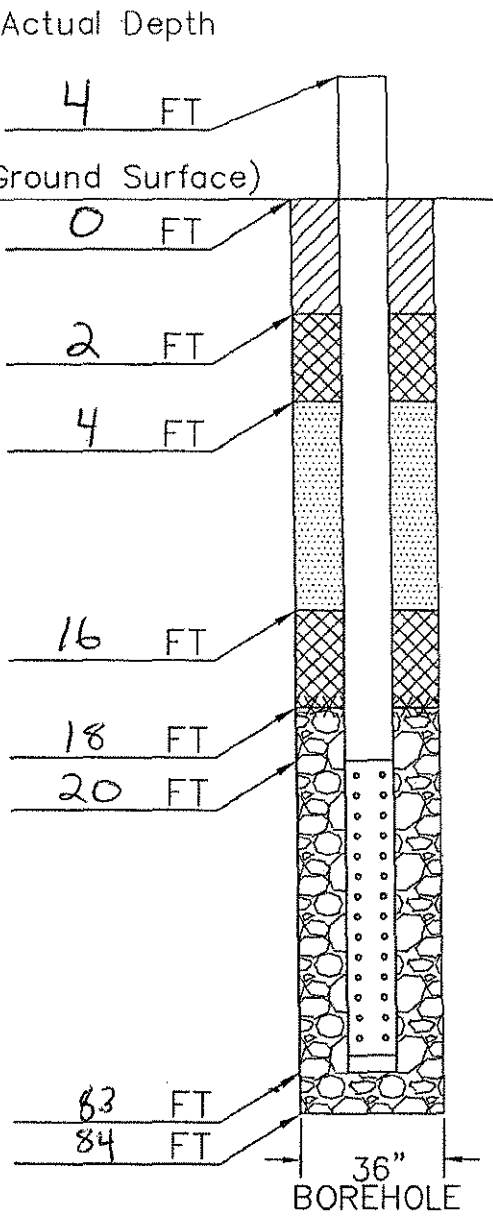
Well No.: 28R
Elevation: Ground 507.9
Exact Location (Coordinates): N:1066580.4 E:516154.9
Date Started: 8/25/2009
Date Completed: 8/25/2009
Boring Size: 36 inch
Total Depth: 84
Length of Perforated Pipe: 63
Length of Solid Pipe: 20
Comments: 15 feet west of existing

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	92	
2-4	soil/dry	92	
4-6	soil/dry	93	
6-10	soil/dry	94	
10-15	trash/dry	96	
15-20	trash/dry	96	
20-25	trash/dry	98	
25-30	trash/dry	99	
30-35	trash/dry	99	
35-40	trash/dry	99	
40-45	trash/dry	99	
45-50	trash/dry	105	
50-55	trash/dry	106	
55-60	trash/dry	106	
60-65	trash/damp	108	
65-70	trash/damp	109	
70-75	sludge/wet	111	
75-80	sludge/wet	113	
80-85	sludge/wet	115	
85-90			
90-95			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 28R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-25-09 Completed Install.: 8-25-09
Time: 8:45 am Time: 12:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 507.9 Location: N 1066580.4 E 516154.9



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 63
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Aquaterra Drilling Log

HOLE NO: GEW-29 | SHEET 1 OF | SHEETS

PROJECT NAME: 2005 LFG Wells/Header COA	DRILLING SUBCONTRACTOR: AEG
PCT NUMBER: 11652.10	NAME OF DRILLER(S): B. Willis
Bridgeton Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IRNT AF10
HOLE LOCATION: GEW 29	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 530.04 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/26/05 — DRILLING END DATE: 7/26/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 70 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Hoppe

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	Waste 1-25 ft of So. 1				1030	Drilling began 7/26/05
30	Waste				1115	
50	Waste					
70		153°F 156°F			1400	Drilling stopped on 7/26/05 at 70 ft due to high temperature
	End of boring at 70 ft					No asbestos containing materials observed

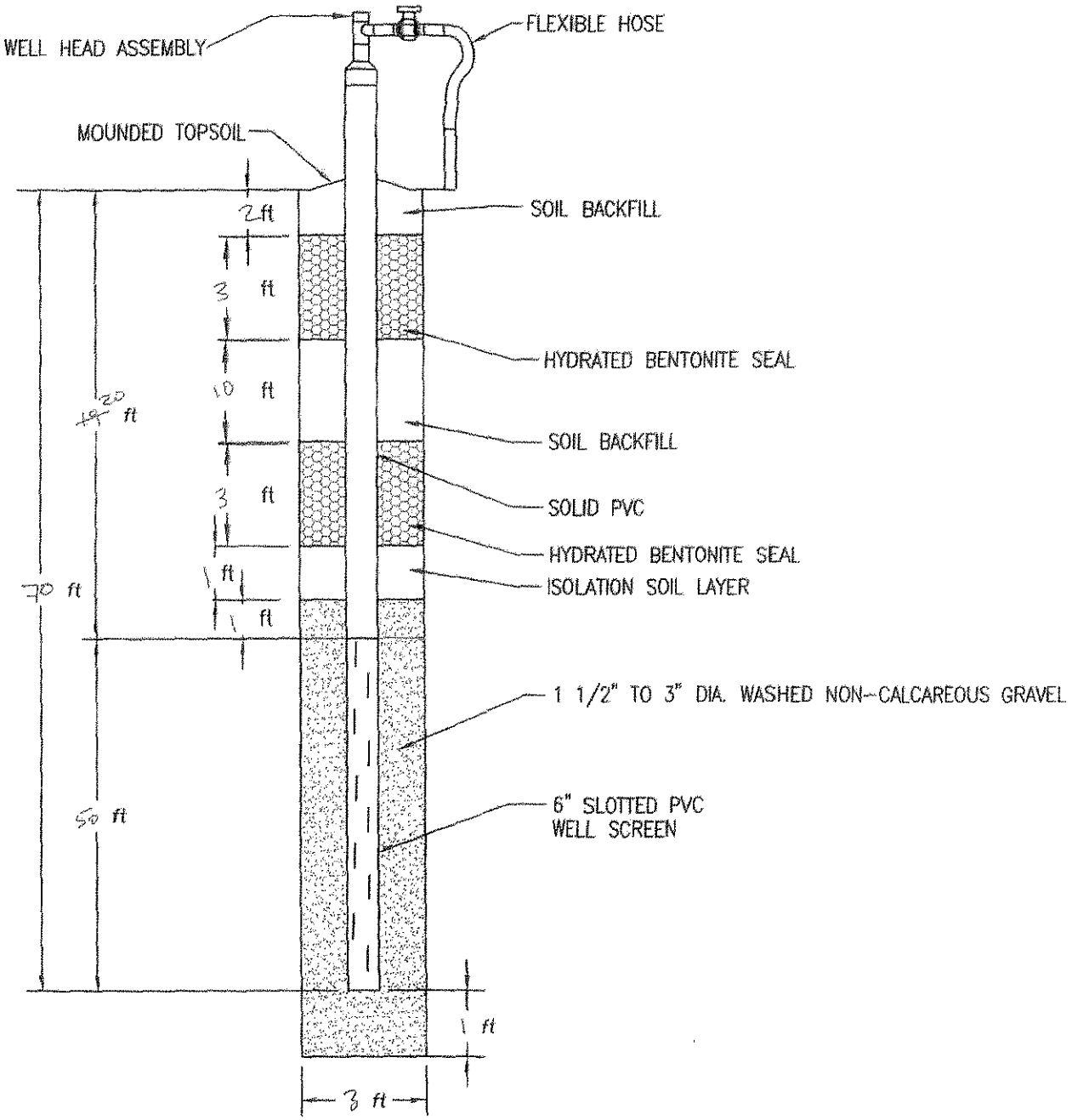
AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.	PROJECT NAME: 2005 LFG Wells/Header COA	HOLE NO: GEW-29

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-29
WELL LOCATION:
INSTALLATION START DATE: 7/26/05
COMPLETION DATE: 7/26/05
DRILLER: AEG - B Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 30R
Elevation: Ground 515.0
Exact Location (Coordinates): N:1066744.2 E:516286.8
Date Started: 8/24/2009
Date Completed: 8/24/2009
Boring Size: 36 inch
Total Depth: 97
Length of Perforated Pipe: 76
Length of Solid Pipe: 20
Comments:

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	93	
2-4	soil/dry	94	
4-6	soil/dry	93	
6-10	soil/dry	95	
10-15	trash/dry	99	
15-20	trash/dry	99	
20-25	trash/dry	101	
25-30	trash/dry	100	
30-35	trash/dry	102	
35-40	trash/dry	100	
40-45	trash/dry	104	
45-50	trash/dry	104	
50-55	trash/dry	104	
55-60	trash/dry	104	
60-65	trash/dry	107	
65-70	trash/dry	108	
70-75	trash/dry	111	
75-80	trash/dry	115	
80-85	trash/wet	118	
85-90	trash/dry	119	
90-95	trash/wet	119	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

QA/QC Monitor: Joshua Ross

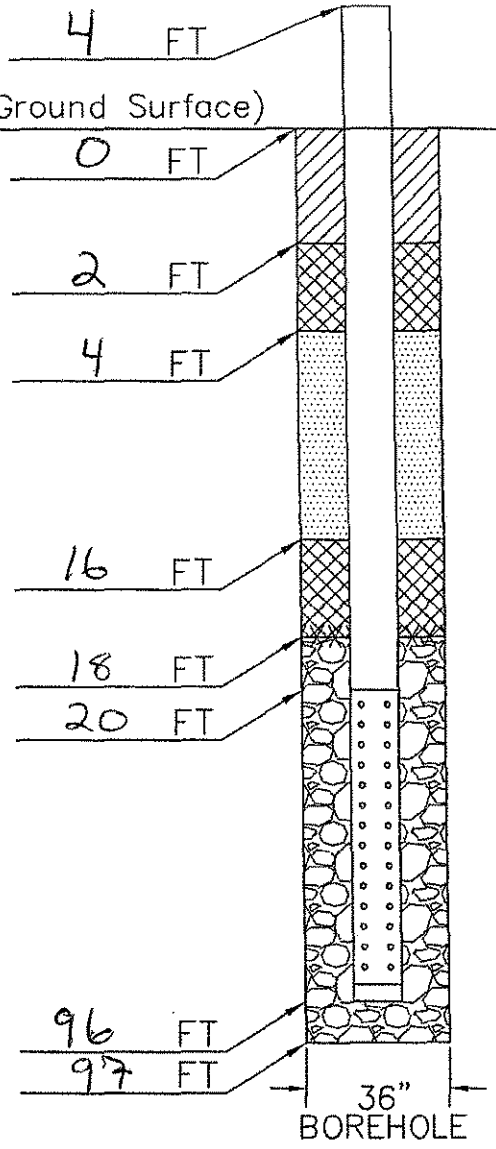
95-100	trash/dry	121	
100-105			
105-110			
110-115			
115-120			
120-125			
125-130			
130-135			
135-140			
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 30R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-24-09 Completed Install.: 8-24-09
Time: 6:00am Time: 4:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 515.0 Location: N 1066744.2 E 516286.8

Actual Depth



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 76
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 31R
Elevation: Ground 511.4
Exact Location (Coordinates): N:1066860.6 E:516426.6
Date Started: 8/24/2009
Date Completed: 8/24/2009
Boring Size: 36 inch
Total Depth: 97 feet
Length of Perforated Pipe: 91
Length of Solid Pipe: 20
Comments: 15 feet west of existing

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	90	
2-4	soil/dry	91	
4-6	soil/dry	92	
6-10	soil/dry	95	
10-15	trash/dry	94	
15-20	trash/dry	95	
20-25	trash/dry	97	
25-30	trash/dry	99	
30-35	trash/dry	100	
35-40	trash/dry	101	
40-45	trash/dry	104	
45-50	trash/damp	106	
50-55	trash/damp	108	
55-60	trash/moist	108	
60-65	trash/moist	110	
65-70	trash/moist	111	
70-75	trash/moist	116	
75-80	trash/wet	114	
80-85	trash/wet	115	
85-90	trash/wet	115	
90-95	trash/wet	116	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

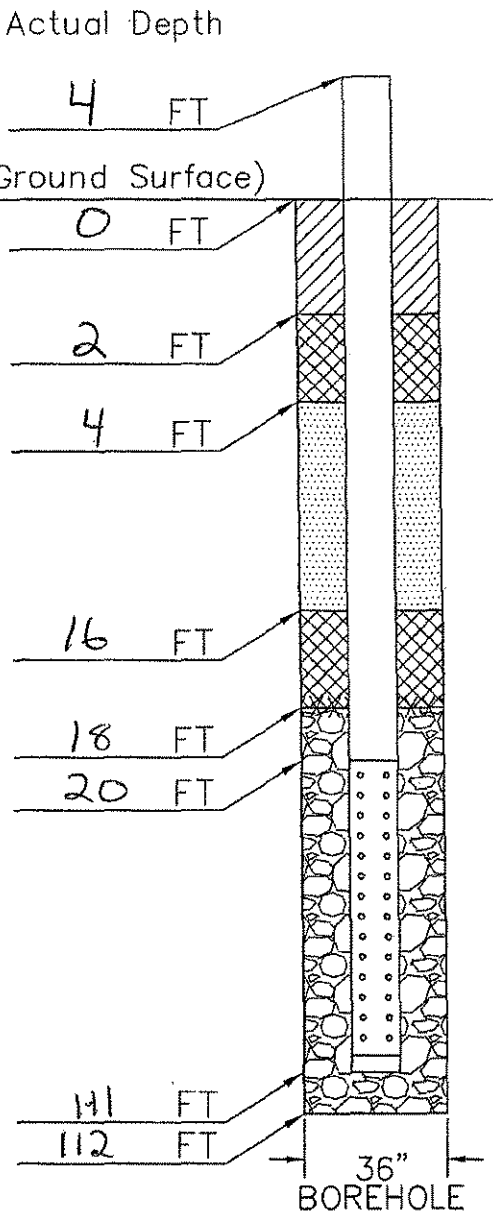
QA/QC Monitor: Joshua Ross

95-100	trash/wet	118	
100-105			
105-110			
110-115			
115-120			
120-125			
125-130			
130-135			
135-140			
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 31R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-25-09 Completed Install.: 8-25-09
Time: 12:45pm Time: 7:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 511.4 Location: N 1066860.6 E 516426.6



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 91
Diameter: 6in
Plug: 6in cap

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 32R | Elevation: Ground 522.6

Exact Location (Coordinates): N:1066994.2 E:516510.5

Date Started: 8/21/2009 | Date Completed: 8/21/2009

Boring Size: 36 inch | Total Depth: 75 feet

Length of Perforated Pipe: 54 | Length of Solid Pipe: 20

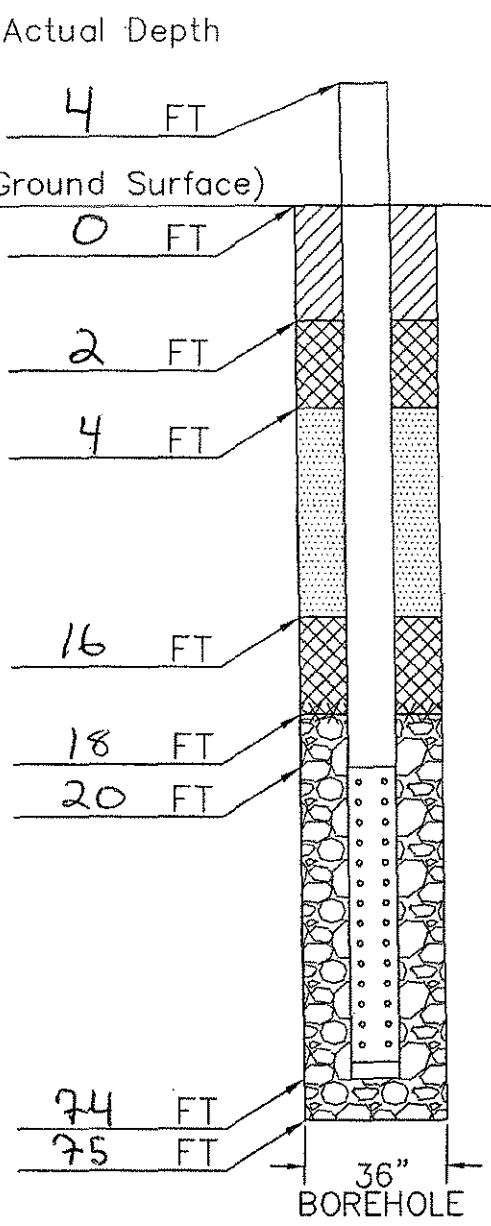
Comments: 15 feet west of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	92	
2-4	soil/dry	93	
4-6	soil/dry	92	
6-10	soil/dry	93	
10-15	trash/dry	96	
15-20	trash/dry	97	
20-25	trash/dry	96	
25-30	trash/dry	96	
30-35	trash/dry	98	
35-40	trash/dry	104	
40-45	trash/dry	102	
45-50	trash/dry	105	
50-55	trash/dry	108	
55-60	trash/dry	113	
60-65	trash/dry	112	
65-70	trash/dry	114	
70-75	trash/dry	116	
75-80			
80-85			
85-90			
90-95			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 32R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-21-09 Completed Install.: 8-21-09
Time: 1:00pm Time: 5:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 522.6 Location: N 1066994.2 E 5965 10.5



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 54
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 33R | Elevation: Ground 513.4

Exact Location (Coordinates): N:1067105.9 E:516655.0

Date Started: 8/21/2009 | Date Completed: 8/21/2009

Boring Size: 36 inch | Total Depth: 75 feet

Length of Perforated Pipe: 54 | Length of Solid Pipe: 20

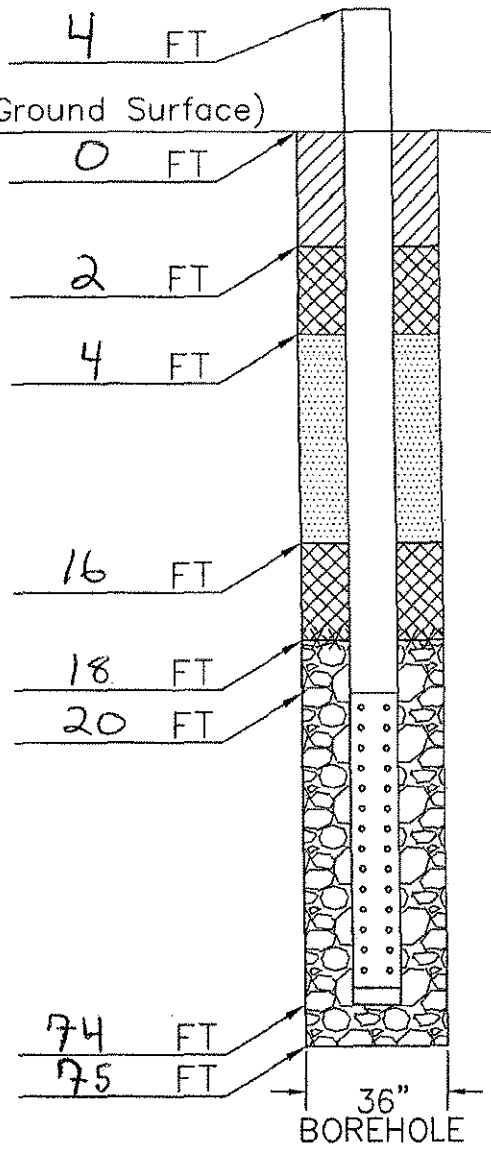
Comments: 15 feet north of existing

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	94	
2-4	soil/dry	93	
4-6	soil/dry	94	
6-10	soil/dry	97	
10-15	trash/dry	98	
15-20	trash/dry	100	
20-25	trash/dry	101	
25-30	trash/dry	103	
30-35	trash/dry	102	
35-40	trash/dry	104	
40-45	trash/dry	106	
45-50	trash/dry	109	
50-55	trash/dry	108	
55-60	trash/dry	107	
60-65	trash/dry	109	
65-70	trash/dry	109	
70-75	trash/dry	111	
75-80			
80-85			
85-90			
90-95			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 33R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-21-09 Completed Install.: 8-21-09
Time: 9:00am Time: 12:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 513.4 Location: N 1067105.9 E 516655.0



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 feet
- Diameter: 6.n

Screen:
- Material: CPVC
- Quantity: 54
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Aquaterra Drilling Log

HOLE NO. GEW-35 | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG System Wells/Header COA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
T N Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-35	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36in Bucket
SURFACE ELEVATION: 513 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/25/05 — DRILLING END DATE: 7/26/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 71 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Hoyt

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	3 ft of soil				930	Began drilling on 7/25/05
10	Waste					
30	Waste				1100	
40					1230	Drilling stopped on 7/25/05 at an upper depth of 40ft.
					715	Resume drilling on 7/26/05
50	Waste					
70	Waste	151°F 157°F			900	Drilling stopped at 71ft due to the high waste temperature
	End of boring at 71ft					No asbestos containing materials observed
80						
90						
100						

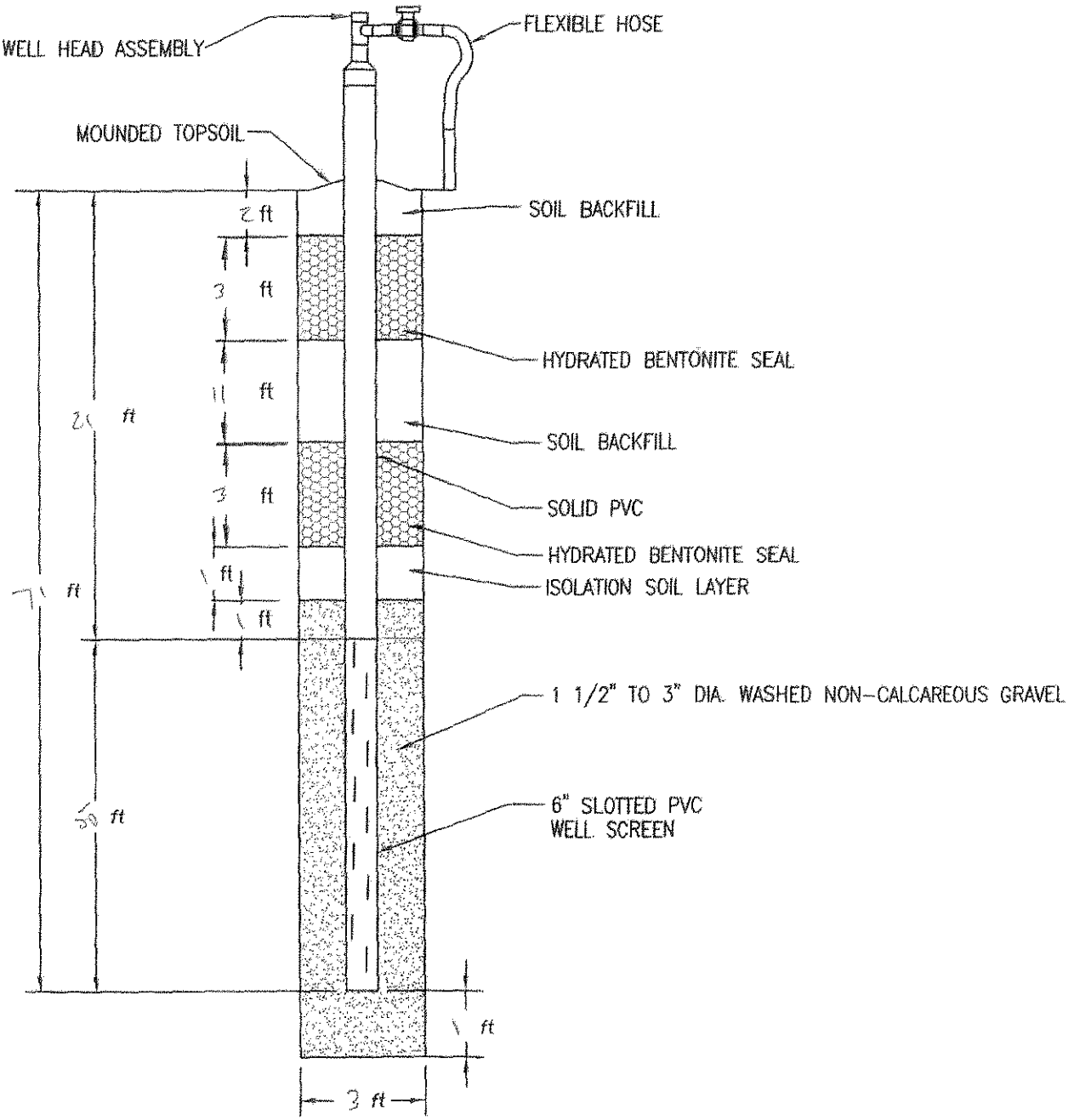
AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.	PROJECT NAME: 2005 LFG System Wells/Header COA	HOLE NO.: GEW-35

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-35
WELL LOCATION: Bridgeton Landfill
INSTALLATION START DATE: 7/25/05
COMPLETION DATE: 7/26/05
DRILLER: AEG - B. Will.
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-36 | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG System Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
JECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
ON: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar TMT AP10
HOLE LOCATION: GEW-36	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36" in Bucket
SURFACE ELEVATION: 520 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/23/05 — DRILLING END DATE: 7/25/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 70 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Kathleen Hogan

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	2 ft of Soil				1400	Drilling begins 7/22/05
10	Waste					
					1600	Drilling stopped for day at 20ft
					700	Drilling returns on 7/25/05
20	Waste					
30						
40	Waste					
50						
60	Waste	145°F				Drilling stopped due to high waste temperatures at 70ft
70		152°F				
	End of boring at 70 ft	156°F				No asbestos containing materials observed
80						
90						
100						
110						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

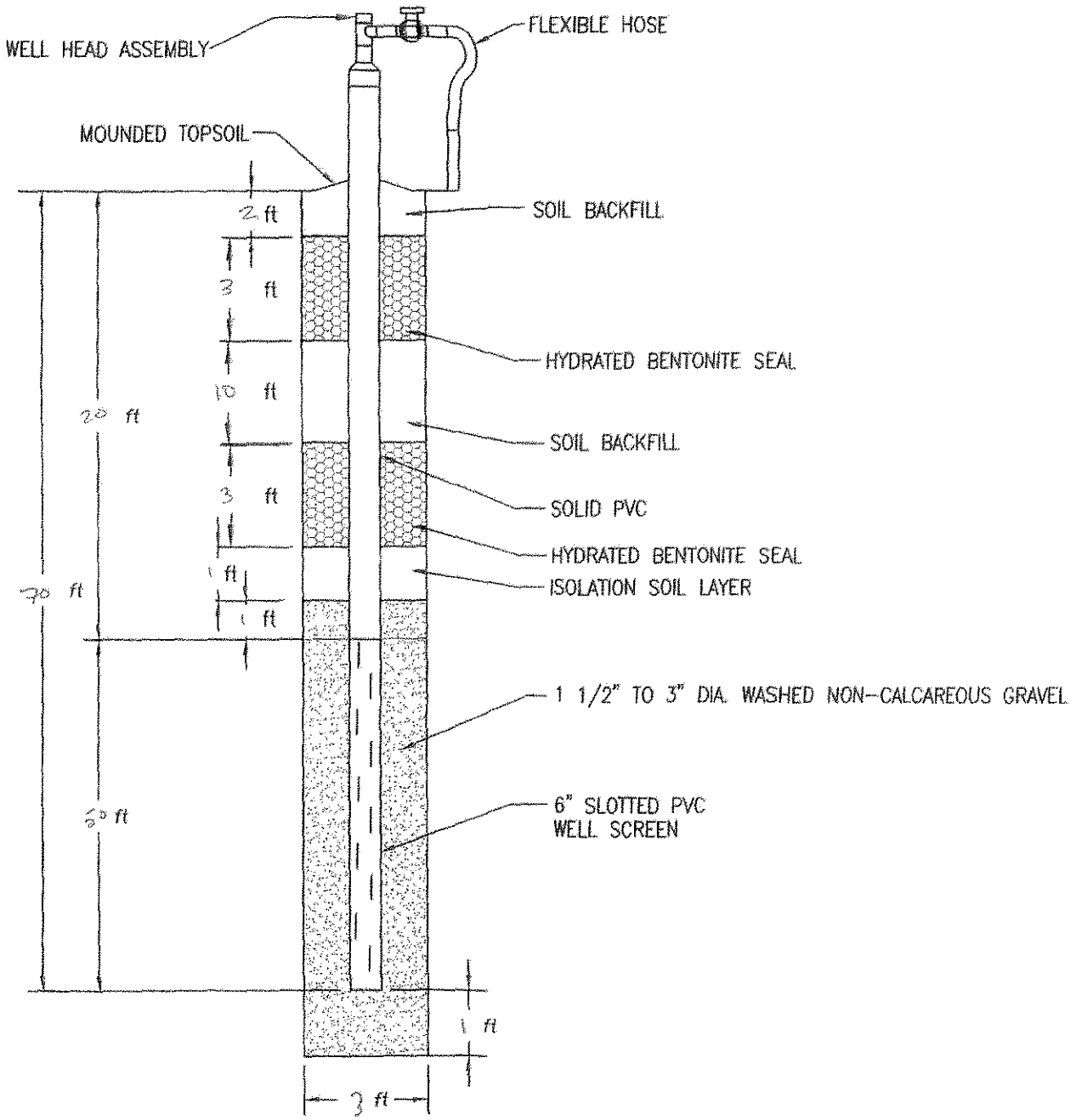
PROJECT NAME: 2005 LFG System Wells/Header CQA | HOLE NO: GEW-36

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-36
WELL LOCATION:
INSTALLATION START DATE: 7/25/05
COMPLETION DATE: 7/25/05
DRILLER: AEG - B Willis
INSPECTOR: Nathan Hoggeson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-37 | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG System Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-37	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 510-ft	
OVERBURDEN THICKNESS: ----	DRILLING START DATE: 7/19/05 — DRILLING END DATE: 7/20/05
DEPTH DRILLED INTO ROCK: ----	DEPTH GROUNDWATER ENCOUNTERED: ----
TOTAL DEPTH OF HOLE: 77 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: ----

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
----	----	----	----

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
----	----	----	----	----	----	----

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
----	----	----	----	Nathan Higgins

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	~2ft of soil				1200	Drilling began on 7/19/05
10	Waste					
20	Waste					
40	Waste					
50						
60	Waste					
70					1445	Drilling stopped on 7/19/05 at ~70 ft. Drilling resumed on 7/20/05
	Waste	156°F 155°F			1145 1230	Drilling stopped on 7/20/05 at an approximate depth of 77ft due to high waste temperatures. No asbestos containing materials observed.
80	End of boring at 77ft					
90						
100						
110						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

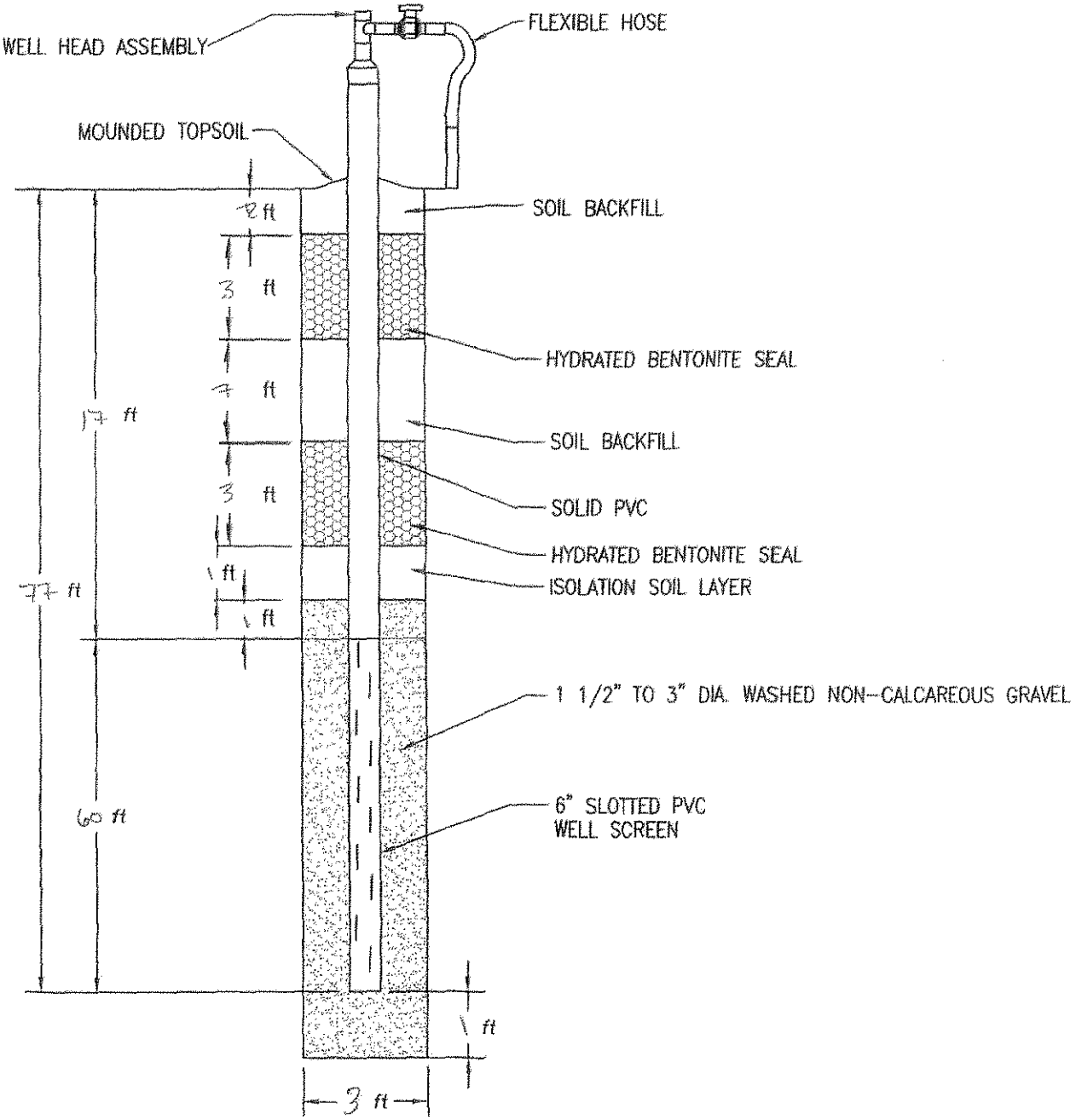
PROJECT NAME: 2005 LFG System Wells/Header CQA | HOLE NO.: GEW-37

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-37
WELL LOCATION:
INSTALLATION START DATE: 7/19/05
COMPLETION DATE: 7/23/05
DRILLER: AEG B. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-38 | SHEET 1 OF SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
JECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
N: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW 38	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 506.06	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/18/05 / DRILLING END DATE: 7/18/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 72 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan T. Hess

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	3 ft of Soil				1415	Drilling began 7/18/05
10	Waste					
20	Waste					
40	Waste					
50	Waste					
60		113° F			1545	Drilling stopped on 7/18/05 at 65 ft approximately
70		158° F			730 915	Drilling stopped on 7/19/05 at 72 ft due to high temperatures
72	End of boring at 72 ft					No asbestos containing materials observed
80						
90						
100						
110						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: 2005 LFG Wells/Header CQA

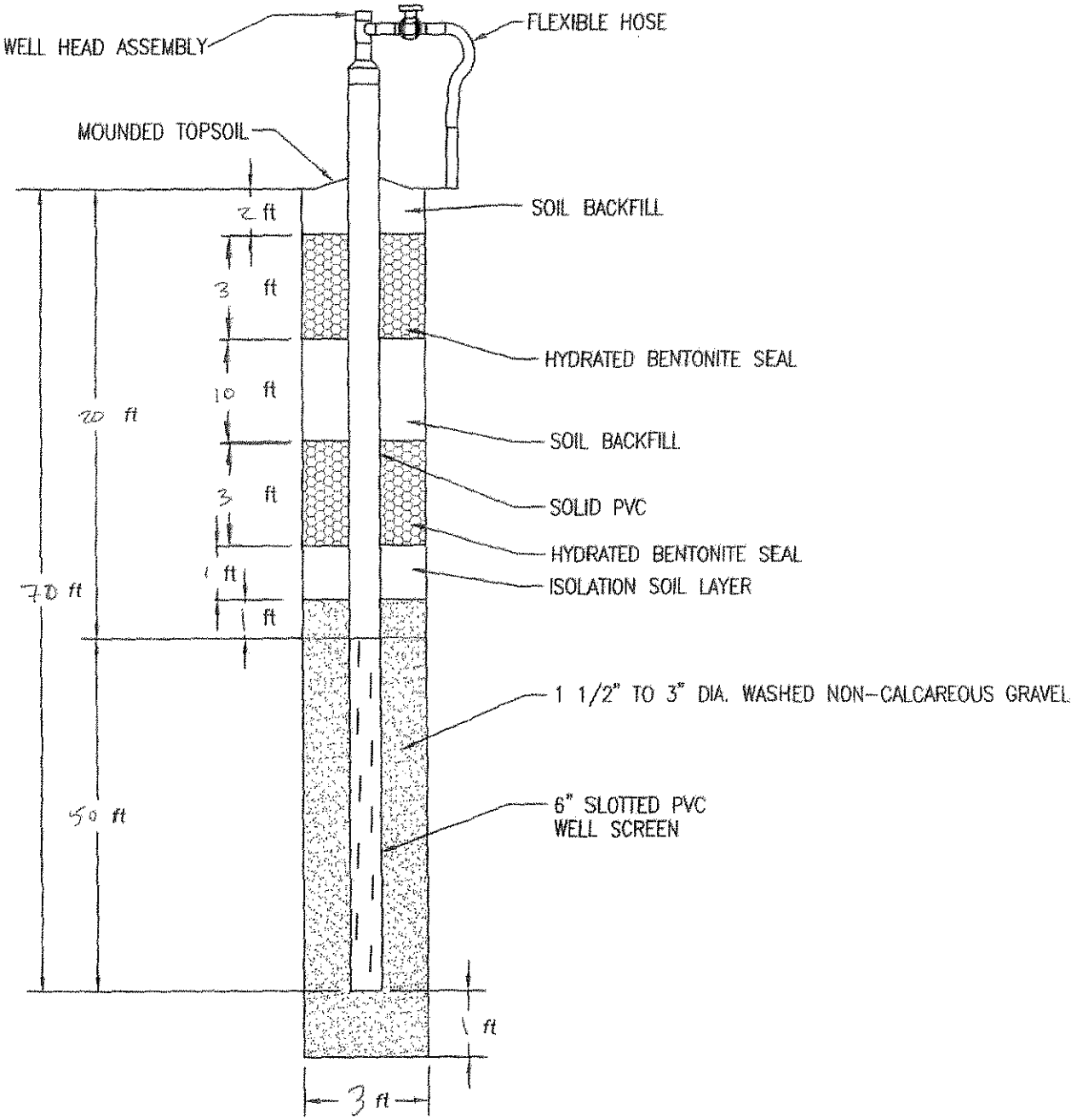
HOLE NO.: GEW-38

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-38
WELL LOCATION:
INSTALLATION START DATE: 7/19/05
COMPLETION DATE: 7/19/05
DRILLER: AEG - B. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-39 | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar EMT AF10
HOLE LOCATION: GEW 39	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3/6in bucket
SURFACE ELEVATION: 507 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/13/05 — DRILLING END DATE: 7/13/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 85 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	4ft Soil Waste				700	
30	Waste					
40						
50	Waste					
60	Waste - Void at 65 ft				830	
70						
80	- Solid again					End of the drilling on 7/13/05 at 85 ft
90	End of the boring at 85 ft					No asbestos containing materials observed
100						
110						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

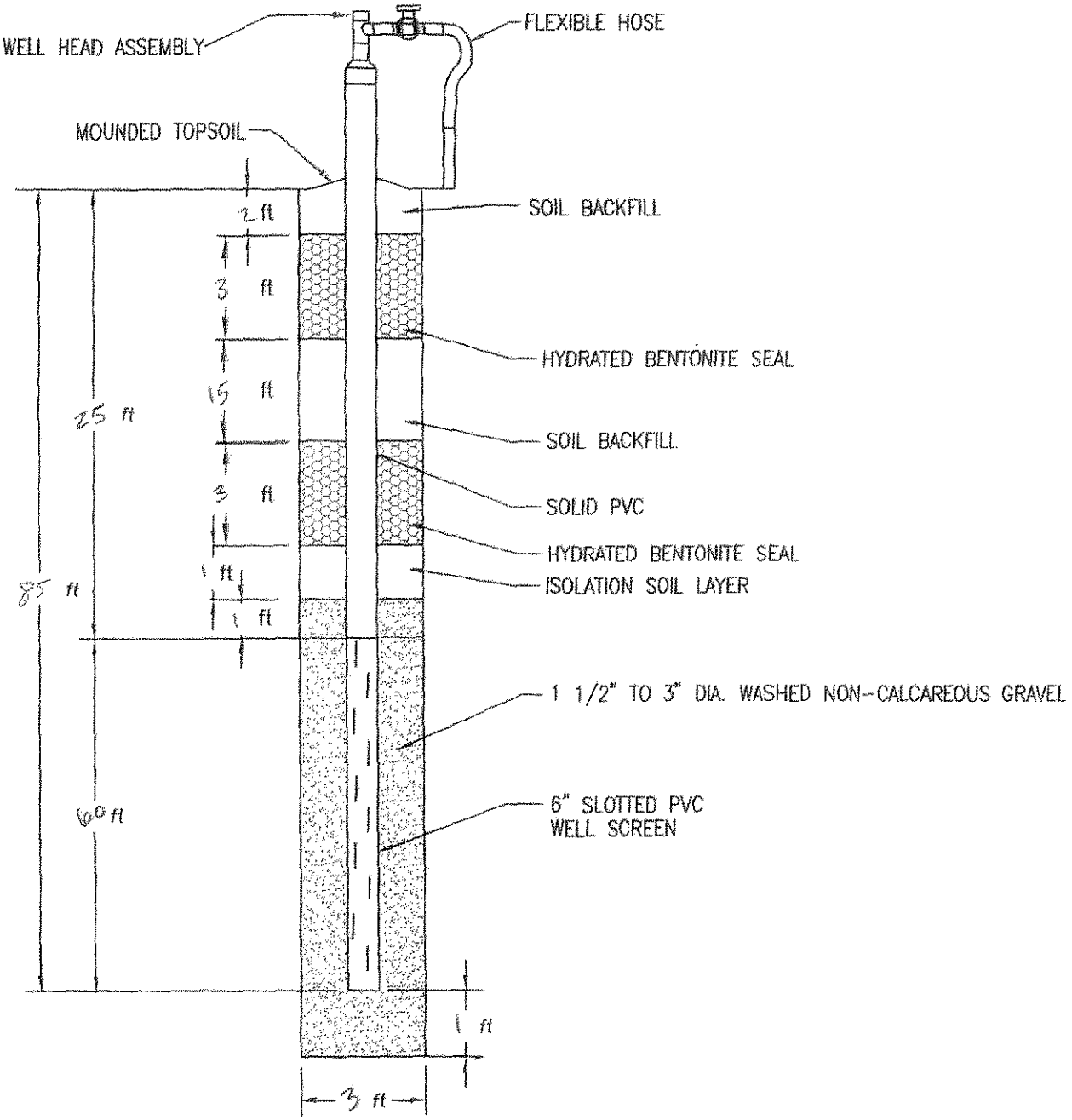
PROJECT NAME: 2005 LFG Wells/Header CQA | HOLE NO.: GEW-39

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-39
WELL LOCATION:
INSTALLATION START DATE: 7/13/05
COMPLETION DATE: 7/14/05
DRILLER: AEG B. Willis
INSPECTOR: Nathan Higgerson JG

COMMENTS:



American Environmental Group Ltd.

Well Log

DATE: 6/26/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GEW 40	WELL NUMBER OR NAME
31'	LINEAR FEET OF DRILLING
31'	LINEAR FEET OF COMPLETION
0'	LINEAR FEET OF ABANDONMENT

Time in: _____ Time out: _____

Weather conditions: Sunny

Site conditions: _____

Rig hrs: _____

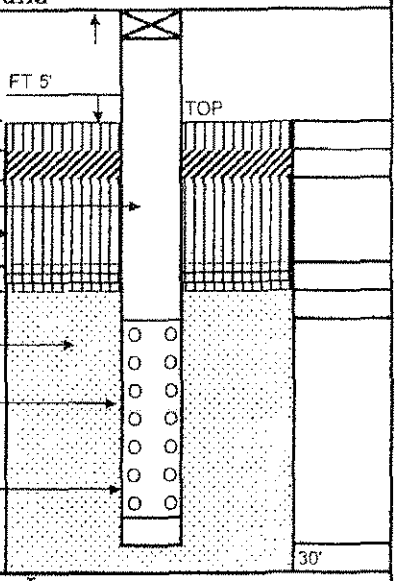
Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

northing 1067960

easting 516561

Well Asbuild



Top of ground elv.	496.74
Backfill Material	2'
Bentonite plug	2'
Length of Solid	14'
Backfill Material	5'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	18'
Length of Perf. Pipe	16'
Style of Pipe	6"SCH80 PVC
Bottom of bore	31'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S	LEL / CO	
7:00	20.9	0	0 0	GEW 50
8:00	"	0	0 0	
9:00	20.9	0	0 0	GEW 40
10:00	"	0	0 0	
11:00	"	0	0 0	
12:00	20.9	0	0 0	GEW 41
1:00	"	0	0 0	
2:00	"	0	0 0	
3:00				
4:00				
5:00				
6:00				

Notes

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-HHT	LIGHT	DRY	64
10-20	"	LIGHT	DRY	73
20-30	HHT	LIGHT	DRY	79
30-40	HHT	LIGHT	DRY	TD 31'
40-50				
50-60				
60-70				
70-80				
80-90				
90-100				
100-110				
110-120				
120-130				
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

BRETT WILLIS 6/26/2004

AEGL SITE SUPERVISOR DATE

NAME & TITLE

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 41R | Elevation Ground 507.0

Exact Location (Coordinates): N:1068086.2 E:516649.1

Date Started: 9/28/2009 | Date Completed: 9/28/2009

Boring Size: 36 inch | Total Depth: 109

Length of Perforated Pipe: 88 | Length of Solid Pipe: 20

Comments: 4 feet north of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	94	
2-4	soil/dry	94	
4-6	soil/dry	94	
6-10	soil/dry	94	
10-15	trash/dry	96	
15-20	trash/dry	96	
20-25	trash/dry	97	
25-30	trash/dry	98	
30-35	trash/dry	99	
35-40	trash/dry	101	
40-45	trash/dry	101	
45-50	trash/dry	104	
50-55	trash/dry	107	
55-60	trash/dry	110	
60-65	trash/dry	113	
65-70	trash/dry	113	
70-75	trash/dry	117	
75-80	trash/dry	118	
80-85	trash/dry	121	
85-90	trash/damp	124	
90-95	trash/wet	128	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

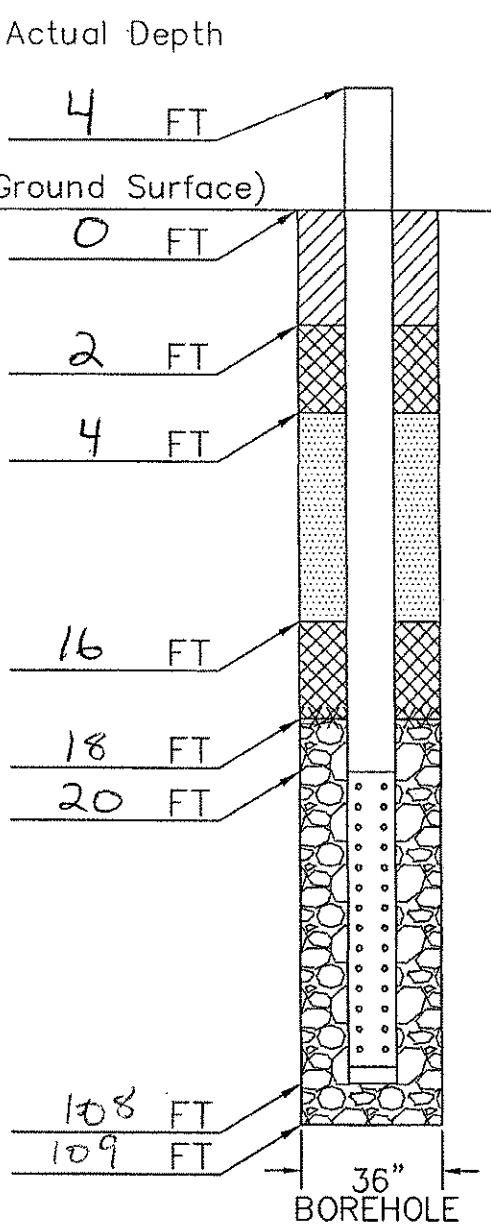
Project Name:	2009 Gas System	Project Number:	0120-131-17
Project Location:	Bridgeton Landfill	QA/QC Monitor:	Joshua Ross

95-100	trash/wet	129	
100-105	sludge/wet	136	
105-110	sludge/wet	136	
110-115			
115-120			
120-125			
125-130			
130-135			
135-140			
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 41R
Drilling Contractor: A.E.G.L Observed By: Joshua Roos
Started Install.: 9-28-09 Completed Install.: 9-28-09
Time: 6:00am Time: 11:00am

Top of Flange Elevation: _____
Ground Surface Elevation: 507.0 Location: N 1068086.2 E 516689.7



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 88
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 42R
Elevation: Ground 507.1
Exact Location (Coordinates): N:1068161.5 E:516689.7
Date Started: 8/18/2009
Date Completed: 8/18/2009
Boring Size: 36in
Total Depth: 101 feet
Length of Perforated Pipe: 97
Length of Solid Pipe: 20
Comments:

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	90	
2-4	trash/dry	94	
4-6	trash/dry	95	
6-10	trash/dry	91	
10-15	trash/dry	94	
15-20	trash/dry	97	
20-25	trash/dry	96	
25-30	trash/dry	93	
30-35	trash/dry	91	
35-40	trash/dry	94	
40-45	trash/dry	96	
45-50	trash/dry	93	
50-55	trash/dry	98	
55-60	trash/dry	99	
60-65	trash/dry	102	
65-70	trash/dry	108	
70-75	trash/dry	104	
75-80	trash/dry	107	
80-85	trash/dry	109	
85-90	trash/damp	110	
90-95	trash/damp	119	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

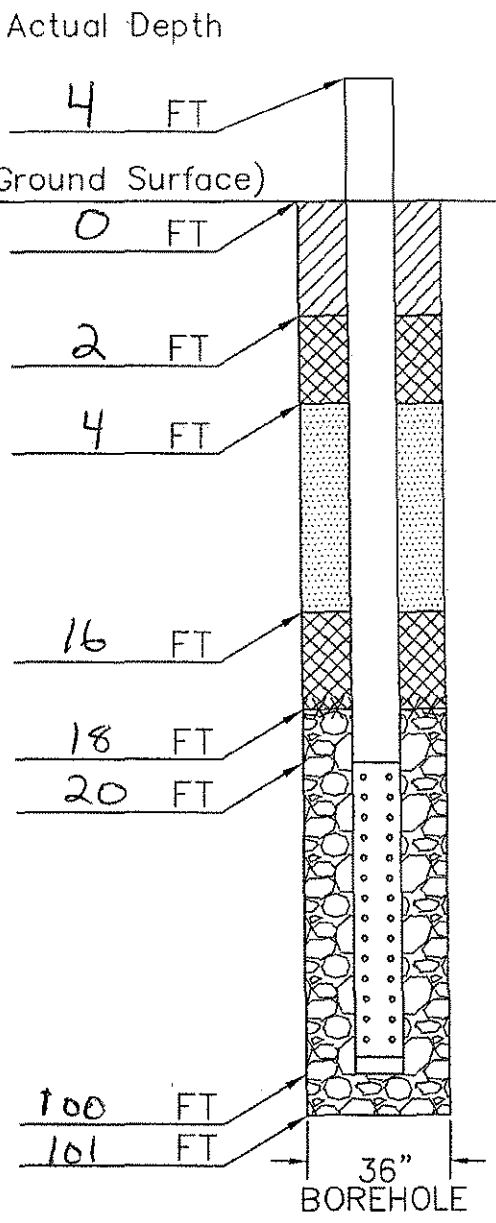
QA/QC Monitor: Joshua Ross

95-100	trash/damp	117	
100-105	trash/damp	118	
105-110			
110-115			
115-120			
120-125			
125-130			
130-135			
135-140			
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 42R
Drilling Contractor: A.E.G.L. Observed By: Joshua Ross
Started Install.: 8-18-09 Completed Install.: 8-18-09
Time: 6:00am Time: 11:30am

Top of Flange Elevation: _____
Ground Surface Elevation: 507.1 Location: N1068161.5 E516689.7



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 80
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 43R
Elevation: Ground 511.6
Exact Location (Coordinates): N:1068294.8 E:516575.9
Date Started: 8/15/2009
Date Completed: 8/15/2009
Boring Size: 36in
Total Depth: 118
Length of Perforated Pipe: 97
Length of Solid Pipe: 20
Comments:

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	95	
2-4	soil/dry	95	
4-6	soil/dry	96	
6-10	soil/dry	94	
10-15	trash/dry	97	
15-20	trash/dry	96	
20-25	trash/dry	99	
25-30	trash/dry	97	
30-35	trash/dry	96	
35-40	trash/dry	99	
40-45	trash/dry	101	
45-50	trash/dry	99	
50-55	trash/dry	99	
55-60	trash/dry	104	
60-65	trash/dry	102	
65-70	trash/dry	103	
70-75	trash/dry	105	
75-80	trash/dry	108	
80-85	trash/dry	109	
85-90	trash/dry	110	
90-95	trash/dry	110	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

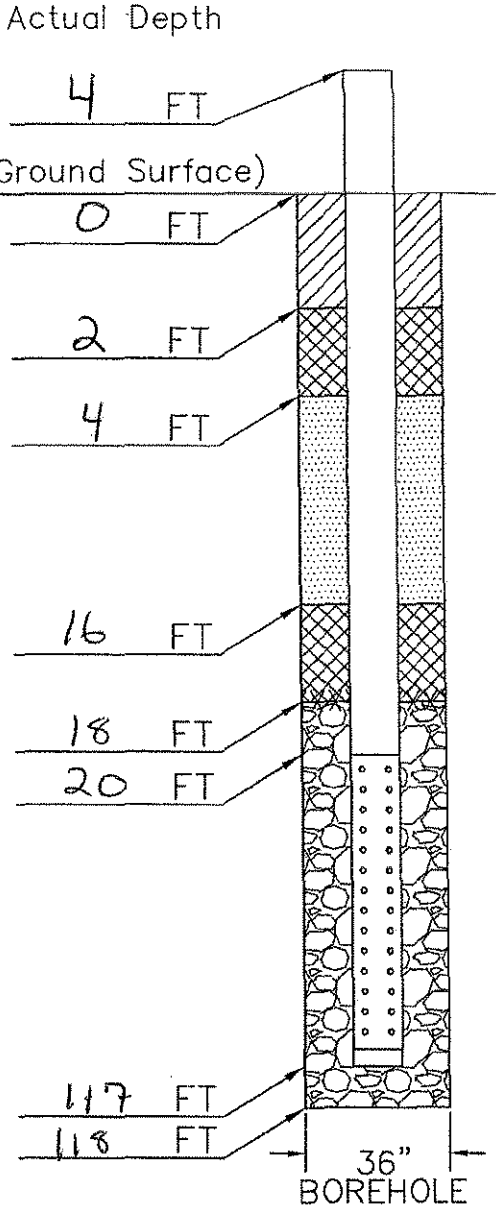
QA/QC Monitor: Joshua Ross

95-100	trash/dry	107	
100-105	trash/damp	115	
105-110	trash/damp	112	
110-115	trash/damp	113	
115-120			
120-125			
125-130			
130-135			
135-140			
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 43 R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-15-09 Completed Install.: 8-15-09
Time: 6:00am Time: 11:30am

Top of Flange Elevation: _____
Ground Surface Elevation: 511.6 Location: N 1068294.8 E 516575.9



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 97
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

American Environmental Group Ltd.

Well Log

DATE: 7/1/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GEW 44 — WELL NUMBER OR NAME

111' — LINEAR FEET OF DRILLING

111' — LINEAR FEET OF COMPLETION

0' — LINEAR FEET OF ABANDONMENT

Time in: _____ Time out: _____

Weather conditions: Sunny

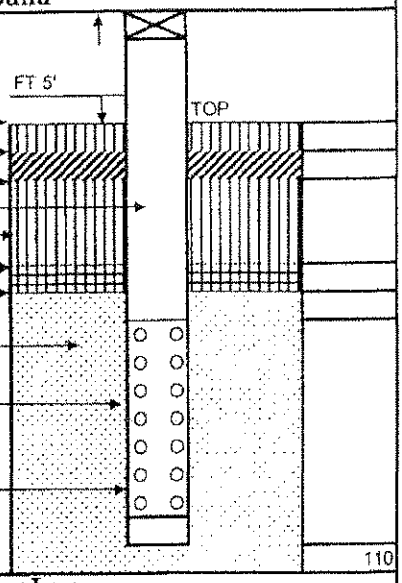
Site conditions: _____

Rig hrs: _____

Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

Well Asbuild



Top of ground elv	517.67
Backfill Material	2'
Bentonite plug	2'
Length of Solid	25'
Backfill Material	15'
Bentonite plug.	2'
Isolation Layer	1'
Length of Gravel Pack	89'
Length of Perf. Pipe	86'
Style of Pipe	6"SCH80 PVC
Bottom of bore	111'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO	
7:00	20.9	0	0	0	GEW 44
8:00	"	0	0	0	
9:00	"	0	0	0	
10:00	"	0	0	0	
11:00	"	0	0	0	
12:00	20.9	0	0	0	GEW 45
1:00					
2:00					
3:00					
4:00					
5:00					
6:00					

Notes

northing 1068434

easting 516497

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-MSW	LIGHT	DRY	62
10-20	MSW	LIGHT	DRY	66
20-30	MSW	LIGHT	DRY	71
30-40	MSW	LIGHT	DRY	71
40-50	WOOD-MSW	LIGHT	DRY	77
50-60	MSW	HEAVY	WET	79
60-70	MSW	HEAVY	WET	81
70-80	MSW	HEAVY	WET	86
80-90	MSW	HEAVY	WET	94
90-100	SLUGE	HEAVY	WET	96
100-110	SLUGE	HEAVY	WET	100
110-120	SLUGE	HEAVY	WET	102
120-130				
130-140				
140-150				

_____ _____

CLIENT REPRESENTATIVE DATE

BRETT WILLIS 7/1/2004

AEGL SITE SUPERVISOR DATE

_____

NAME & TITLE

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

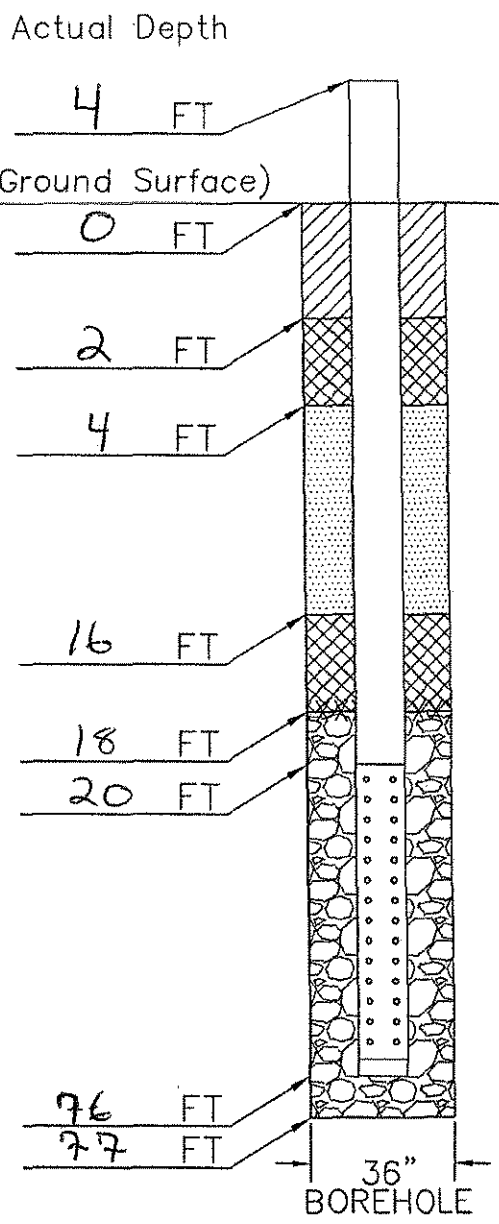
Well No.: 45R
Elevation: Ground 501.2
Exact Location (Coordinates): N:1068616.2 E:516560.5
Date Started: 8/14/2009
Date Completed: 8/14/2009
Boring Size: 36in
Total Depth: 77
Length of Perforated Pipe: 60
Length of Solid Pipe: 20
Comments: 10 foot N of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil	90	
2-4	soil	90	
4-6	soil	90	
6-10	soil	90	
10-15	soil	90	
15-20	soil	95	
20-25	soil/trash/moist	105	
25-30	soil/trash/moist	105	
30-35	trash/moist	108	
35-40	trash/moist	110	
40-45	trash/wet	110	
45-50	trash/wet	110	
50-55	trash/wet	115	
55-60	trash/wet	110	
60-65	trash/wet	115	
65-70	trash/wet	125	
70-75	trash/wet	120	
75-80	trash/wet	129	
80-85	trash/wet	128	
85-90			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 45 R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-14-09 Completed Install.: 8-14-09
Time: 6:00am Time: 11:00am

Top of Flange Elevation: _____
Ground Surface Elevation: 501.2 Location: N 1068616.2 E 516560.5



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6.n

Screen:
Material: CPVC
Quantity: 56
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

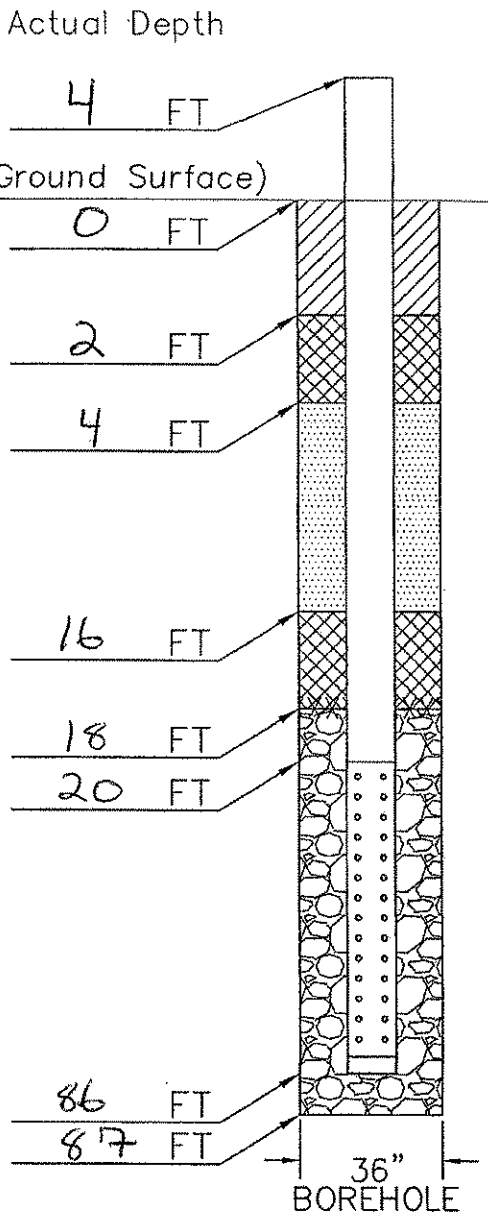
Well No.: 46R
Elevation: Ground 506.2
Exact Location (Coordinates): N:1068710.5 E:516665.6
Date Started: 8/13/2009
Date Completed: 8/13/2009
Boring Size: 36in
Total Depth: 87
Length of Perforated Pipe: 70
Length of Solid Pipe: 20
Comments: 5 foot nw of existing

Depth	Material Drilled	Temp.	Comment
0-2	soil/trash/moist	95	
2-4	soil/trash/moist	95	
4-6	soil/trash/moist	95	
6-10	soil/trash/moist	98	
10-15	trash/wet	115	
15-20	trash/wet	115	
20-25	trash/wet	115	
25-30	trash/wet	115	
30-35	trash/wet	115	
35-40	trash/wet	125	
40-45	trash/wet	125	
45-50	trash/wet	130	
50-55	trash/wet	127	
55-60	trash/wet	136	
60-65	trash/wet	137	
65-70	trash/wet	137	
70-75	trash/wet	135	
75-80	trash/wet	139	
80-85	trash/wet	139	
85-90			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 46R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-13-09 Completed Install.: 8-13-09
Time: 8:45 am Time: 12:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 506.2 Location: N1068710.5 E 51666.56



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6.n

Screen:
- Material: CPVC
- Quantity: 70
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

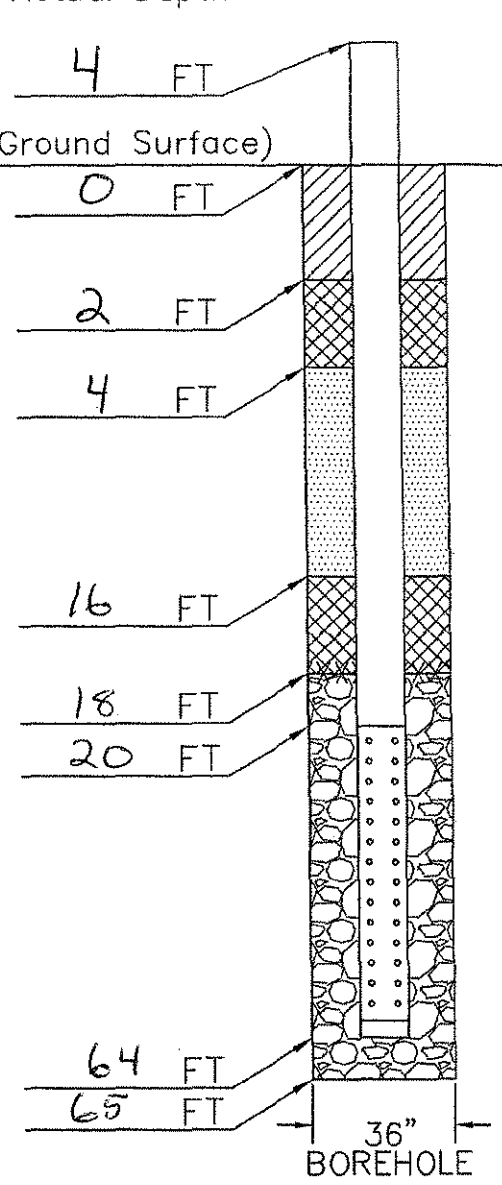
Well No.: 47R
Elevation: Ground 521.9
Exact Location (Coordinates): N:1068692.6 E:516445.2
Date Started: 8/13/2009
Date Completed: 8/13/2009
Boring Size: 36
Total Depth: 65
Length of Perforated Pipe: 48
Length of Solid Pipe: 20
Comments: from existing well 10 foot sw

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	94	
2-4	soil/dry	94	
4-6	soil/dry	94	
6-10	soil/dry	94	
10-15	soil/dry	105	
15-20	soil/trash/moist	110	
20-25	soil/trash/moist	110	
25-30	soil/trash/moist	110	
30-35	soil/trash/moist	116	
35-40	soil/trash/moist	118	
40-45	trash/wet	120	
45-50	trash/wet	120	
50-55	trash/wet	125	
55-60	trash/wet	139	
60-65	trash/wet	137	
65-70			
70-75			
75-80			
80-85			
85-90			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 47R
Drilling Contractor: A.E.&L. Observed By: Joshua Ross
Started Install.: 8-13-09 Completed Install.: 8-13-09
Time: 6:00am Time: 8:30am

Top of Flange Elevation: _____
Ground Surface Elevation: 521.9 Location: N 1068692.6 E 516445.2



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 44
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Aquaterra Drilling Log

HOLE NO. GEW-48A | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IM7 AF10
HOLE LOCATION: GEW-48A	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36in Bucket
SURFACE ELEVATION: 526.78 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/16/05 — DRILLING END DATE: 7/16/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 64 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

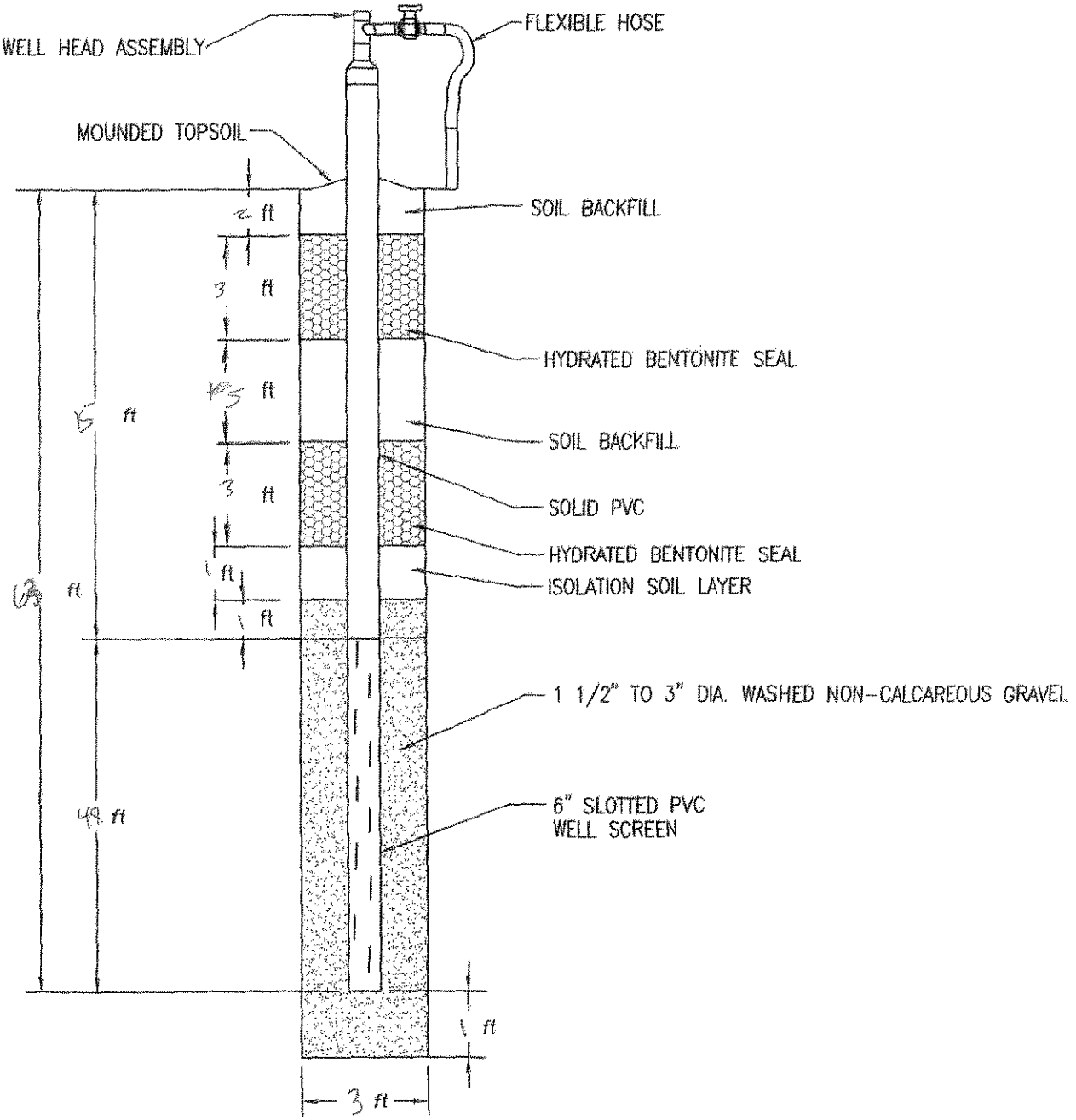
DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Cover soil				1245	Drilling begins 7/16/05
10	Waste					
30	Waste					
40	Sand					
50		118°F			1340	
60	Waste	112°F			1430	End of the drilling on 7/16/05 at 64'F
70	End of boring at 64ft				1445	No asbestos containing materials observed
80						
90						
100						
110						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GGW-48A
WELL LOCATION:
INSTALLATION START DATE: 7/16/05
COMPLETION DATE: 7/16/05
DRILLER: AEG - B. Willis
INSPECTOR: Nathan Eggerson

COMMENTS:

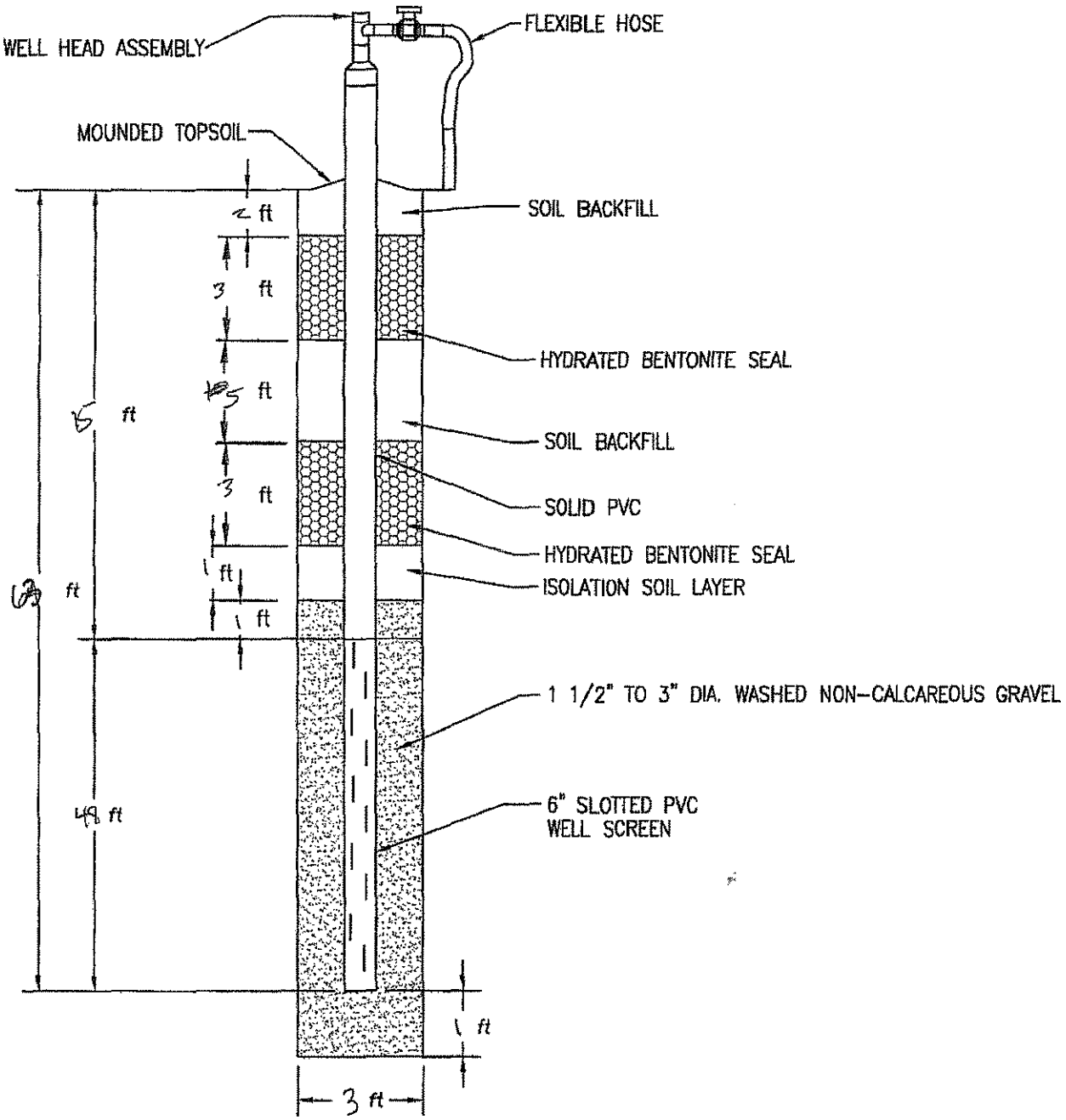


AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
verland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GGW-48A
WELL LOCATION:
INSTALLATION START DATE: 7/16/05
COMPLETION DATE: 7/16/05
DRILLER: AEG - B. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-49	SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW-49	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT:
SURFACE ELEVATION: 525 ft	36 in Bucket
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/16/05 — DRILLING END DATE: 7/18/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 66 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan [signature]

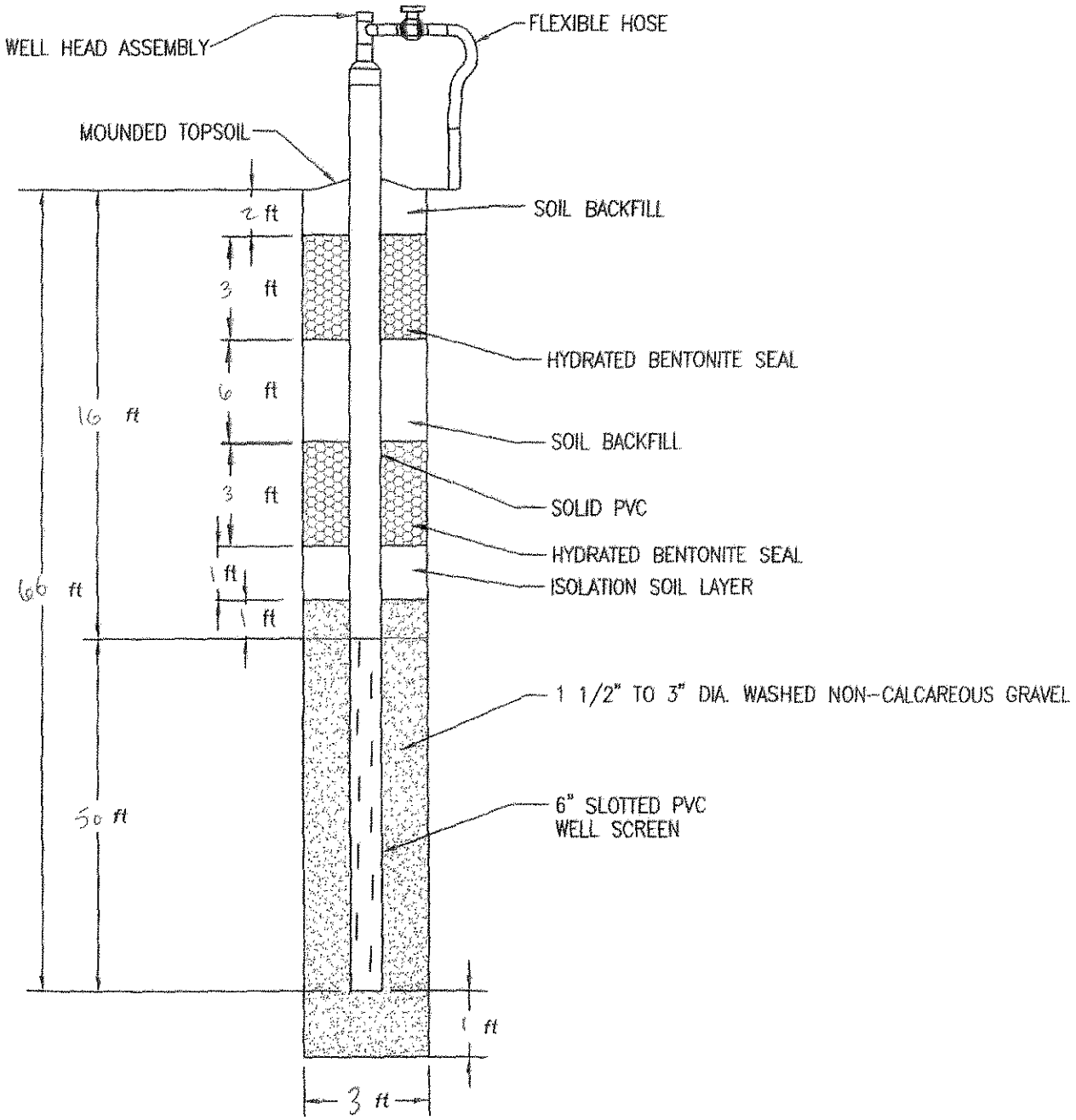
DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0–10	~1 ft of soil Waste				1540	Drilling begin on 7/16/05
20	Waste					
30–40	Waste	—	—	—	1700 700	Stopped drilling for the day at 45 ft on 7/16/05 Resume drilling on 7/18/05
50–60	Waste	152°F 153°F			900	Drilling stopped at 66 ft due to the temperature being so high.
70	End of boring at 66 ft					No asbestos containing materials observed
80						
90						
100						
110						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-49
WELL LOCATION:
INSTALLATION START DATE: 7/16/05
COMPLETION DATE: 7/18/05
DRILLER: AEG B. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



American Environmental Group Ltd.

Well Log

DATE: 6/26/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GEW 50 WELL NUMBER OR NAME

54' LINEAR FEET OF DRILLING

54' LINEAR FEET OF COMPLETION

0' LINEAR FEET OF ABANDONMENT

Time in: Time out:

Weather conditions: Sunny

Site conditions:

Rig hrs:

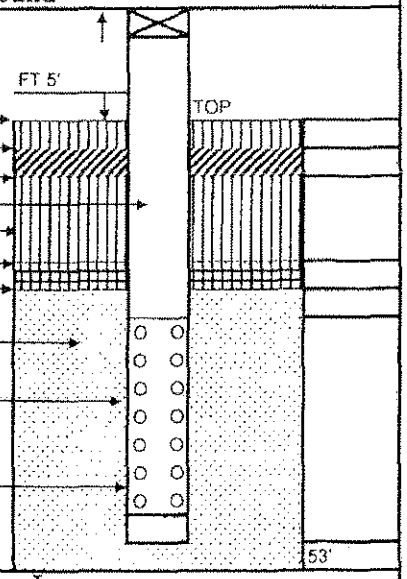
Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

northing 1068476

easting 516230

Well Asbuild



Top of ground elv	524.37
Backfill Material	2'
Bentonite plug	2'
Length of Solid	16'
Backfill Material	7'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	39'
Length of Perf. Pipe	37'
Style of Pipe	6"SCH80 PVC
Bottom of bore	54'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO	
7:00	20.9	0	0	0	GEW 50
8:00	"	0	0	0	
9:00	20.9	0	0	0	GEW 40
10:00	"	0	0	0	
11:00	"	0	0	0	
12:00	20.9	0	0	0	GEW 41
1:00	"	0	0	0	
2:00	"	0	0	0	
3:00					
4:00					
5:00					
6:00					

Notes

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-HHT	LIGHT	DRY	64
10-20	"	LIGHT	DRY	70
20-30	WOOD-HHT	LIGHT	DRY	79
30-40	HHT	LIGHT	DRY	84
40-50	HHT	LIGHT	DRY	92
50-60	HHT	LIGHT	DRY	TD 54'
60-70				
70-80				
80-90				
90-100				
100-110				
110-120				
120-130				
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

BRETT WILLIS 6/26/2004

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO. GGW-51 | SHEET 1 OF 1 SHEETS

PROJECT NAME: 2005 LFG Wells/Heady CQA	DRILLING SUBCONTRACTOR: AGG
ECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
L N: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar FMT AF10
HOLE LOCATION: GGW 51	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 523.50	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/16/05 / DRILLING END DATE: 7/16/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 70 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Matthew Hayes

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Cut 2 ft of soil				900	Drilling began on 7/16/05
10	Waste					
30	Waste					
40						
50	Waste	125° F			1000	
60		138° F				
70	Waste	154° F			1030	Drilling stopped at 70 ft due to high temperatures
	End of boring at 70 ft	152.5° F			1045	No Asbestos Containing Materials Observed
80						
90						
100						
110						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

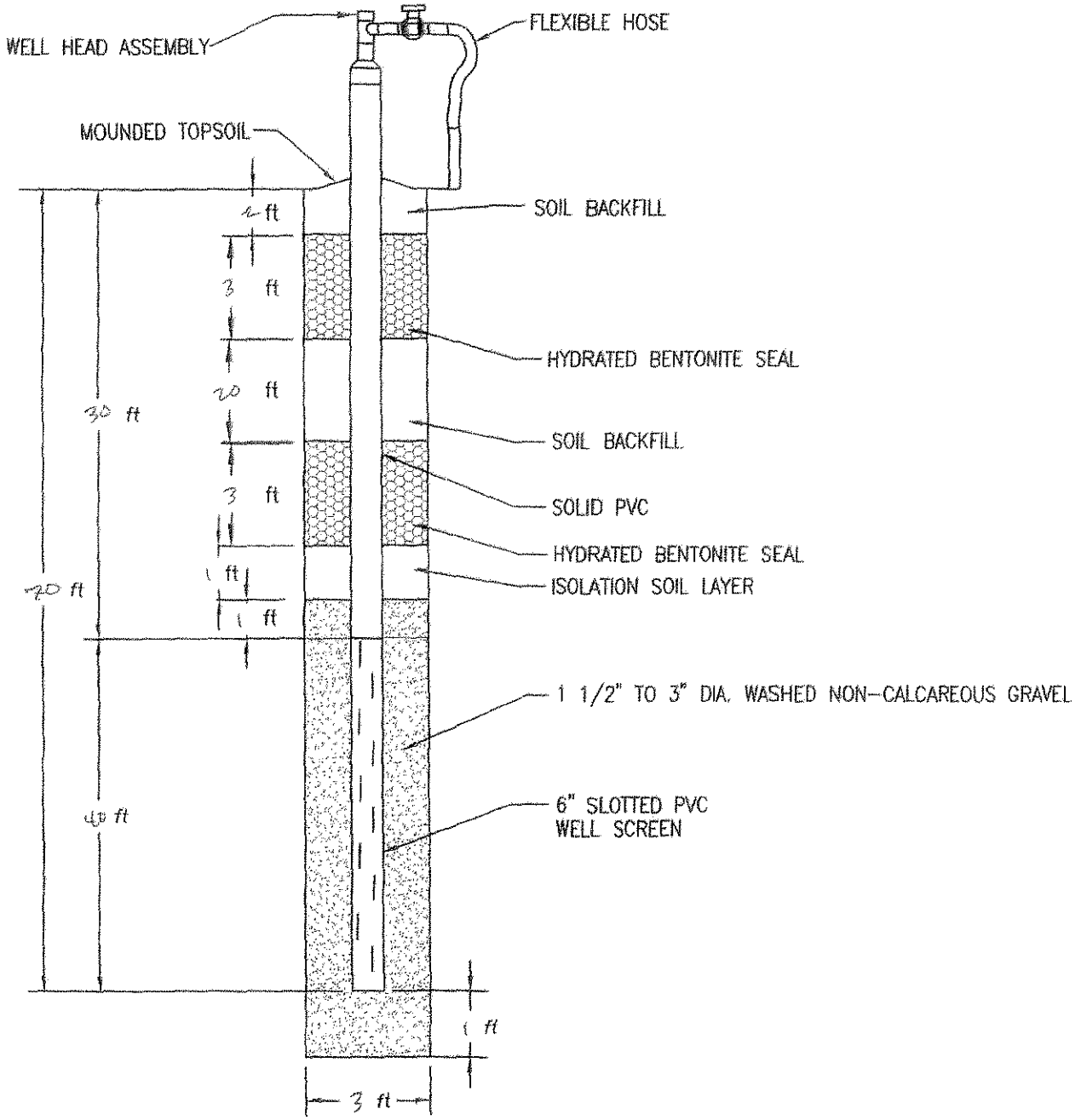
PROJECT NAME: 2005 LFG Wells/Heady CQA | HOLE NO.: GEW-51

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-51
WELL LOCATION:
INSTALLATION START DATE: 7/16/05
COMPLETION DATE: 7/16/05
DRILLER: AEG - B. Willis
INSPECTOR: Nathan Higgerson NH

COMMENTS:



American Environmental Group Ltd.

Well Log

DATE: 6/25/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GEW 52 — WELL NUMBER OR NAME

62' — LINEAR FEET OF DRILLING

62' — LINEAR FEET OF COMPLETION

0' — LINEAR FEET OF ABANDONMENT

Time in: _____ Time out: _____

Weather conditions: Sunny

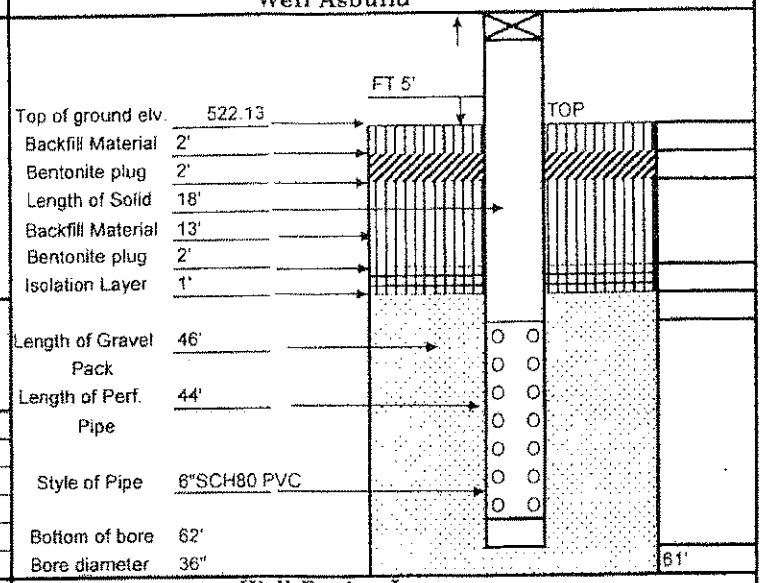
Site conditions: _____

Rig hrs: _____

Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

Well Asbuild



Top of ground elv.	522.13
Backfill Material	2'
Bentonite plug	2'
Length of Solid	18'
Backfill Material	13'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	46'
Length of Perf. Pipe	44'
Style of Pipe	6"SCH80 PVC
Bottom of bore	62'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S	LEL / CO	
7:00	20.9	0	0	0 GEW 52
8:00	20.9	0	0	0 GEW 4
9:00	"	0	0	0
10:00	"	0	0	0
11:00	"	0	0	0
12:00	20.9	0	0	0 GEW 3
1:00	"	0	0	0
2:00	"	0	0	0
3:00	"	0	0	0
4:00	20.9	0	0	0 GEW 2
5:00	20.9	0	0	0 6-24-04
6:00	"	0	0	0

Notes

northing 106325

easting 516248

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-HHT	LIGHT	DRY	69
10-20	HHT	LIGHT	DRY	76
20-30	HHT	LIGHT	DRY	81
30-40	HHT	LIGHT	DRY	85
40-50	HHT	LIGHT	DRY	98
50-60	HHT	LIGHT	DRY	98
60-70	HHT-DIRT	LIGHT	DRY	TD 62'
70-80				
80-90				
90-100				
100-110				
110-120				
120-130				
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

BRETT WILLIS 6/25/2004

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO. GEW-53 | SHEET 1 OF 2 SHEETS

PROJECT NAME: 2005 LFG Wells / Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
CITY: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AF10
HOLE LOCATION: GEW 53	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 527	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/14/05 — DRILLING END DATE: 7/15/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 136 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	[signature]

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Waste [illegible] LFH of 5001				1310	Begin drilling on 7/14/05
10						
30	Waste					
40						
50	Waste					
60						
70	Waste				1530	
80						
90	Waste					
100						
110	Waste				1715	Drilling stopped for the day at an approximate depth of 115ft
					700	Drilling Resumes on 7/15/05
	Waste					

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: 2005 LFG Wells / Header CQA | HOLE NO.: GEW-53

Aquaterra Drilling Log

HOLE NO. GEW 53 | SHEET 2 OF SHEETS 2

PROJECT NAME: 2005 LFG Wells/Header CQA

INSPECTOR: Nathan Hingerson

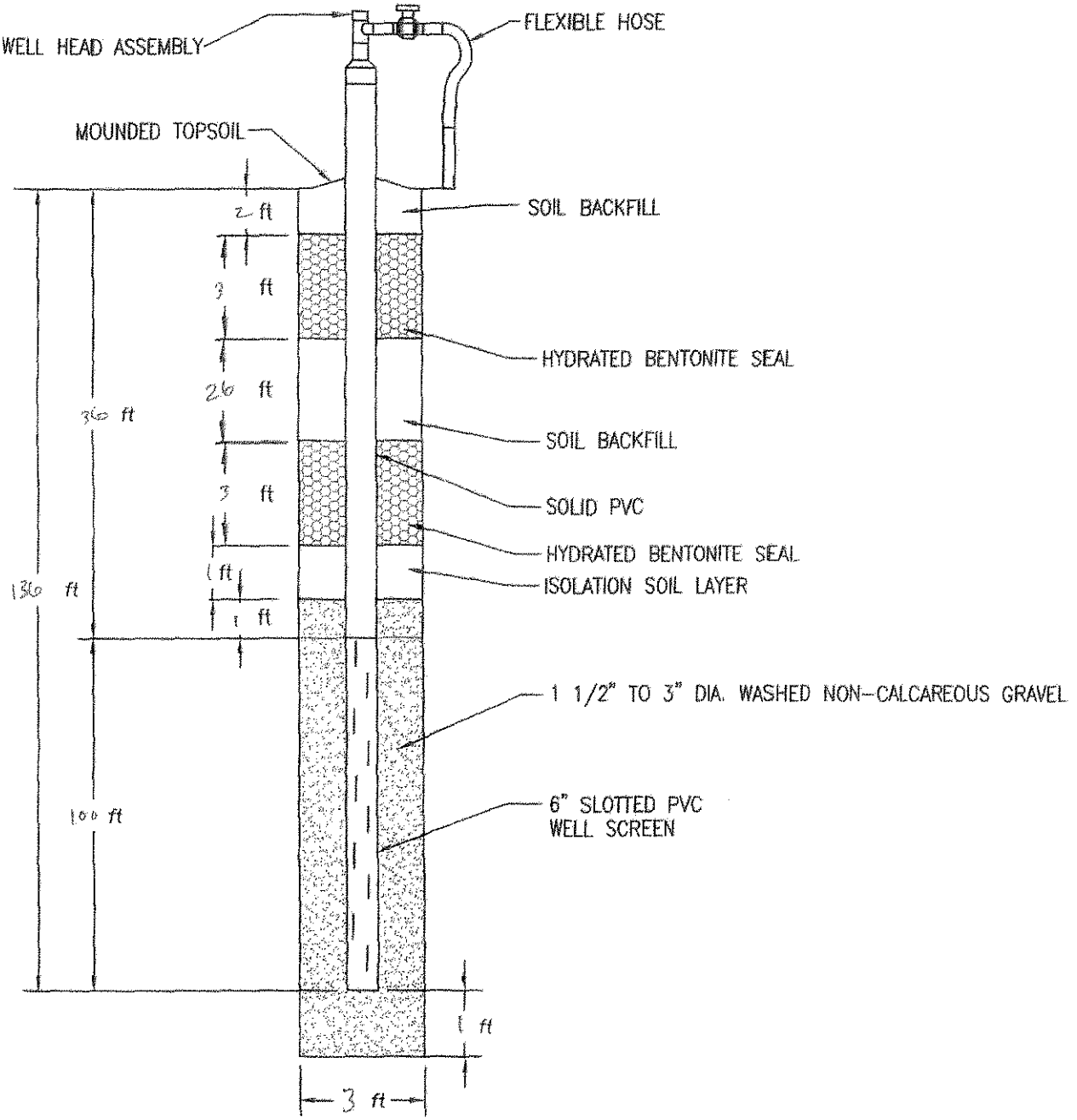
DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
Weight					
				930	Drilling finished on 7/15/05 at a total depth of 1360'
End of the boring at 1360'					No Asbestos Containing Materials Observed

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-53
WELL LOCATION:
INSTALLATION START DATE: 7/14/05
COMPLETION DATE: 7/15/05
DRILLER: AEG - B. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-54 | SHEET 1 OF 2 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
IN: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IM7 - AF10
HOLE LOCATION: GEW-54	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36in Bucket
SURFACE ELEVATION: 522.92 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/13/05 — DRILLING END DATE: 7/14/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 136 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Hyzer

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	[illegible] 25 ft of 50.1				1245	Begin drilling on 7/13/05
10	Waste					
30	Waste					
40						
50	Waste				1400	
60						
70	Waste				1500	
80						
90						End of the drilling on 7/13/05 at depth of 90 ft
	Waste				700	Resume drilling on 7/14/05
100						
110	Wet Waste					

Aquaterra Drilling Log

HOLE NO. GEW-54 | SHEET 2 OF 2 SHEETS

PROJECT NAME: 2005 LFG Wells / Header CQA

INSPECTOR: ~~Author~~ Nathan Higgerson

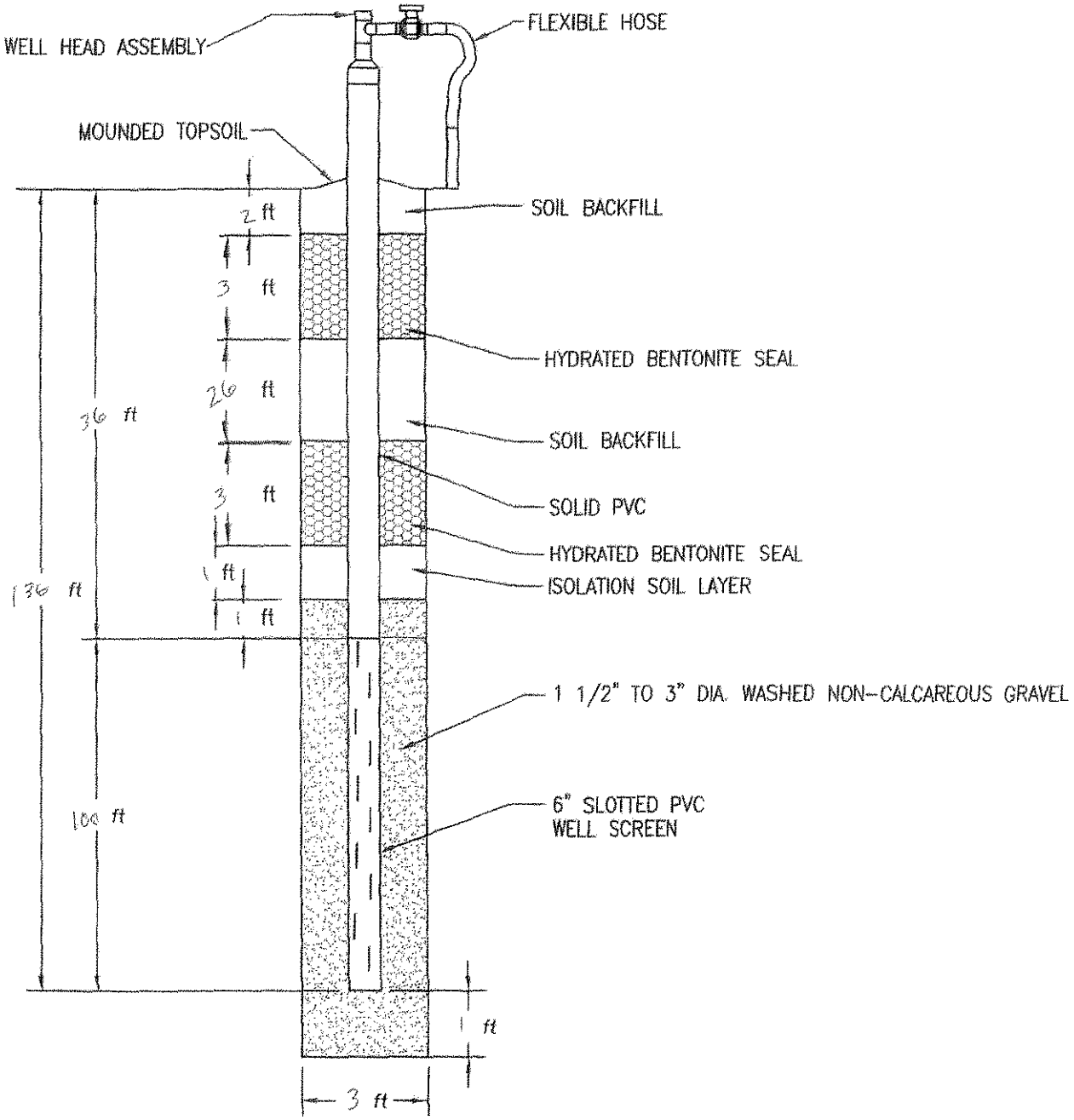
DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
120 Waste					
130 Waste				1100	End of drilling on 7/14/05 at a depth of 126'
140 End of the boring at a depth of 136 ft					No Asbestos Containing Materials ~~Encountered~~ Observed

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-54
WELL LOCATION:
INSTALLATION START DATE: 7/14/05
COMPLETION DATE: 7/14/05
DRILLER: AEG - B. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-55 | SHEET 1 OF SHEETS

PROJECT NAME: 2005 LFG Wells/Header	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
CITY: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar IMT AT 10
HOLE LOCATION: GEW-55	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 in Bucket
SURFACE ELEVATION: 522.10	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/15/05 — DRILLING END DATE: 7/16/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 84 ft.	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	2 ft of soil				945	Beginning on 7/15/05
10	Waste					
20	Waste					
42	Waste					
50						
60						
72	Waste					
		148°				
		150°			1330	End of drilling on 7/15/05 at a depth of 80 ft.
80	End of Boring at 84 ft	152°			700	Resume drilling on 7/16/05
						End of the boring at 84 ft due to the temperature being around 150° F. No asbestos containing materials observed
92						
0						

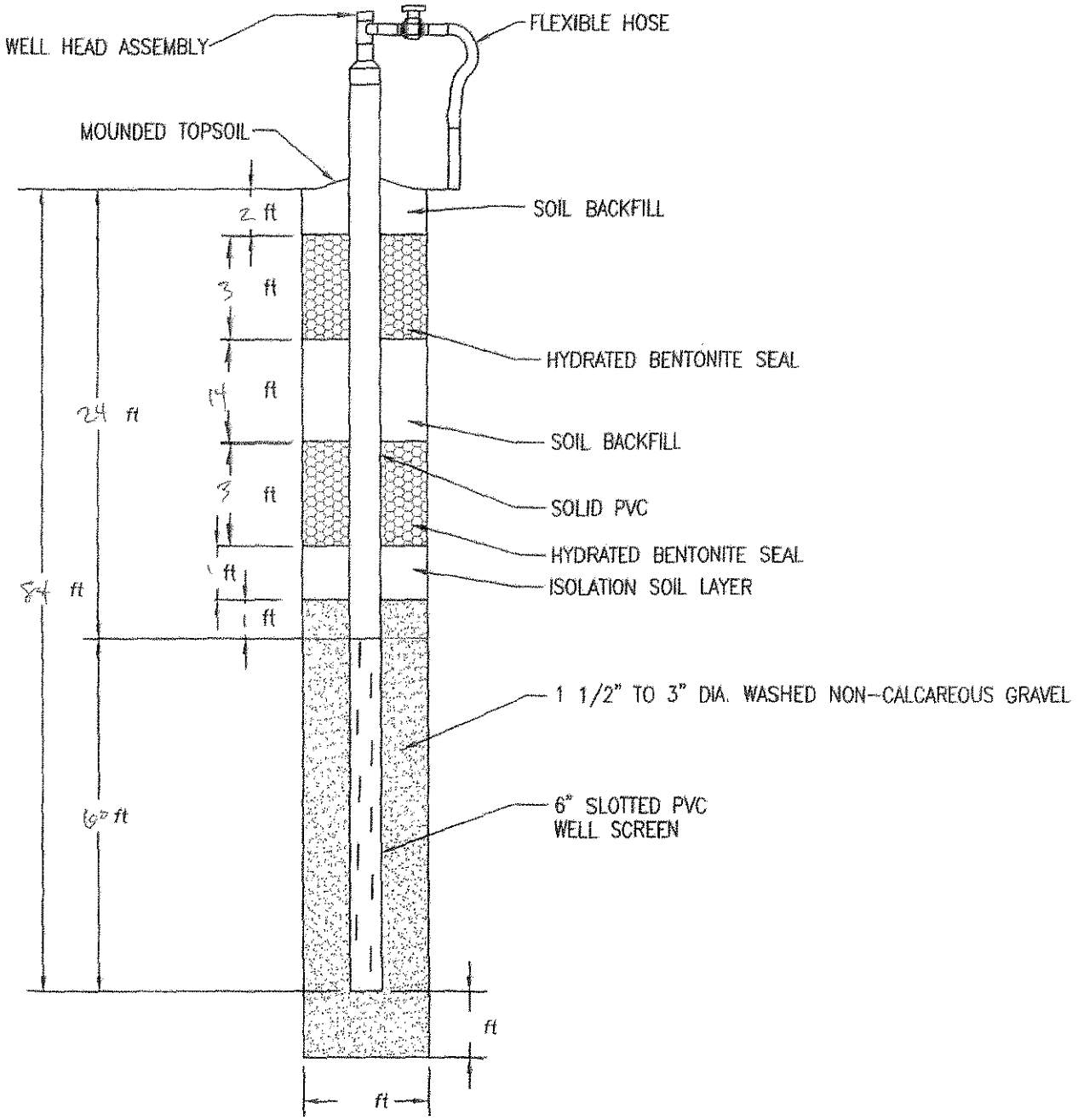
AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.	PROJECT NAME: 2005 LFG Wells/Header CQA	HOLE NO.: GEW-55

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-55
WELL LOCATION:
INSTALLATION START DATE: 7/15/05
COMPLETION DATE: 7/16/05
DRILLER: AEG - B. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 56R | Elevation: Ground 499.1

Exact Location (Coordinates): N:1067786.2 E:516317.6

Date Started: 9/26/2009 | Date Completed: 9/26/2009

Boring Size: 36 inch | Total Depth: 101

Length of Perforated Pipe: 80 | Length of Solid Pipe: 20

Comments: 10 feet south of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	93	
2-4	soil/dry	93	
4-6	soil/dry	93	
6-10	soil/dry	93	
10-15	trash/dry	97	
15-20	trash/dry	97	
20-25	trash/dry	99	
25-30	trash/dry	99	
30-35	trash/dry	100	
35-40	trash/dry	102	
40-45	trash/dry	107	
45-50	trash/dry	110	
50-55	trash/dry	110	
55-60	trash/dry	116	
60-65	trash/damp	117	
65-70	trash/moist	122	
70-75	trash/moist	124	
75-80	trash/wet	129	
80-85	trash/wet	130	
85-90	sludge/wet	134	
90-95	sludge/wet	136	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

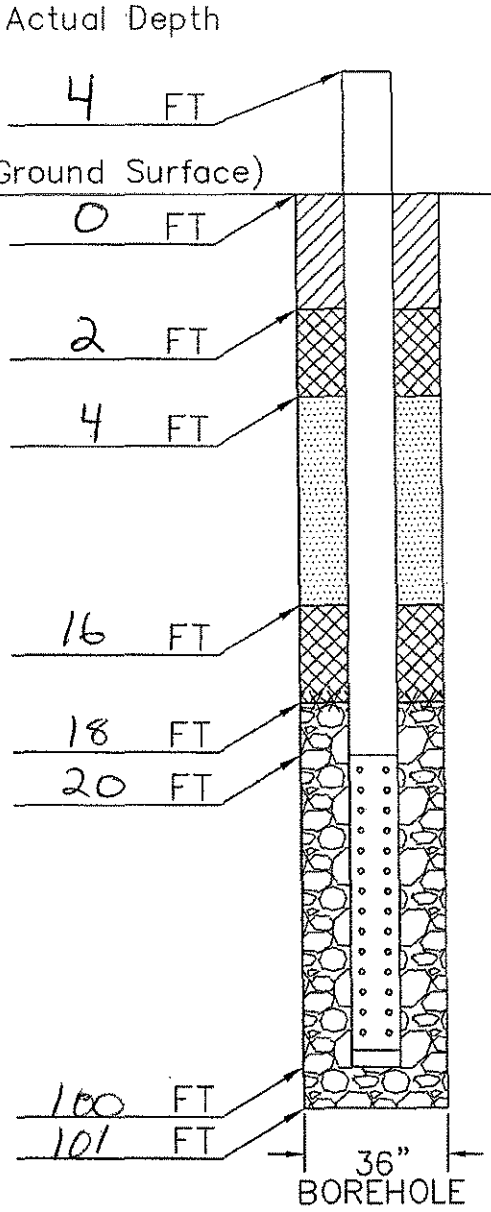
Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	sludge/wet	136	
100-105	sludge/wet	136	
105-110			
110-115			
115-120			
120-125			
125-130			
130-135			
135-140			
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 56R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-26-09 Completed Install.: 9-26-09
Time: 6:00am Time: 11:00am

Top of Flange Elevation: _____
Ground Surface Elevation: 499.1 Location: N 1067786.2E 516317.6



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 feet
Diameter: 6.n

Screen:
Material: CPVC
Quantity: 80
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 57R
Elevation: Ground 551.8
Exact Location (Coordinates): N:1067220.9 E:516522.1
Date Started: 9/16/2009
Date Completed: 9/16/2009
Boring Size: 36 inch
Total Depth: 136
Length of Perforated Pipe: 115
Length of Solid Pipe: 20
Comments: 5 feet SE of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	94	
2-4	soil/dry	94	
4-6	soil/dry	94	
6-10	soil/dry	94	
10-15	trash/dry	99	
15-20	trash/dry	99	
20-25	trash/dry	99	
25-30	trash/dry	99	
30-35	trash/dry	105	
35-40	trash/dry	105	
40-45	trash/dry	107	
45-50	trash/dry	107	
50-55	trash/dry	109	
55-60	trash/dry	110	
60-65	trash/dry	110	
65-70	trash/dry	113	
70-75	trash/dry	113	
75-80	trash/dry	113	
80-85	trash/dry	113	
85-90	trash/dry	116	
90-95	trash/dry	116	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

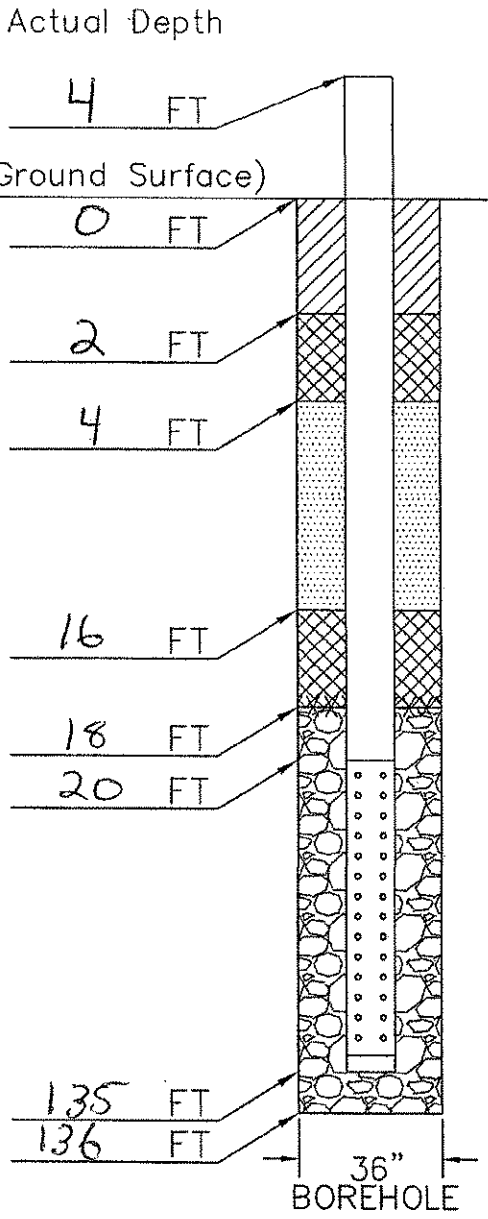
QA/QC Monitor: Joshua Ross

95-100	trash/dry	119	
100-105	trash/dry	119	
105-110	trash/dry	122	
110-115	trash/dry	122	
115-120	trash/dry	123	
120-125	trash/damp	124	
125-130	trash/damp	124	
130-135	trash/damp	124	
135-140	trash/damp	124	
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 5 17 R
Drilling Contractor: A.E.&L. Observed By: Joshua Ross
Started Install.: 9-16-09 Completed Install.: 9-16-09
Time: 10:00am Time: 4:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 551.8 Location: N 1067220.9 E 516522.1



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 115
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

American Environmental Group Ltd.

Well Log

DATE: 6/3/2004

PROJECT NAME: BRIDGTON

PROJECT#: 1-04-028

DRILLING

GEW 58 — WELL NUMBER OR NAME

136' — LINEAR FEET OF DRILLING

136' — LINEAR FEET OF COMPLETION

0' — LINEAR FEET OF ABANDONMENT

Time in: _____ Time out: _____

Weather conditions: Sunny

Site conditions: _____

Rig hrs: _____

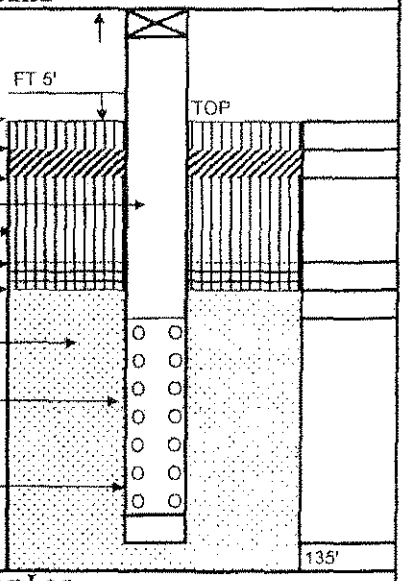
Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

northing 1067359

easting 516560

Well Asbuild



Top of ground elv.	554.65
Backfill Material	1'
Bentonite plug	2'
Length of Solid	21'
Backfill Material	18'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	117'
Length of Perf. Pipe	115'
Style of Pipe	8"SCH80 PVC
Bottom of bore	136
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO	
7:00	20.9	0	0	0	GW 57
8:00	"	0	0	0	
9:00	"	0	0	0	
10:00	20.9	0	0	0	GW 58
11:00	"	0	0	0	
12:00	"	0	0	0	
1:00	"	0	0	0	
2:00	"	0	0	0	
3:00	"	0	0	0	
4:00	"	0	0	0	
5:00	20.9	0	0	0	GW 65
6:00					

Notes

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-MSW	LIGHT	DRY	70
10-20	"	LIGHT	DRY	72
20-30	MSW	LIGHT	DRY	75
30-40	WOOD-MSW	LIGHT	DRY	75
40-50	MSW	LIGHT	DRY	75
50-60	STEEL-MSW	LIGHT	DRY	83
60-70	MSW	LIGHT	DRY	88
70-80	MSW	LIGHT	DRY	96
80-90	MSW	LIGHT	DRY	102
90-100	MSW	HEAVY	Moisture	106
100-110	MSW	HEAVY	Moisture	106
110-120	MSW	HEAVY	Moisture	111
120-130	M SW	HEAVY	Moisture	115
130-140	MSW	HEAVY	Moisture	TD 136'
140-150				

CLIENT REPRESENTATIVE DATE

BRETT WILLIS 6/3/2004

AEGL SITE SUPERVISOR DATE

NAME & TITLE

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 59R | Elevation: Ground 551.0

Exact Location (Coordinates): N:1067487.5 E:516435.1

Date Started: 9/17/2009 | Date Completed: 9/17/2009

Boring Size: 36 inch | Total Depth: 134

Length of Perforated Pipe: 113 | Length of Solid Pipe: 20

Comments: 20 feet south of existing

Depth	Material Drilled	Temp.	Comment
0-2	trash/dry	93	
2-4	trash/dry	93	
4-6	trash/dry	93	
6-10	trash/dry	93	
10-15	trash/dry	97	
15-20	trash/dry	97	
20-25	trash/dry	99	
25-30	trash/dry	99	
30-35	trash/dry	99	
35-40	trash/dry	102	
40-45	trash/dry	102	
45-50	trash/dry	102	
50-55	trash/dry	105	
55-60	trash/dry	105	
60-65	trash/dry	109	
65-70	trash/dry	109	
70-75	trash/dry	111	
75-80	trash/dry	111	
80-85	trash/dry	111	
85-90	trash/dry	115	
90-95	trash/dry	115	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

oject Name: 2009 Gas System | Project Number: 0120-131-17

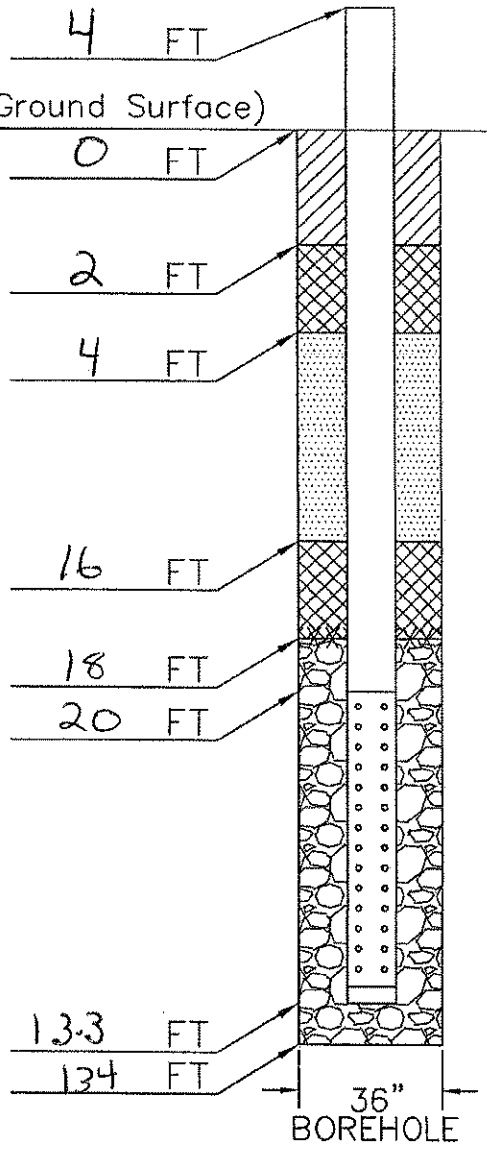
Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	trash/dry		121	
100-105	trash/dry		123	
105-110	trash/dry		125	
110-115	trash/dry		129	
115-120	trash/wet		134	
120-125	trash/wet		134	
125-130	sludge/wet		139	
130-135	sludge/wet		141	
135-140				
140-145				
145-150				

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 59 R
Drilling Contractor: A.E.G.L Observed By: Joshua Rose
Started Install.: 9-17-09 Completed Install.: 9-17-09
Time: 6.00am Time: 4.00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 551.0 Location: N 1667487.5 E 516435.1



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 113
Diameter: 6in
Plug: 6in cap

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 60R | Elevation: Ground 551.9

Exact Location (Coordinates): N:1067128.0 E:516480.7

Date Started: 9/18/2009 | Date Completed: 9/18/2009

Boring Size: 36 inch | Total Depth: 150

Length of Perforated Pipe: 129 | Length of Solid Pipe: 20

Comments: 20 feet west of existing

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	92	
2-4	soil/dry	92	
4-6	soil/dry	92	
6-10	soil/dry	92	
10-15	trash/dry	96	
15-20	trash/dry	96	
20-25	trash/dry	96	
25-30	trash/dry	99	
30-35	trash/dry	99	
35-40	trash/dry	100	
40-45	trash/dry	101	
45-50	trash/dry	103	
50-55	trash/dry	103	
55-60	trash/dry	105	
60-65	trash/dry	105	
65-70	trash/dry	105	
70-75	trash/dry	105	
75-80	trash/dry	111	
80-85	trash/dry	111	
85-90	trash/dry	111	
90-95	trash/dry	111	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

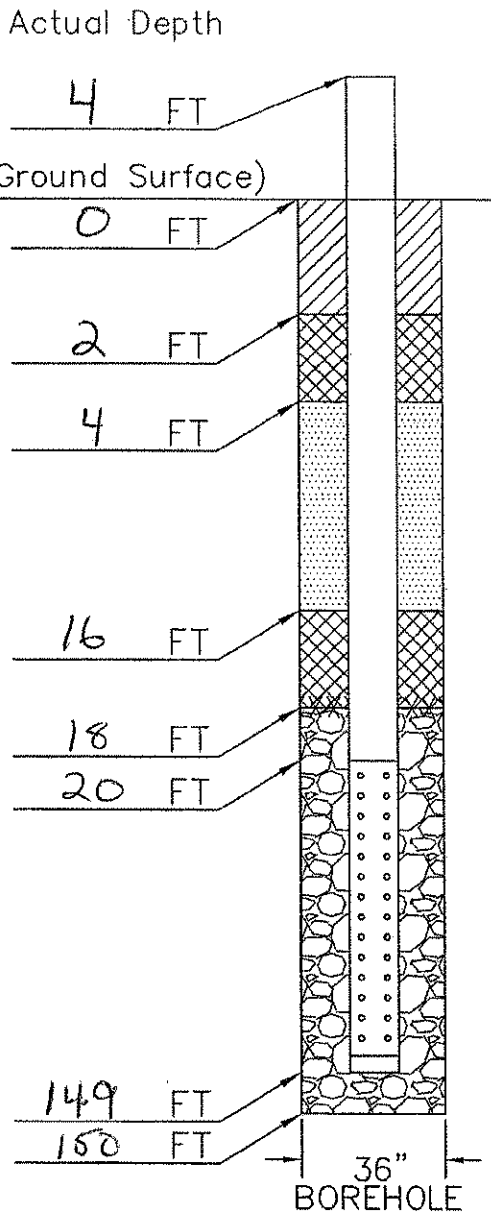
Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	trash/dry		113	
100-105	trash/dry		113	
105-110	trash/dry		116	
110-115	trash/dry		116	
115-120	trash/dry		119	
120-125	trash/dry		124	
125-130	trash/dry		124	
130-135	trash/dry		127	
135-140	trash/dry		127	
140-145	trash/dry		129	
145-150	trash/dry		131	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 60R
Drilling Contractor: A.E.&L. Observed By: Joshua Roos
Started Install.: 9-18-09 Completed Install.: 9-18-09
Time: 6:00am Time: 5:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 551.9 Location: N 1067128.0 E 516480.7



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 129
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 61R | Elevation: Ground 555.6

Exact Location (Coordinates): N:1067265.1 E:516465.1

Date Started: 9/21/2009 | Date Completed: 9/21/2009

Boring Size: 36 inch | Total Depth: 150

Length of Perforated Pipe: 129 | Length of Solid Pipe: 20

Comments: 15 feet NE of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	92	
2-4	soil/dry	92	
4-6	soil/dry	92	
6-10	soil/dry	92	
10-15	trash/dry	94	
15-20	trash/dry	94	
20-25	trash/dry	95	
25-30	trash/dry	95	
30-35	trash/dry	95	
35-40	trash/dry	97	
40-45	trash/dry	97	
45-50	trash/dry	99	
50-55	trash/dry	101	
55-60	trash/dry	101	
60-65	trash/dry	103	
65-70	trash/dry	105	
70-75	trash/dry	105	
75-80	trash/dry	107	
80-85	trash/dry	111	
85-90	trash/dry	111	
90-95	trash/dry	114	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

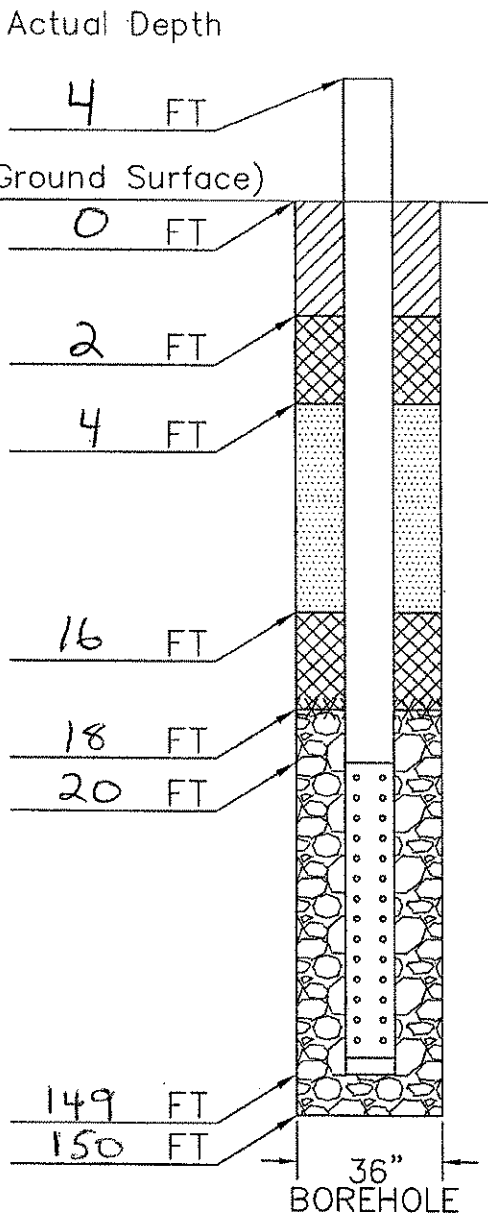
Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	trash/dry		114	
100-105	trash/dry		117	
105-110	trash/dry		121	
110-115	trash/dry		124	
115-120	trash/dry		124	
120-125	trash/dry		128	
125-130	trash/dry		128	
130-135	trash/dry		128	
135-140	trash/dry		128	
140-145	trash/dry		131	
145-150	trash/dry		131	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 61R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-21-09 Completed Install.: 9-21-09
Time: 6:00am Time: 5:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 555.6 Location: N 1067265.1 E 516465.1



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 129
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

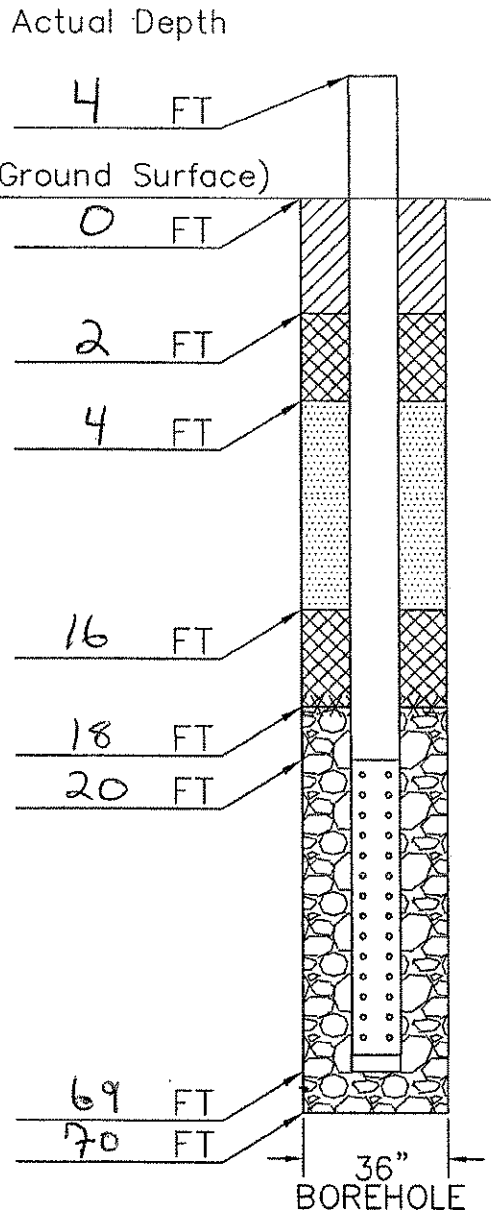
Project Name:	2009 Gas System	Project Number:	0120-131-17
Project Location:	Bridgeton Landfill	QA/QC Monitor:	Joshua Ross
Well No.:	62R	Elevation:	Ground 556.6
Exact Location (Coordinates):	N:1067375.2	E:516320.3	
Date Started:	8/21/2009	Date Completed:	8/21/2009
Boring Size:	36 inch	Total Depth:	70
Length of Perforated Pipe:	49	Length of Solid Pipe:	20
Comments:	15 foot south of existing		

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	92	
2-4	soil/dry	94	
4-6	soil/dry	95	
6-10	soil/dry	95	
10-15	trash/dry	96	
15-20	trash/dry	97	
20-25	trash/dry	97	
25-30	trash/dry	97	
30-35	trash/dry	98	
35-40	trash/dry	100	
40-45	trash/dry	101	
45-50	trash/dry	100	
50-55	trash/dry	100	
55-60	trash/dry	105	
60-65	trash/dry	108	
65-70	trash/dry	110	
70-75			
75-80			
80-85			
85-90			
90-95			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 62R
Drilling Contractor: A.E.&L. Observed By: Joshua Ross
Started Install.: 8-21-09 Completed Install.: 8-21-09
Time: 6:00am Time: 8:30am

Top of Flange Elevation: _____
Ground Surface Elevation: 556.6 Location: N 1067375.2 E 516320.3



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 49
Diameter: 6in
Plug: 6in cap

American Environmental Group Ltd.

Well Log

DATE: 6/8/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GEW 63	WELL NUMBER OR NAME
107'	LINEAR FEET OF DRILLING
107'	LINEAR FEET OF COMPLETION
0'	LINEAR FEET OF ABANDONMENT

Time in: _____ Time out: _____

Weather conditions: Sunny

Site conditions: _____

Rig hrs: _____

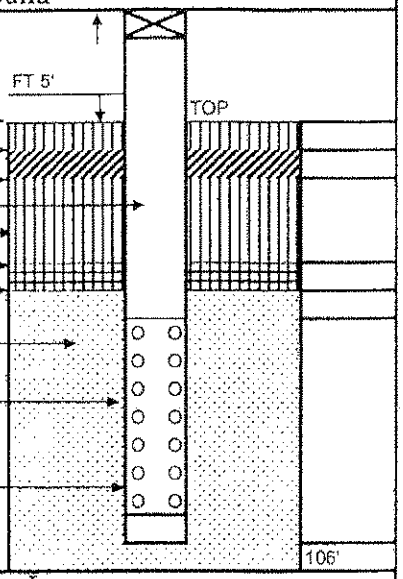
Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

northing 1067568

easting 516279

Well Asbuild



Top of ground elv.	507.88
Backfill Material	1'
Bentonite plug	2'
Length of Solid	25'
Backfill Material	17'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	84'
Length of Perf. Pipe	82'
Style of Pipe	6"SCH80 PVC
Bottom of bore	107'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO
7:00	20.9	0	0	0 GEW 65
8:00	"	0	0	0
9:00	"	0	0	0
7:00	20.9	0	0	0 6-5-04
7:00	20.9	0	0	0 6-07-04
6:30	20.9	0	0	0 6-08-04
1:00				
2:00				
3:00				
4:00				
5:00				
6:00				

Notes

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-ROC	LIGHT	DRY	74
10-20	MSW	LIGHT	DRY	86
20-30	MSW	LIGHT	DRY	91
30-40	MSW	LIGHT	DRY	98
40-50	MSW	LIGHT	DRY	101
50-60	MSW	LIGHT	DRY	103
60-70	MSW	LIGHT	DRY	103
70-80	MSW	LIGHT	DRY	114
80-90	WOOD-STEEL	LIGHT	Moisture	116
90-100	MSW	LIGHT	Moisture	116
100-110	MSW	LIGHT	Moisture	TD 107'
110-120				
120-130				
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

BRETT WILLIS 6/8/2004

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO. GEW-64 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill · Gas System Install	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 0203w008	NAME OF DRILLER(S): John Stanley
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: IMT / Caterpillar
HOLE LOCATION: GEW-64	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 inch Borehole
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS:	DRILLING START DATE: 8/20/03 — DRILLING END DATE: 8/21/03
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 140 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Heather L Heggen

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	2 feet of cover soil				1515	
	Refuse	80°F				
30		80°F				
	Refuse	81°F				
40		81°F				
					1645	End of drilling on 8/20/03 at 50 ft
50		84°F			715	Resume drilling on 8/21/03
	Refuse					
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: | HOLE NO. GEW-64

Aquaterra Drilling Log

HOLE NO. GEW-64 | SHEET 1 OF SHEETS 2

PROJECT NAME: Bridgeton Landfill - Gas System Install

INSPECTOR: Nathan Hagerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	Refuse					
70						
					900	
80						
90	Refuse					
100						
110					1100	
120	Refuse				1130	
130						
140					1300	
	End of boring at 140 ft.					No Asbestos Containing Materials Encountered

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO.

American Environmental Group Ltd.

Well Form

DATE: 08/21/2003

PROJECT NAME: Bridgeton

PROJECT#: 1-03-011

DRILLING

GW 64 WELL NUMBER OR NAME

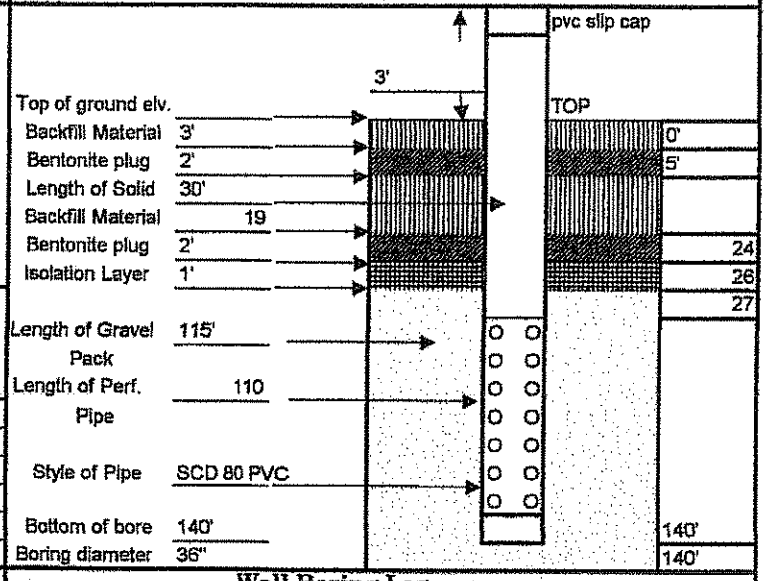
140' LINEAR FEET OF DRILLING

140' LINEAR FEET OF COMPLETION

0 LINEAR FEET OF ABANDONMENT

NOTES:

Well Asbuild



MONITORING LOG

Calibration date 08/22/03

Time	OXYGEN	H2S	LEL	CO	Date
07:00	20.9	0	0	0	GW 64
08:00	"	0	0	0	"
09:00	"	0	0	0	"
10:00	"	0	0	0	"
11:00	"	0	0	0	"
12:00	"	0	0	0	"
01:00	"	0	0	0	"
02:00	"	0	0	0	"
03:00	20.9	0	0	0	GW61
04:00	"	0	0	0	"
05:00	"	0	0	0	"
06:00					

Notes

Well Boring Log

Depth	Composition	Degree of Comp.	Degree of Moisture	Temp
0-10	cover	slight	dry	
10-20	"	slight	dry	80
20-30	"	slight	dry	
30-40	"	slight	Moisture	81
40-50	"	slight	"	
50-60	dirt "	moderate	"	86
60-70	"	moderate	dry	
70-80	"	slight	dry	97
80-90	"	moderate	dry	
90-100	"	moderate	dry	97
100-110	c&d "	heavy	dry	
110-120	"	heavy	dry	104
120-130	"	heavy	dry	
130-140	"	heavy	dry	TD 140'
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

John Stanley 08/21/2003

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO. GEW 65A | SHEET 1 OF 2 SHEETS

PROJECT NAME: GEW 23A & 27A CQA	DRILLING SUBCONTRACTOR: PDI
PROJECT NUMBER: 2048.10	NAME OF DRILLER(S): MITCH WILKENSON
LOCATION: BRIDGETON, MISSOURI	MANUFACTURER'S DESIGNATION OF DRILL: WESTERN BORE 200 CRAWLER DRILL
HOLE LOCATION: 35' NORTHEAST OF GEW 65 ON TOP OF 2006 FILL, CLOVER HILL	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 24" BUCKET; 2 OPERATORS FROM LAFARGE; 35" DIAMETER HOLE
SURFACE ELEVATION: 572 ±	
OVERBURDEN THICKNESS: 5' ±	DRILLING START DATE: 10-4-06 / DRILLING END DATE: 10-5-06
DEPTH DRILLED INTO ROCK: NO	DEPTH GROUNDWATER ENCOUNTERED: NO
TOTAL DEPTH OF HOLE: 135	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NO

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
–	–	–	–

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
–	–	–	–	–	–	–

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
FILLED	SOIL, GRAVEL, BENTONITE	–	GAS WELL	TERRY L. MUELLER

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	0+00				1100	
	CH	0+02		SOIL		
	0+05	0+05		BENTONITE		
10			SOIL			
	WASTE		6" SOLID PVC			
20						DRY
		0+29		BENTONITE		
30	0+32	0+32			1200	
		0+33		SOIL		
		0+34				
	WASTE					
40			6" PERFORATED PVC			WASTE TEMPERATURE
	0+47				1300	75°-80°F
50			GRAVEL			
	WASTE					
	0+59				1400	
60						

Aquaterra Drilling Log

HOLE NO. GEW-65A | SHEET 2 OF 2 SHEETS

PROJECT NAME: GEW 23A & 27A CQA

INSPECTOR: (TERRY L. MUELLER)

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60						
70	WASTE					
	0+74				1500	
80	WASTE					↑ DRY ↓
	0+87				1600	
90	WASTE					
	0+95				1700	
	WASTE					
	1+02		GRAVEL / 6" PERFORATED / GRAVEL		1800 10-4-06 ↑ 0700 10-5-06 ↓	WASTE TEMPERATURE 105°-110°
110	WASTE					↑ MOIST ↓
	1+11				0800	
	WASTE					
	1+20				0900	WASTE TEMPERATURE 130°F
120	WASTE 1+23				1000	CONCRETE CHUNKS REMOVED
	WASTE 1+26				1100	
	WASTE 1+30				1200	NEWSPAPER & MAGAZINES FOUND FROM JANUARY 2000
130	WASTE	134				
	1+35	135			1300	WASTE TEMPERATURE 130°F
140						
						NO ASBESTOS MATERIAL OBSERVED
150						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: GEW 23A & 27A CQA

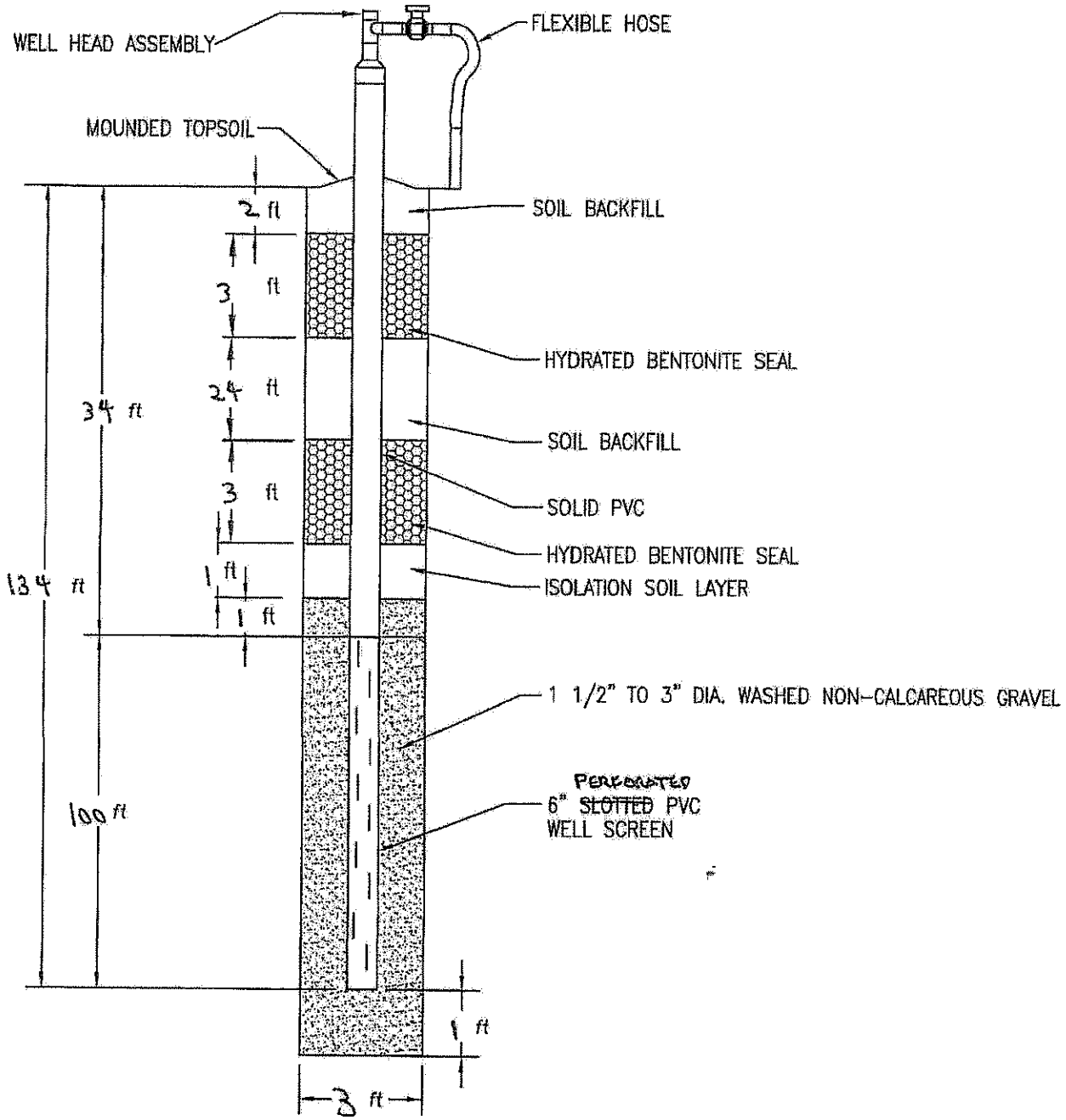
HOLE NO.: GEW 65A

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairveiw Heights, Illinois 62208

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 2048.10
PROJECT NAME: GEW 23A & 27A CDA
GAS WELL NO.: 65A
WELL LOCATION: TOP OF 2006 FINAL CONTR. - 35' NORTHEAST OF WELL 65
INSTALLATION START DATE: 10-4-06
COMPLETION DATE: 10-5-06
DRILLER: MITCH WILLIAMSON PDI
INSPECTOR: (TERRY L. MUELLER)

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-66 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill - Gas System Installation	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 0203008	NAME OF DRILLER(S): John Stanley
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: IMT / Caterpiller
HOLE LOCATION: GEW-66	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 inch hornhole
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 8/16/03 — DRILLING END DATE: 8/17/03
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 140 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan J Hyzer

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	18 inches of Cover Soil				1030	
	Refuse	73°F				
20		76°F			1050	
30	Refuse	83°F				
40		84°F				
					1200	
50		87°F				
	Refuse	87°F				
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: | HOLE NO. GEW-66

Aquaterra Drilling Log

HOLE NO. GEW-66 | SHEET 2 OF SHEETS 2

PROJECT NAME: Bridgeton Landfill - Gas System Install

INSPECTOR: Nathan Higgerson

DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
Refuse	98°F			1	
	102°F			1300	
	106°F				
Refuse	114°F			1440	End of drilling on 8/16/03 at 100 ft
				800	Resumes drilling on 8/17/03
Refuse					
Refuse					
End of boring at 140 ft				1040	No Asbestos Containing Materials Encountered

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. GEW-66

American Environmental Group Ltd.

Well Form

DATE: 08/17/03

PROJECT NAME: Bridgeton

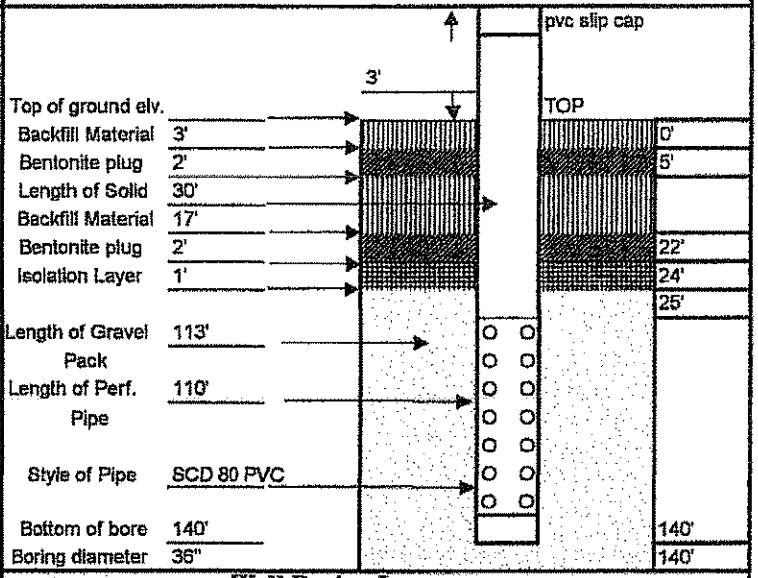
PROJECT#: 1-03-011

DRILLING

GW 66	WELL NUMBER OR NAME
40'	LINEAR FEET OF DRILLING
140'	LINEAR FEET OF COMPLETION
0	LINEAR FEET OF ABANDONMENT

NOTES:

Well Asbuild



MONITORING LOG

Calibration date 08/17/03

Time	OXYGEN	H2S	LEL	/	CO-	Date
07:00	20.9	0	0		0	GW 66
08:00	"	0	0		0	"
09:00	"	0	0		0	"
10:00	"	0	0		0	"
11:00	"	0	0		0	"
12:00						
01:00						
02:00						
03:00						
04:00						
05:00						
06:00						

Notes

Well Boring Log

Depth	Composition	Degree of Comp.	Degree of Moisture	Temp
0-10	cover / res was.	slight	dry	
10-20	"	slight	dry	76
20-30	"	slight	dry	
30-40	"	slight	dry	84
40-50	"	slight	dry	
50-60	"	slight	dry	87
60-70	"	slight	dry	
70-80	"	slight	dry	102
80-90	"	moderate	dry	
90-100	"	moderate	dry	114
100-110	"	moderate	dry	
110-120	"	moderate	dry	112
120-130	"	moderate	dry	
130-140	"	moderate	dry	TD 140'
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

John Stanley 08/17/03

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO. GEW-67 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill - Gas System Install	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 02031008	NAME OF DRILLER(S): John Stanley
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: JMT / Caterpillar
HOLE LOCATION: GEW-67	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 inch borehole
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 9/4/03 — DRILLING END DATE: 9/5/03
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 135 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Tepper

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	6 inches of Cover soil				~~1150~~ 1445	
	Refuse					
20						
30	Refuse					
40						
					1545	
50					1600	End of drilling on 9/4/03 @ ± 55 feet.
					715	Resume drilling on 9/5/03

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME:

HOLE NO.: GEW-67

Aquaterra Drilling Log

HOLE NO. GEW-67 | SHEET 2 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill Gas System Install

INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
70	Refuse					
80						
90	Refuse					
100					1100	
110						
120						
130	Refuse				1400	
140	End of boring at 135 feet					No Asbestos Containing Materials Encountered. Well was stopped at 135 feet for safety reasons.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. GEW-67

American Environmental Group Ltd.

Well Form

DATE: 09/05/03

PROJECT NAME: Bridgeton

PROJECT#: 1-03-011

DRILLING

GW 67 WELL NUMBER OR NAME

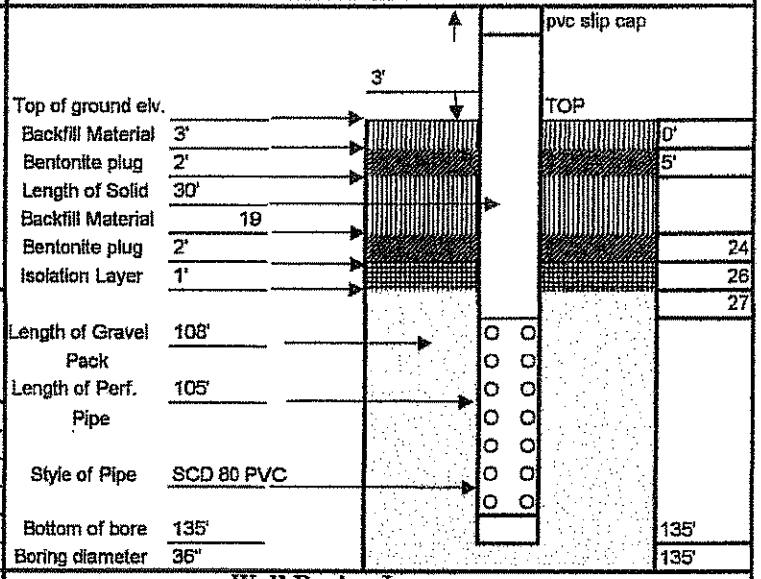
135' LINEAR FEET OF DRILLING

135' LINEAR FEET OF COMPLETION

0' LINEAR FEET OF ABANDONMENT

NOTES:

Well Asbuild



MONITORING LOG

Calibration date 09/05/03

Time	OXYGEN	H2S	LEL / CO-	Date
07:00	20.9	0	0 0	GW 67
08:00	"	0	0 0	"
09:00	"	0	0 0	"
10:00	"	0	0 0	"
11:00	"	0	0 0	"
12:00	"	0	0 0	"
01:00	"	0	0 0	"
02:00				
03:00				
04:00				
05:00				
06:00				

Notes

Well Boring Log

Depth	Composition	Degree of Comp.	Degree of Moisture	Temp
0-10	cover res was.	slight	dry	
10-20	"	slight	dry	79
20-30	"	slight	dry	
30-40	"	slight	dry	81
40-50	"	slight	dry	
50-60	"	slight	dry	80
60-70	"	slight	dry	
70-80	"	slight	dry	86
80-90	"	slight	dry	
90-100	"	slight	dry	88
100-110	"	slight	dry	
110-120	"	moderate	dry	101
120-130	"	moderate	dry	
130-140	"	moderate	dry	TD 135'
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

John Stanley 09/05/03

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO. GEW-68 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill - Gas System Install	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 0203100 8	NAME OF DRILLER(S): John Stanley
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: IMT / Caterpillar
HOLE LOCATION: GEW-68	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 inch borehole
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 8/22/03 — DRILLING END DATE: 8/25/03
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 135 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan L Hegger

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	3 feet of cover soil (including Berm)				1500	
	Refuse	81°F				
20		86°F				
30		85°F				
40	Refuse	90°F				
50		89°F				
60		90°F				End of drilling on 8/27/03 at 60 ft

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: | HOLE NO.: GEW-68

Aquaterra Drilling Log

HOLE NO. GEW-68 | SHEET 2 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill - Gas System Install

INSPECTOR: Nathan Higgerson

TH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
70	Refuse				845	Resume drilling on 8/23/03
80						
90	Refuse				1035	
100						
110					1200	
120	Refuse				1300	End of drilling on 8/28/03 at 120 ft
					700	Resume drilling on 8/25/03
130						
	End of boring at 135 feet				930	No Asbestos containing materials encountered
140						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. GEW-68

American Environmental Group Ltd.

Well Form

DATE: 08/25/2003

PROJECT NAME: Bridgeton

PROJECT#: 1-03-011

DRILLING

GW 68 WELL NUMBER OR NAME

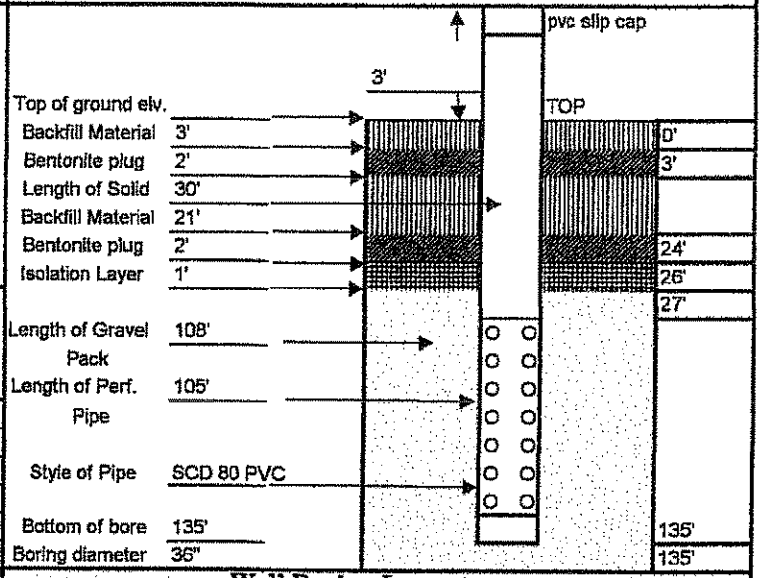
135' LINEAR FEET OF DRILLING

135' LINEAR FEET OF COMPLETION

0 LINEAR FEET OF ABANDONMENT

NOTES:

Well Asbuild



MONITORING LOG

Calibration date 08/25/03

Time	OXYGEN	H2S	LEL / CO-	Date
07:00	20.9	0	0 0	GW 68
08:00	"	0	0 0	"
09:00	"	0	0 0	"
10:00				
11:00				
12:00				
01:00				
02:00				
03:00				
04:00				
05:00				
06:00				

Notes

Well Boring Log

Depth	Composition		Degree of Comp.	Degree of Moisture	Temp
0-10	cover	res was.	slight	dry	
10-20		"	slight	dry	86
20-30		"	slight	dry	
30-40		"	slight	dry	90
40-50		"	slight	dry	
50-60	dirt	"	moderate	dry	90
60-70		"	moderate	dry	
70-80		"	slight	dry	90
80-90		"	moderate	dry	
90-100		"	moderate	dry	94
100-110	c&d	"	high	dry	
110-120		"	high	dry	99
120-130		"	high	dry	
130-140		"	high	dry	TD 135'
140-150					

CLIENT REPRESENTATIVE DATE

NAME & TITLE

John Stanley 08/25/2003

AEGL SITE SUPERVISOR DATE

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 69R | Elevation: Ground 561.0

Exact Location (Coordinates): N:1067020.6 E:516147.9

Date Started: 9/23/2009 | Date Completed: 9/23/2009

Boring Size: 36 inch | Total Depth: 150

Length of Perforated Pipe: 129 | Length of Solid Pipe: 20

Comments: feet wesr of existing welll

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	93	
2-4	soil/dry	93	
4-6	soil/dry	93	
6-10	soil/dry	93	
10-15	trash/dry	97	
15-20	trash/dry	97	
20-25	trash/dry	99	
25-30	trash/dry	99	
30-35	trash/dry	99	
35-40	trash/dry	100	
40-45	trash/dry	101	
45-50	trash/dry	104	
50-55	trash/dry	104	
55-60	trash/dry	105	
60-65	trash/dry	106	
65-70	trash/dry	108	
70-75	trash/dry	108	
75-80	trash/dry	109	
80-85	trash/dry	109	
85-90	trash/dry	109	
90-95	trash/dry	114	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

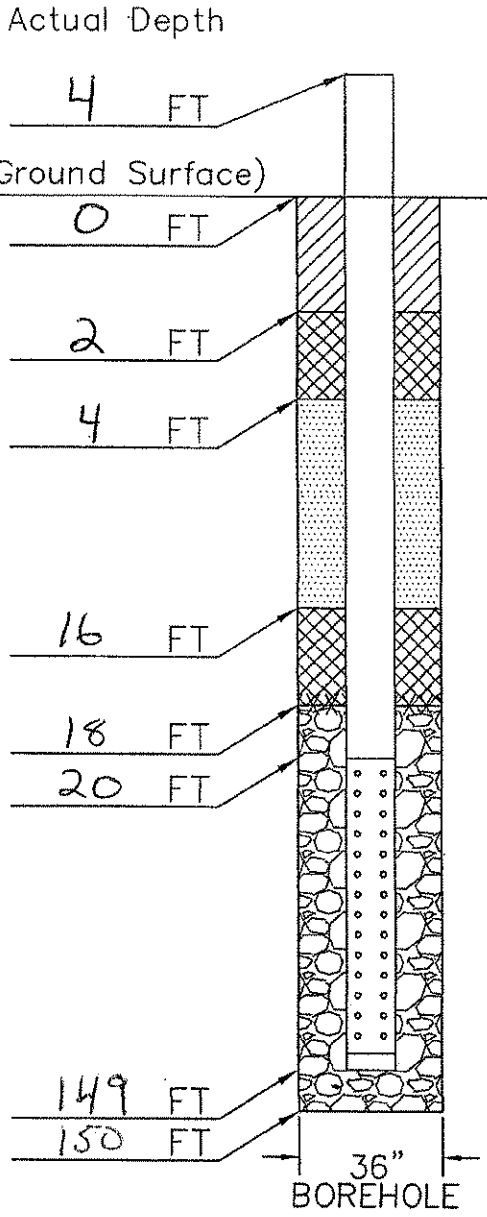
Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	trash/dry		114	
100-105	trash/dry		116	
105-110	trash/dry		120	
110-115	trash/dry		120	
115-120	trash/dry		120	
120-125	trash/dry		131	
125-130	trash/dry		131	
130-135	trash/dry		133	
135-140	trash/dry		135	
140-145	trash/dry		137	
145-150	trash/dry		137	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 69R
Drilling Contractor: A.E.&L. Observed By: Joshua Ross
Started Install.: 9-23-09 Completed Install.: 9-23-09
Time: 6:00am Time: 6:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 561.0 Location: N 1067020.6 E 516147.9



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 129
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

roject Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 70R | Elevation: Ground 563.7

Exact Location (Coordinates): N:1067133.9 E:516104.7

Date Started: 9/9/2009 | Date Completed: 9/9/2009

Boring Size: 36 inch | Total Depth: 150

Length of Perforated Pipe: 129 | Length of Solid Pipe: 20

Comments: 15 feet north of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	90	
2-4	soil/dry	90	
4-6	soil/dry	90	
6-10	soil/trash/dry	90	
10-15	trash/dry	94	
15-20	trash/dry	94	
20-25	trash/dry	94	
25-30	trash/dry	98	
30-35	trash/dry	101	
35-40	trash/dry	105	
40-45	trash/dry	109	
45-50	trash/dry	109	
50-55	trash/dry	110	
55-60	trash/dry	110	
60-65	trash/dry	111	
65-70	trash/dry	112	
70-75	trash/dry	112	
75-80	trash/dry	112	
80-85	trash/dry	115	
85-90	trash/dry	115	
90-95	trash/dry	117	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

roject Name: 2009 Gas System | Project Number: 0120-131-17

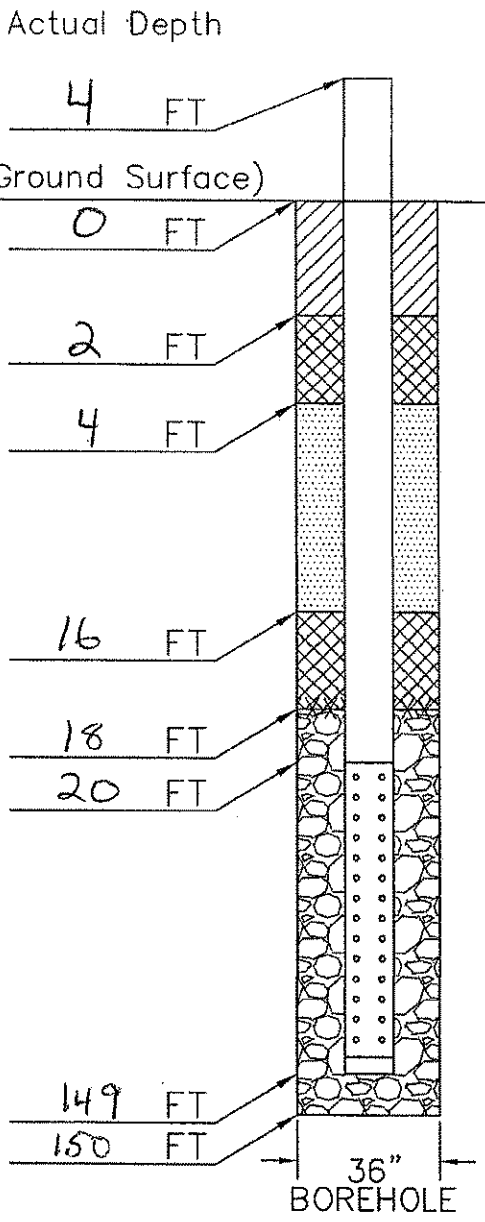
Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	trash/dry		117	
100-105	trash/dry		120	
105-110	trash/dry		124	
110-115	trash/dry		127	
115-120	trash/dry		129	
120-125	trash/dry		132	
125-130	trash/dry		132	
130-135	trash/dry		135	
135-140	trash/dry		135	
140-145	trash/dry		138	
145-150	trash/dry		138	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 70 R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-9-09 Completed Install.: 9-9-09
Time: 6:00am Time: 4:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 563.7 Location: N 1067133.9 E 516104.7



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 129
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Aquaterra Drilling Log

HOLE NO. GEW-71 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill - Gas System Installation	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 02031008	NAME OF DRILLER(S): John Stanley
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: IMT / Caterpillar
HOLE LOCATION: GEW-71	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 inch borehole
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 8/12/03 — DRILLING END DATE: 8/13/03
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 140 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Matthew J. Hepp

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	15 inches of cover soil				1158	
	Refuse	74°F				
20		74°F				
	Refuse					
30		78°F			1300	
40		79°F				
50		78°F				
	Refuse					
		81°F				
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. GEW-71

Aquaterra Drilling Log

HOLE NO. GEW-71 | SHEET 2 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill - Gas System Install

INSPECTOR: Nathan Higgerson

DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
Refuse	82°F			1400	
	84°F				
Refuse	87°F				
	92°F				
Refuse	96°F			1500	End of drilling on 8/12/03 at 110 feet
				715	Resume drilling on 8/13/03
Refuse					
				900	
				1115	
End of boring at 140 ft.					No Asbestos Containing Materials Encountered

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. GEW-71

American Environmental Group Ltd.

Well Form

DATE: 08/13/2203

PROJECT NAME: Bridgeton

PROJECT#: 1-03-011

DRILLING

GW 71 WELL NUMBER OR NAME

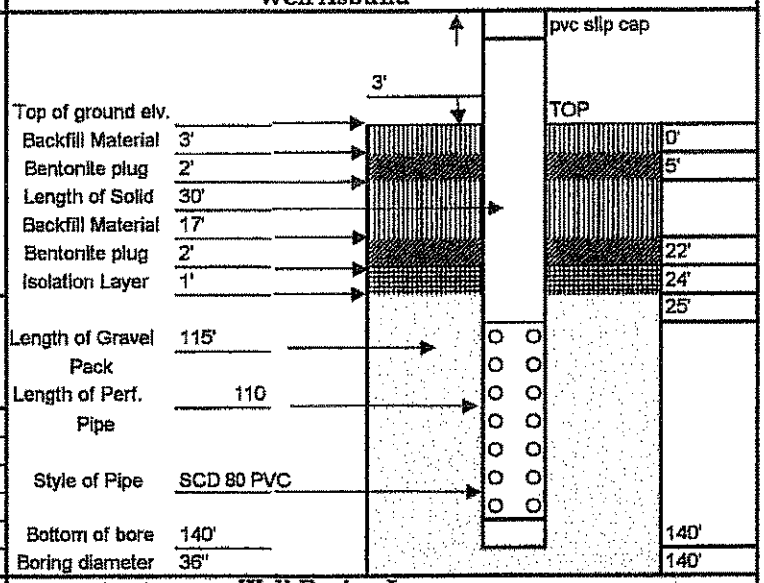
140' LINEAR FEET OF DRILLING

140' LINEAR FEET OF COMPLETION

0 LINEAR FEET OF ABANDONMENT

NOTES:

Well Asbuild



MONITORING LOG

Calibration date 08/13/03

Time	OXYGEN	H2S	LEL	/	CO-	Date
07:00	20.9	0	0		0	GW 71
08:00	"	0	0		0	"
09:00	"	0	0		0	"
10:00	20.9	0	0		0	GW 72
11:00	20.9	0	0		0	"
12:00	"	0	0		0	"
01:00	"	0	0		0	"
02:00	"	0	0		0	"
03:00	"	0	0		0	"
04:00	"	0	0		0	"
05:00	"	0	0		0	"
06:00						

Notes

Well Boring Log

Depth	Composition	Degree of Comp.	Degree of Moisture	Temp
0-10	cover / res was.	slight	dry	
10-20	"	slight	dry	74
20-30	"	slight	dry	
30-40	"	slight	dry	79
40-50	"	slight	dry	
50-60	"	slight	dry	81
60-70	"	slight	dry	
70-80	"	slight	dry	84
80-90	"	moderate	dry	
90-100	"	moderate	dry	92
100-110	"	moderate	dry	
110-120	"	moderate	dry	104
120-130	"	moderate	dry	
130-140	"	moderate	dry	TD 140'
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

John Stanley 08/13/2003

AEGL SITE SUPERVISOR DATE

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 72R
Elevation: Ground 551.8
Exact Location (Coordinates): N:1067284.7 E:515878.9
Date Started: 9/4/2009
Date Completed: 9/4/2009
Boring Size: 36 inch
Total Depth: 150
Length of Perforated Pipe: 129
Length of Solid Pipe: 20
Comments:

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	94	
2-4	soil/dry	94	
4-6	soil/dry	94	
6-10	soil/dry	96	
10-15	trash/dry	97	
15-20	trash/dry	97	
20-25	trash/dry	99	
25-30	trash/dry	100	
30-35	trash/dry	103	
35-40	trash/dry	103	
40-45	trash/dry	104	
45-50	trash/dry	109	
50-55	trash/dry	108	
55-60	trash/dry	111	
60-65	trash/dry	111	
65-70	trash/dry	114	
70-75	trash/dry	114	
75-80	trash/dry	114	
80-85	trash/dry	119	
85-90	trash/dry	119	
90-95	trash/dry	122	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

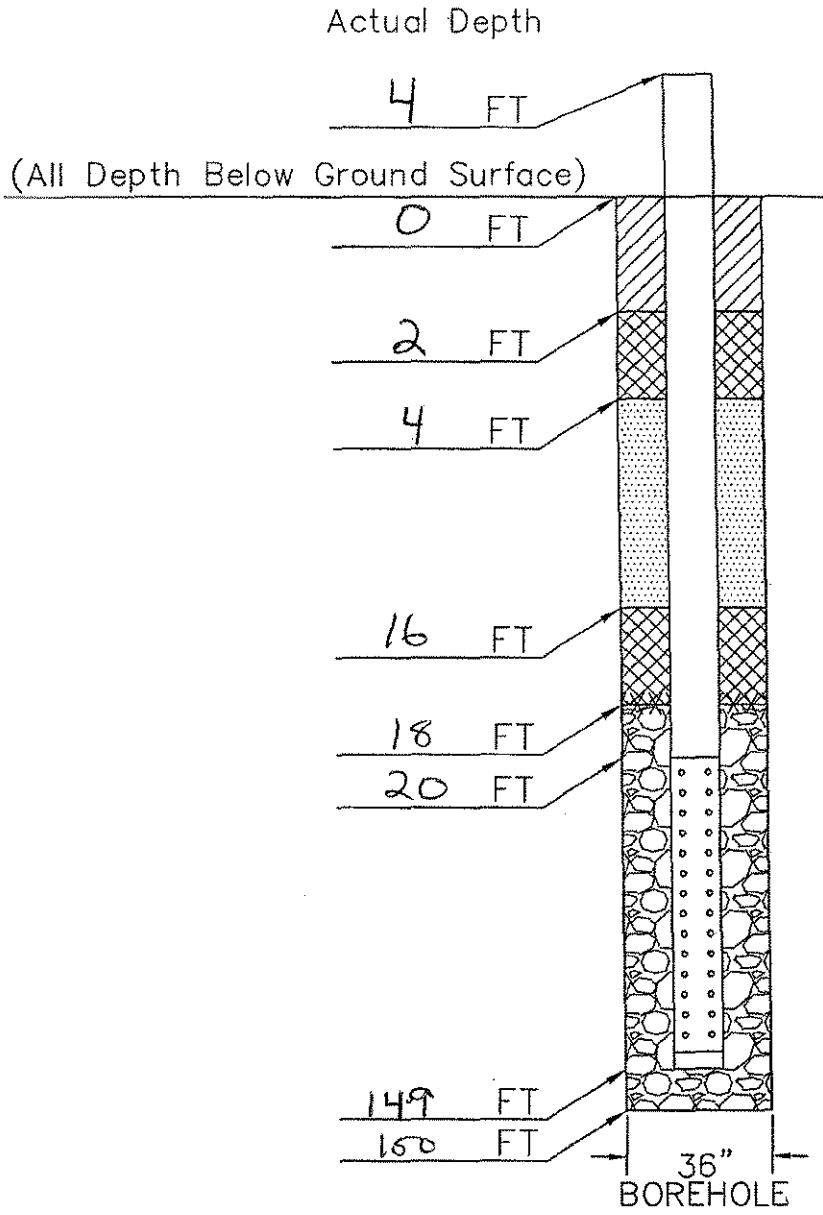
Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	trash/dry		124	
100-105	trash/dry		127	
105-110	trash/dry		128	
110-115	trash/dry		127	
115-120	trash/dry		132	
120-125	trash/dry		133	
125-130	trash/dry		136	
130-135	trash/dry		136	
135-140	trash/dry		137	
140-145	trash/dry		137	
145-150	trash/dry		140	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 72R
Drilling Contractor: A.E.G.L. Observed By: Joshua Ross
Started Install.: 9-4-09 Completed Install.: 9-4-09
Time: 6:00am Time: 4:30pm

Top of Flange Elevation: ____
Ground Surface Elevation: 551.8 Location: N1067284.7 E 515878.9



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 129
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary — Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 73R | Elevation: Ground 553.7

Exact Location (Coordinates): N:1066831.2 E:516116.9

Date Started: 9/25/2009 | Date Completed: 9/25/2009

Boring Size: 36 inch | Total Depth: 150

Length of Perforated Pipe: 129 | Length of Solid Pipe: 20

Comments: 10 feet N of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	95	
2-4	soil/dry	95	
4-6	soil/dry	95	
6-10	soil/dry	95	
10-15	trash/dry	99	
15-20	trash/dry	99	
20-25	trash/dry	101	
25-30	trash/dry	101	
30-35	trash/dry	103	
35-40	trash/dry	104	
40-45	trash/dry	106	
45-50	trash/dry	108	
50-55	trash/dry	108	
55-60	trash/dry	108	
60-65	trash/dry	108	
65-70	trash/dry	111	
70-75	trash/dry	111	
75-80	trash/dry	112	
80-85	trash/dry	112	
85-90	trash/dry	117	
90-95	trash/dry	117	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	trash/dry		123	
100-105	trash/dry		123	
105-110	trash/dry		123	
110-115	trash/dry		125	
115-120	trash/dry		128	
120-125	trash/dry		128	
125-130	trash/dry		131	
130-135	trash/dry		131	
135-140	trash/dry		132	
140-145	trash/dry		137	
145-150	trash/dry		137	

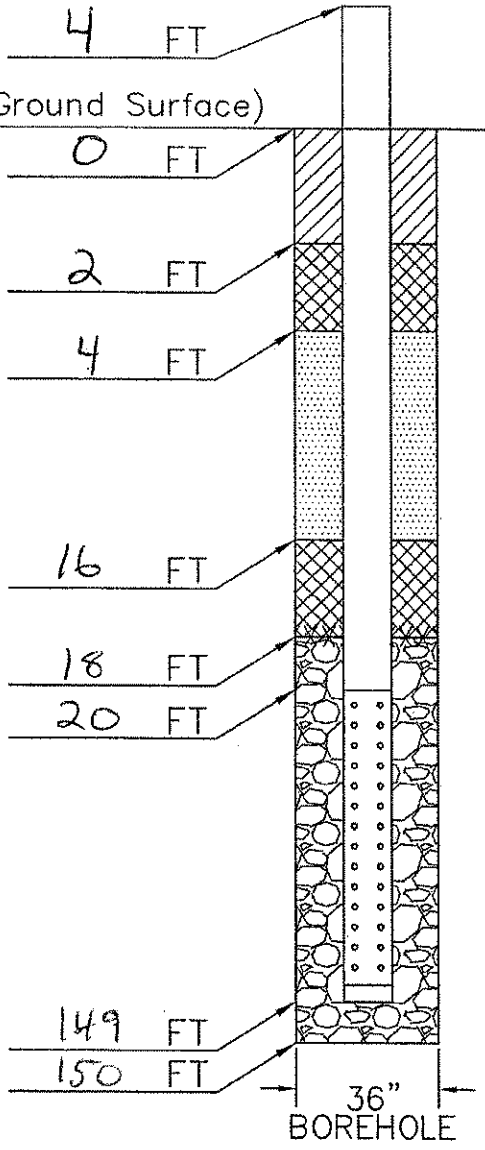
Record of Gas Well Installation

Job Number: 0120-121-17 Job Name: 2009 gas system Well Number: F-3 R
Drilling Contractor: A.E.G.L Observed By: Joshua Roos
Started Install.: 9-25-09 Completed Install.: 9-25-09
Time: 6:00am Time: 6:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 553.7 Location: N1066831.2 E516116.9

Actual Depth

(All Depth Below Ground Surface)



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 129
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

American Environmental Group Ltd.

Well Log

DATE: 7/12/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GW74	WELL NUMBER OR NAME
136'	LINEAR FEET OF DRILLING
136'	LINEAR FEET OF COMPLETION
0'	LINEAR FEET OF ABANDONMENT

Time in: Time out:

Weather conditions: Sunny

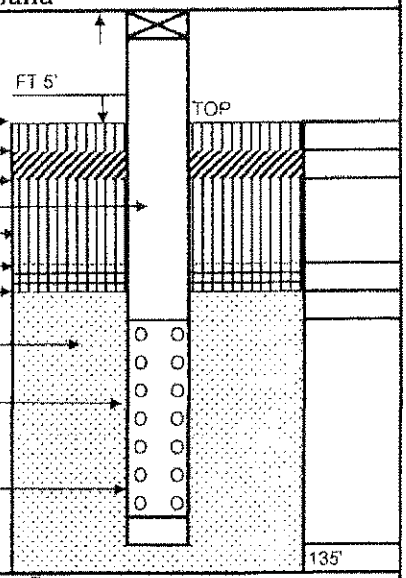
Site conditions:

Rig hrs:

Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

Well Asbuild



Top of ground elv.	563
Backfill Material	2'
Bentonite plug	2'
Length of Solid	25'
Backfill Material	14'
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	115'
Length of Perf. Pipe	111'
Style of Pipe	6"SCH80 PVC
Bottom of bore	136'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO	
7:00	20.9	0	0	0	GEW 74
8:00	"	0	0	0	
9:00	20.9	0	0	0	GEW 82
10:00	"	0	0	0	
11:00	"	0	0	0	
12:00	"	0	0	0	
1:00	"	0	0	0	
2:00	"	0	0	0	
3:00	"	0	0	0	
4:00	"	0	0	0	
5:00	"	0	0	0	
6:00	20.9	0	0	0	GEW 13

Notes

northing 1066973

easting 515988

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-MSW	LIGHT	DRY	71
10-20	MSW	LIGHT	DRY	71
20-30	MSW	LIGHT	DRY	76
30-40	MSW	LIGHT	DRY	79
40-50	MSW	LIGHT	DRY	85
50-60	MSW	LIGHT	DRY	88
60-70	MSW	LIGHT	DRY	88
70-80	MSW	LIGHT	DRY	94
80-90	MSW	LIGHT	DRY	101
90-100	MSW	LIGHT		107
100-110	WOOD-DIRT			113
110-120	MSW			113
120-130	MSW			118
130-140	MSW			TD 136
140-150				

CLIENT REPRESENTATIVE DATE

NAME & TITLE

BRETT WILLIS 7/12/2004

AEGL SITE SUPERVISOR DATE

Aquaterra Drilling Log

HOLE NO. GEW-75 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill - Gas System Install	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 02031008	NAME OF DRILLER(S): John Stanley
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: IMT / Caterpillar
HOLE LOCATION: GEW-75	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36 inch bore hole
SURFACE ELEVATION: -	
OVERBURDEN THICKNESS: -	DRILLING START DATE: 8/14/03 — DRILLING END DATE: 8/16/03
DEPTH DRILLED INTO ROCK: -	DEPTH GROUNDWATER ENCOUNTERED: -
TOTAL DEPTH OF HOLE: 140 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: -

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
-	-	-	-

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
-	-	-	-	-	-	-

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
-	-	-	-	Nathan Hyde

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	1 ft of Cover soil				1510	
10	Refuse					
					1545	End of drilling on 8/14/03 at 15 feet
					730	Resume drilling on 8/15/03
20	Refuse					
30						
40					800	
	Refuse					
50						
					900	
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: | HOLE NO.: GEW-75

Aquaterra Drilling Log

HOLE NO. GEW-75 | SHEET 2 OF 2 SHEETS

PROJECT NAME: Bridgeton Landfill - Gas System Install

INSPECTOR: Nathan Hagerman

DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
Refuse					
Refuse				1000	
Refuse					
Refuse				1045	End of drilling on 8/15/03 at 110 Ft
				715	Resume drilling on 8/16/03
Refuse	100°F				
Refuse	112°F				
End of boring at 140 ft				930	No Asbestos Containing Materials Encountered

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. GEW-75

American Environmental Group Ltd.

Well Form

DATE: 08/16/03

PROJECT NAME: Bridgeton

PROJECT#: 1-03-011

DRILLING

GW 75 WELL NUMBER OR NAME

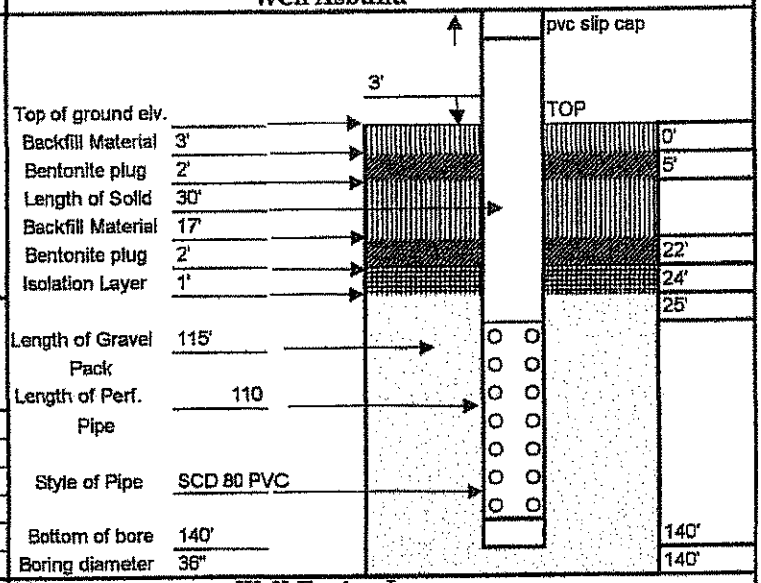
140' LINEAR FEET OF DRILLING

140 LINEAR FEET OF COMPLETION

0 LINEAR FEET OF ABANDONMENT

NOTES:

Well Asbuild



MONITORING LOG

Calibration date 08/16/03

Time	OXYGEN	H2S	LEL	CO		Date
07:00	20.9	0	0	0	GW 75	
08:00	"	0	0	0	"	
09:00	"	0	0	0	"	
10:00	"	0	0	0	"	
11:00	20.9	0	0	0	GW 66	
12:00	"	0	0	0	"	
01:00	"	0	0	0	"	
02:00	"	0	0	0	"	
03:00	"	0	0	0	"	
04:00	"	0	0	0	"	
05:00						
06:00						

Notes

Well Boring Log

Depth	Composition		Degree of Comp.	Degree of Moisture	Temp
0-10	cover	res was.	slight	dry	
10-20		"	slight	dry	76
20-30		"	slight	dry	
30-40		"	slight	dry	77
40-50		"	slight	dry	
50-60		"	slight	dry	88
60-70		"	slight	dry	
70-80		"	slight	dry	92
80-90		"	moderate	dry	
90-100	steel	"	moderate	dry	94
100-110	concrete	"	moderate	dry	
110-120		"	moderate	dry	110
120-130		"	moderate	dry	
130-140		"	moderate	dry	TD 140'
140-150					

CLIENT REPRESENTATIVE DATE

NAME & TITLE

John Stanley 08/16/03

AEGL SITE SUPERVISOR DATE

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 76R
Elevation: Ground 545.0
Exact Location (Coordinates): N:1067148.3 E:515728.0
Date Started: 9/3/2009
Date Completed: 9/3/2009
Boring Size: 36 inch
Total Depth: 139
Length of Perforated Pipe: 118
Length of Solid Pipe: 20
Comments: 15 feet of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	93	
2-4	soil/dry	93	
4-6	soil/dry	93	
6-10	soil/dry	93	
10-15	trash/dry	96	
15-20	trash/dry	97	
20-25	trash/dry	97	
25-30	trash/dry	101	
30-35	trash/dry	104	
35-40	trash/dry	106	
40-45	trash/dry	106	
45-50	trash/dry	106	
50-55	trash/dry	106	
55-60	trash/dry	110	
60-65	trash/dry	112	
65-70	trash/dry	115	
70-75	trash/dry	115	
75-80	trash/dry	115	
80-85	trash/dry	118	
85-90	trash/dry	121	
90-95	trash/dry	121	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

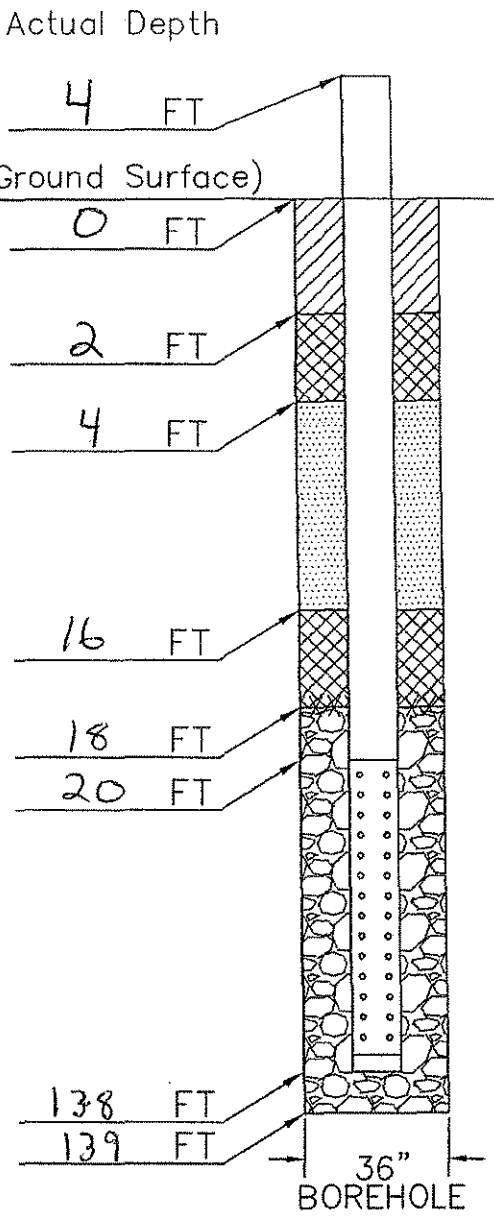
QA/QC Monitor: Joshua Ross

95-100	trash/dry		121	
100-105	trash/dry		125	
105-110	trash/damp		125	
110-115	trash/damp		128	
115-120	trash/dry		131	
120-125	trash/moist		134	
125-130	trash/moist		134	
130-135	sludge/wet		137	
135-140	sludge/wet		138	
140-145				
145-150				

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 76R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-3-09 Completed Install.: 9-3-09
Time: 6:00am Time: 5:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 545.0 Location: N1067148.3 E 515728.0



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 118
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

American Environmental Group Ltd.

Well Log

DATE: 6/1/2004

PROJECT NAME: BRIDGETON

PROJECT#: 1-04-028

DRILLING

GEW 77 WELL NUMBER OR NAME

122' LINEAR FEET OF DRILLING

122' LINEAR FEET OF COMPLETION

0' LINEAR FEET OF ABANDONMENT

Time in: _____ Time out: _____

Weather conditions: Sunny

Site conditions: _____

Rig hrs: _____

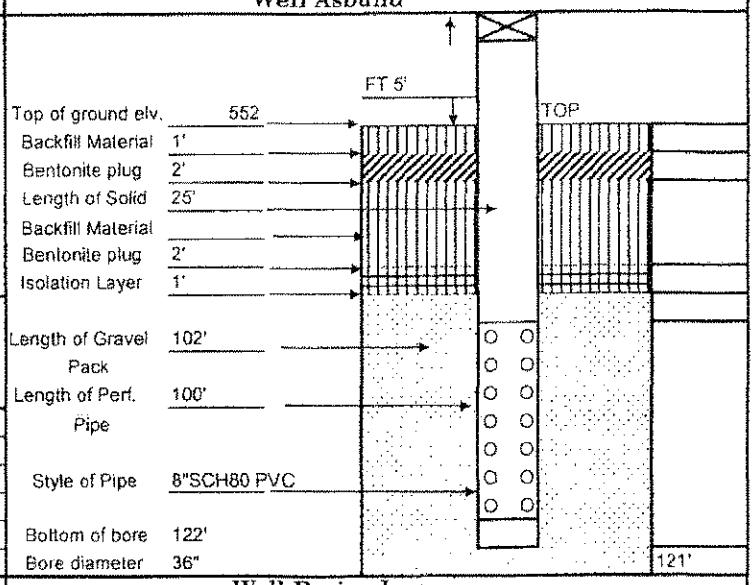
Service: Oil/ OK Raidiator/ OK Grease/ OK

NOTES:

northing 1066599

easting 516000

Well Asbuild



Top of ground elv.	552
Backfill Material	1'
Bentonite plug	2'
Length of Solid	25'
Backfill Material	
Bentonite plug	2'
Isolation Layer	1'
Length of Gravel Pack	102'
Length of Perf. Pipe	100'
Style of Pipe	8"SCH80 PVC
Bottom of bore	122'
Bore diameter	36"

MONITORING LOG

Time	OXYGEN	H2S		LEL / CO	
7:00	20.9	0	0	0	6-02-04
8:00	"	0	0	0	
9:00	"	0	0	0	
10:00	"	0	0	0	
11:00	"	0	0	0	
12:00	"	0	0	0	6-01-04
1:00	"	0	0	0	
2:00	"	0	0	0	
3:00	"	0	0	0	
4:00	"	0	0	0	
5:00	"	0	0	0	
6:00	"	0	0	0	

Notes

Well Boring Log

Depth	Composition	Degree of Decomp.	Degree of Moisture	Temp
0-10	DIRT-MSW	LIGHT	DRY	63
10-20	MSW	LIGHT	DRY	63
20-30	MSW	LIGHT	DRY	71
30-40	MSW	LIGHT	DRY	72
40-50	MSW	LIGHT	DRY	74
50-60	MSW	LIGHT	DRY	76
60-70	MSW	LIGHT	DRY	82
70-80	MSW	LIGHT	DRY	82
80-90	MSW-WOOD	LIGHT	DRY	88
90-100	MSW	LIGHT	DRY	97
100-110	MSW	LIGHT	DRY	105
110-120	MSW-STEEL	LIGHT	DRY	109
120-130	STEEL	LIGHT	DRY	TD 122'
130-140				
140-150				

CLIENT REPRESENTATIVE DATE

BRETT WILLIS 6/1/2004

AEGL SITE SUPERVISOR DATE

NAME & TITLE

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

roject Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 78R | Elevation: Ground 555.7

Exact Location (Coordinates): N:1066840.7 E:515908.1

Date Started: 9/8/2009 | Date Completed: 9/8/2009

Boring Size: 36 inch | Total Depth: 150 feet

Length of Perforated Pipe: 129 | Length of Solid Pipe: 20

Comments: 15 sw of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	94	
2-4	soil/dry	94	
4-6	soil/dry	94	
6-10	soil/dry	94	
10-15	trash/dry	97	
15-20	trash/dry	97	
20-25	trash/dry	98	
25-30	trash/dry	99	
30-35	trash/dry	99	
35-40	trash/dry	99	
40-45	trash/dry	100	
45-50	trash/dry	100	
50-55	trash/dry	100	
55-60	trash/dry	101	
60-65	trash/dry	106	
65-70	trash/dry	106	
70-75	trash/dry	111	
75-80	trash/dry	112	
80-85	trash/dry	112	
85-90	trash/dry	112	
90-95	trash/dry	113	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

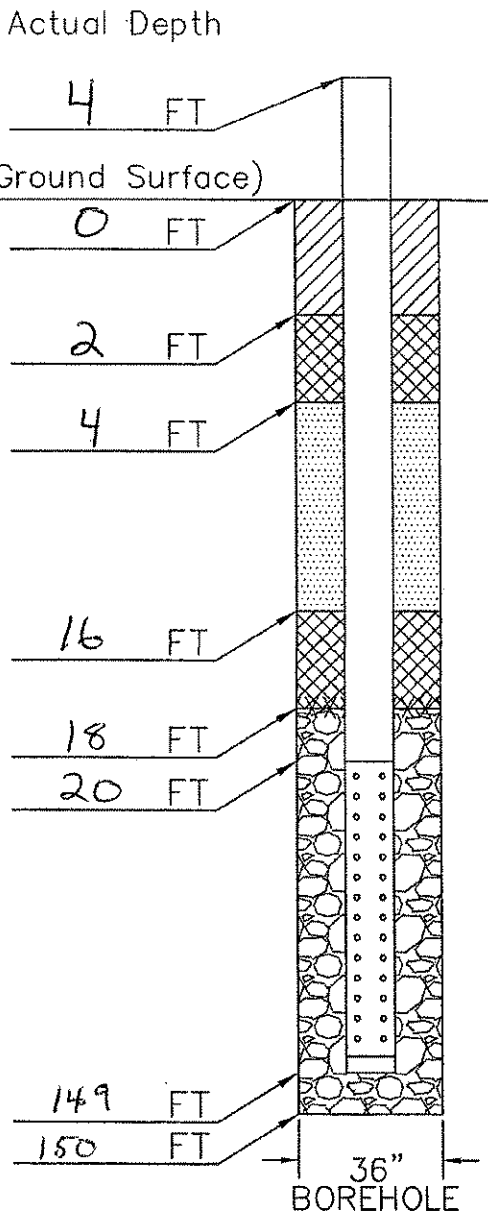
Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

95-100	trash/dry		113	
100-105	trash/dry		118	
105-110	trash/dry		121	
110-115	trash/dry		131	
115-120	trash/dry		131	
120-125	trash/dry		131	
125-130	trash/dry		134	
130-135	trash/dry		135	
135-140	trash/dry		135	
140-145	trash/dry		139	
145-150	trash/dry		143	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 78 R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-8-09 Completed Install.: 9-8-09
Time: 6:00am Time: 5:30pm

Top of Flange Elevation: _____
Ground Surface Elevation: 555.7 Location: N 1066840.7 E 515909.1



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 129
Diameter: 6in
Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary — Weaver Boos Consultants

Project Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 79R | Elevation: Ground 555.7

Exact Location (Coordinates): N:1066972.2 E:515771.8

Date Started: 9/2/2009 | Date Completed: 9/2/2009

Boring Size: 36 inch | Total Depth: 150

Length of Perforated Pipe: 129 | Length of Solid Pipe: 20

Comments: 0 feet south of existing

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	96	
2-4	soil/dry	96	
4-6	soil/dry	96	
6-10	soil/dry	96	
10-15	trash/dry	99	
15-20	trash/dry	99	
20-25	trash/dry	103	
25-30	trash/dry	103	
30-35	trash/dry	106	
35-40	trash/dry	106	
40-45	trash/dry	108	
45-50	trash/dry	109	
50-55	trash/dry	111	
55-60	trash/dry	111	
60-65	trash/dry	111	
65-70	trash/dry	115	
70-75	trash/dry	115	
75-80	trash/dry	117	
80-85	trash/dry	121	
85-90	trash/dry	123	
90-95	trash/dry	126	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

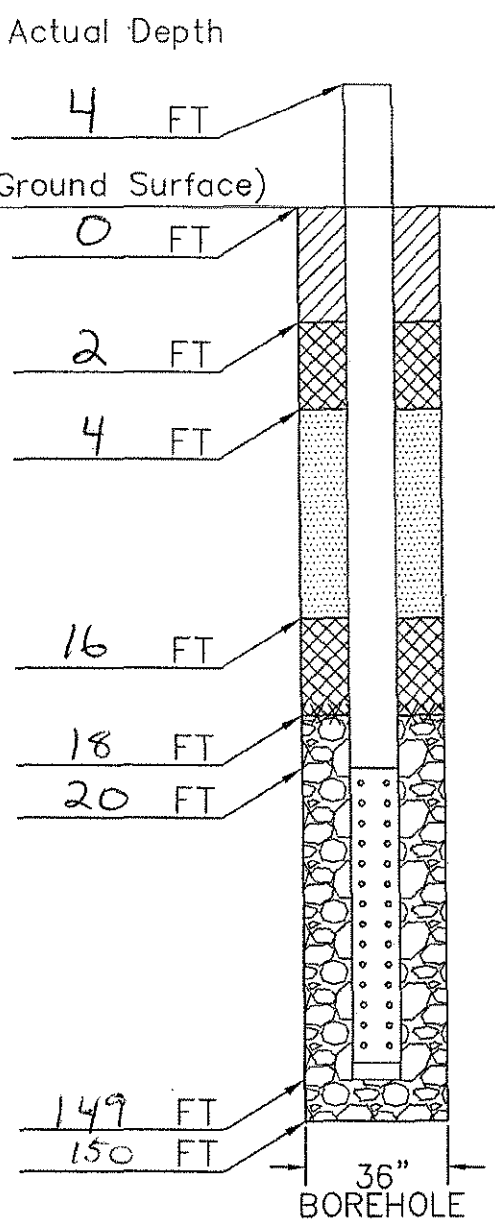
QA/QC Monitor: Joshua Ross

95-100	trash/dry		126	
100-105	trash/dry		130	
105-110	trash/dry		130	
110-115	trash/dry		135	
115-120	trash/dry		135	
120-125	trash/dry		137	
125-130	trash/dry		137	
130-135	trash/dry		137	
135-140	trash/dry		137	
140-145	trash/dry		139	
145-150	trash/dry		141	

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 79R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-2-09 Completed Install.: 9-2-09
Time: 6:00am Time: 4:30pm

Top of Flange Elevation: ____
Ground Surface Elevation: 555.7 Location: N 1066972.2E 515771.8



Materials

Intermediate or Final Cover:
Material: clay soil material

Top Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Backfill:
Material: clay soil material

Bottom Seal:
Material: Granular bentonite
Quntity: 12 bags
Hydrated: yes

Filter Pack:
Material: 1" to 3" gravel

Riser:
Material: CPVC
Quantity: 24 Feet
Diameter: 6in

Screen:
Material: CPVC
Quantity: 129
Diameter: 6in
Plug: 6in cap

Aquaterra Drilling Log

HOLE NO. GEW 80 | SHEET 1 OF 2 SHEETS

PROJECT NAME: GW & Header Bridgeton Landfill	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 652.10	NAME OF DRILLER(S): B. Willis 2 crew
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar AF10
HOLE LOCATION: GEW 80	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3/4 Bucket
SURFACE ELEVATION: 551.88'	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 6/23/05 — DRILLING END DATE: 6/25/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE:	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Higgs

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	Soil				10:15	Soil - 4' thickness
	waste					
50						
60	waste				12:30	Dry waste
	waste				2:30	
	waste				5:00	Stopped for the day
	Waste				7:00	resumed drilling on 6/26/05

Aquaterra Drilling Log

HOLE NO.

SHEET OF SHEETS

PROJECT NAME: GW & Header Bridgeton Landfill

INSPECTOR: J. Jordan, D. Hormesch

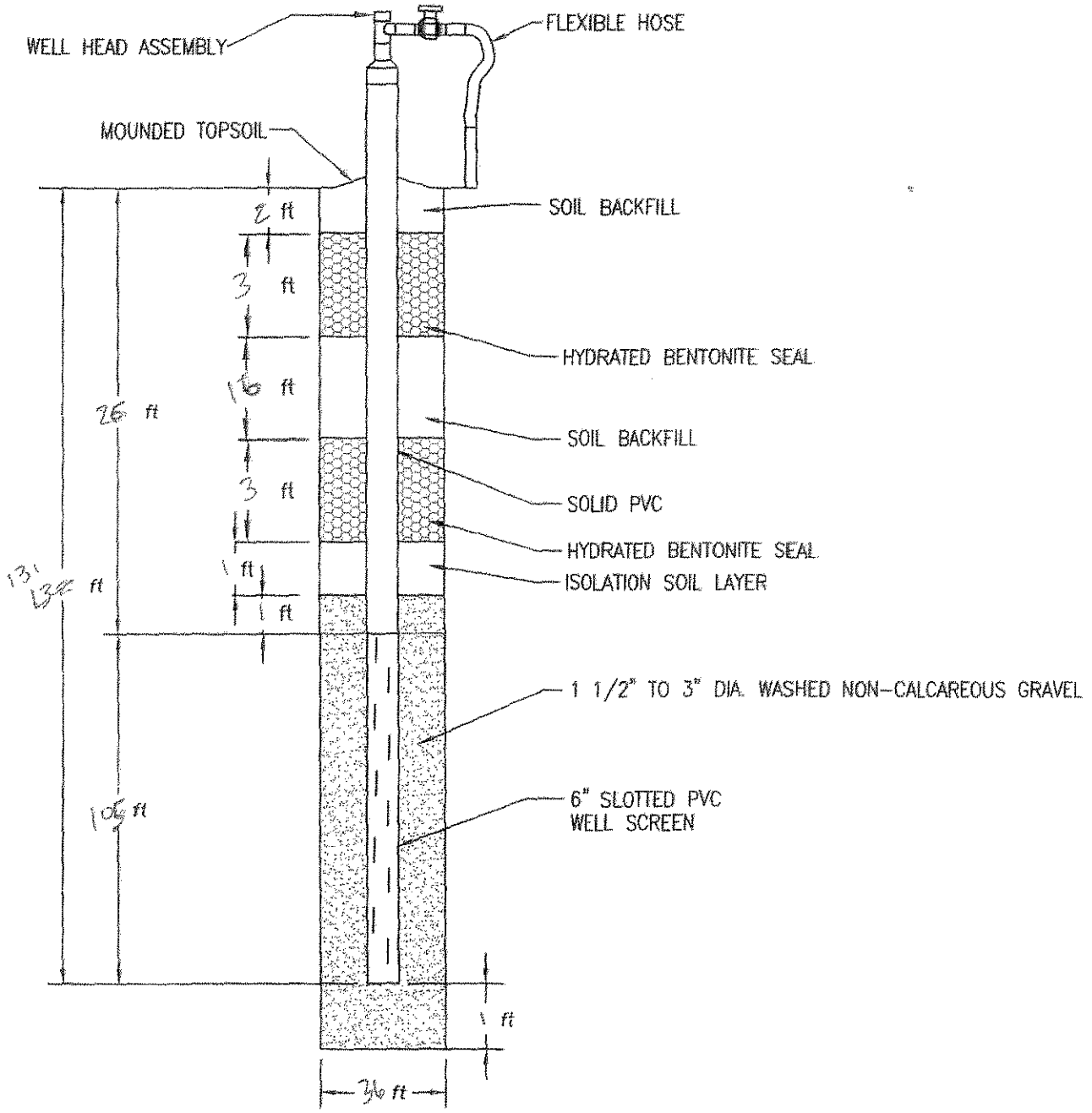
DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
Waste				800	
					End of drilling on 6/25/05
End of boring at total depth of 132 ft					No asbestos containing material observed

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-80
WELL LOCATION:
INSTALLATION START DATE: 6/25/05
COMPLETION DATE: 6/25/05
DRILLER: B. Wills
INSPECTOR: Nathan Higgerson

COMMENTS:



Aquaterra Drilling Log

HOLE NO. GEW-81 | SHEET 1 OF 2 SHEETS

PROJECT NAME: 2005 LFG Wells/Header COA	DRILLING SUBCONTRACTOR: AEG
PROJECT NUMBER: 1652.10	NAME OF DRILLER(S): B. Willis
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Caterpillar LMT AF10
HOLE LOCATION: GEW-81	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 36in bucket
SURFACE ELEVATION: 539 ft	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 7/1/05 — DRILLING END DATE: 7/2/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 130 ft.	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	[signature]

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Excavated 2ft of soil				1100	
2	Waste					
30	Waste				1300	
40						
50						
60	Waste					
70					1400	Ended the drilling on 7/1/05 at 70 ft.
80	Waste				700	Resume drilling on 7/2/05
90						
100	Waste				900	
110						
120	Waste				1100	

Aquaterra Drilling Log

HOLE NO. GEW - 81 | SHEET 2 OF 2 SHEETS

PROJECT NAME: 2005 LFG Wells/Header CQA

INSPECTOR: Nathan Higgerson

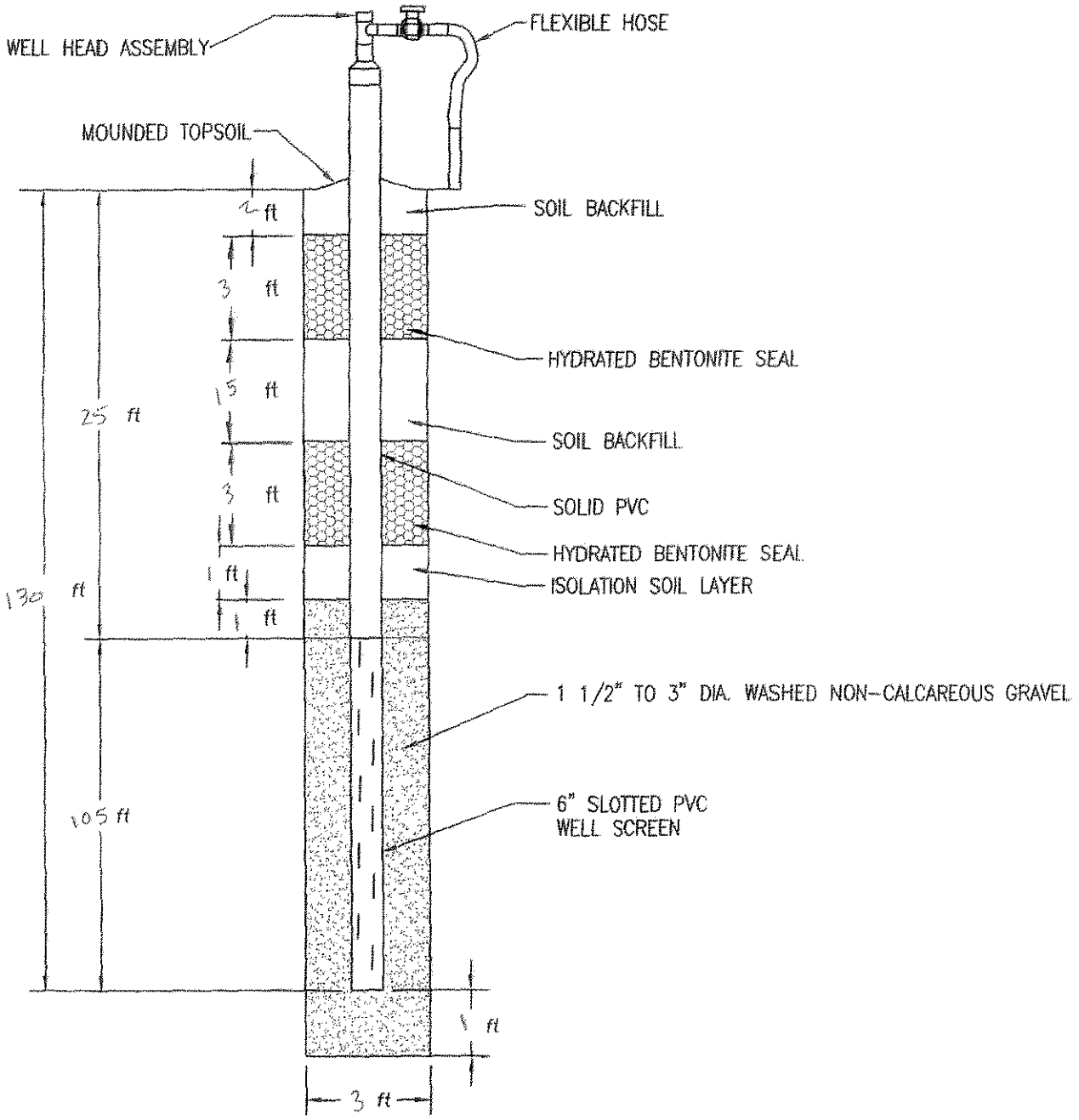
DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
Waste				1100	Drilling stopped at a depth of 130 ft due to sluff in the borehole
End of boring at 130 ft					No odors or staining materials observed

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

GAS WELL CONSTRUCTION DIAGRAM

PROJECT NUMBER: 1652.10
PROJECT NAME: 2005 Bridgeton Gas System CQA
GAS WELL NO.: GEW-81
WELL LOCATION:
INSTALLATION START DATE: 7/1/05
COMPLETION DATE: 7/2/05
DRILLER: AEC - B. Willis
INSPECTOR: Nathan Higgerson

COMMENTS:



Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System
Project Number: 0120-131-17
Project Location: Bridgeton Landfill
QA/QC Monitor: Joshua Ross

Well No.: 82R
Elevation: Ground 541.4
Exact Location (Coordinates): N:1066998.5 E:515634.0
Date Started: 8/26/2009
Date Completed: 8/26/2009
Boring Size: 36 inch
Total Depth: 131 feet
Length of Perforated Pipe: 110
Length of Solid Pipe: 20
Comments: 10 feet east of existing

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	90	
2-4	soil/dry	93	
4-6	soil/dry	93	
6-10	soil/dry	95	
10-15	trash/dry	96	
15-20	trash/dry	95	
20-25	trash/dry	97	
25-30	trash/dry	98	
30-35	trash/dry	99	
35-40	trash/dry	104	
40-45	trash/dry	108	
45-50	trash/dry	108	
50-55	trash/dry	108	
55-60	trash/dry	108	
60-65	trash/dry	111	
65-70	trash/dry	112	
70-75	trash/dry	112	
75-80	trash/dry	112	
80-85	trash/dry	115	
85-90	trash/dry	116	
90-95	trash/dry	115	

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

Project Name: 2009 Gas System

Project Number: 0120-131-17

Project Location: Bridgeton Landfill

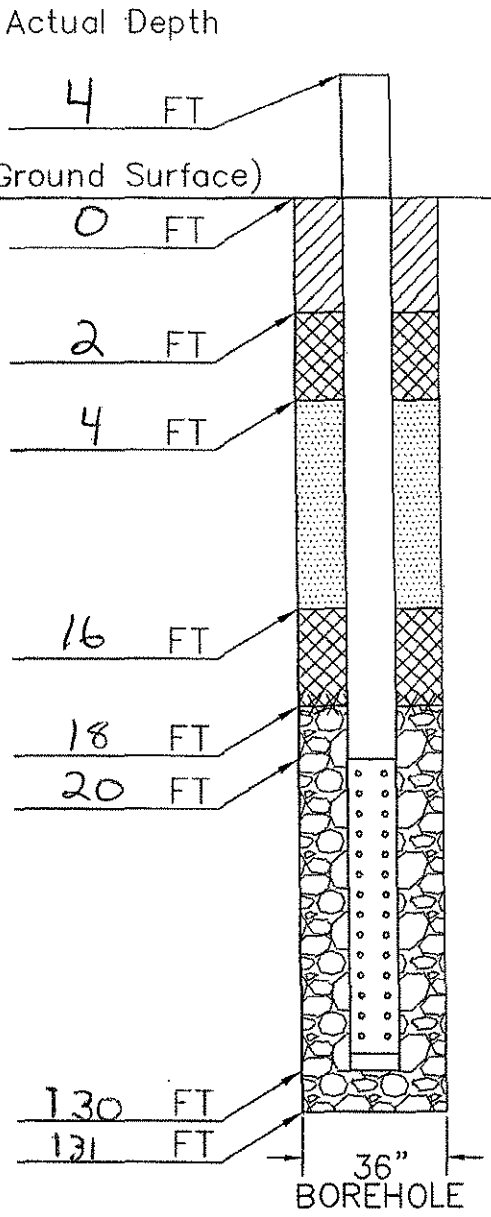
QA/QC Monitor: Joshua Ross

95-100	trash/dry	115	
100-105	trash/dry	117	
105-110	trash/dry	118	
110-115	trash/dry	119	
115-120	trash/dry	120	
120-125	trash/damp	120	
125-130	trash/damp	120	
130-135	trash/dry	122	
135-140			
140-145			
145-150			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: B2R
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 8-26-09 Completed Install.: 8-26-09
Time: 8:00am Time: 3:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 541.4 Location: N 106698.5E 515634.0



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 110
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

oject Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 83 | Elevation: Ground 560.8

Exact Location (Coordinates): N:1067246.0 E:516252.0

Date Started: 9/15/2009 | Date Completed: 9/15/2009

Boring Size: 36 inch | Total Depth: 60

Length of Perforated Pipe: 39 | Length of Solid Pipe: 20

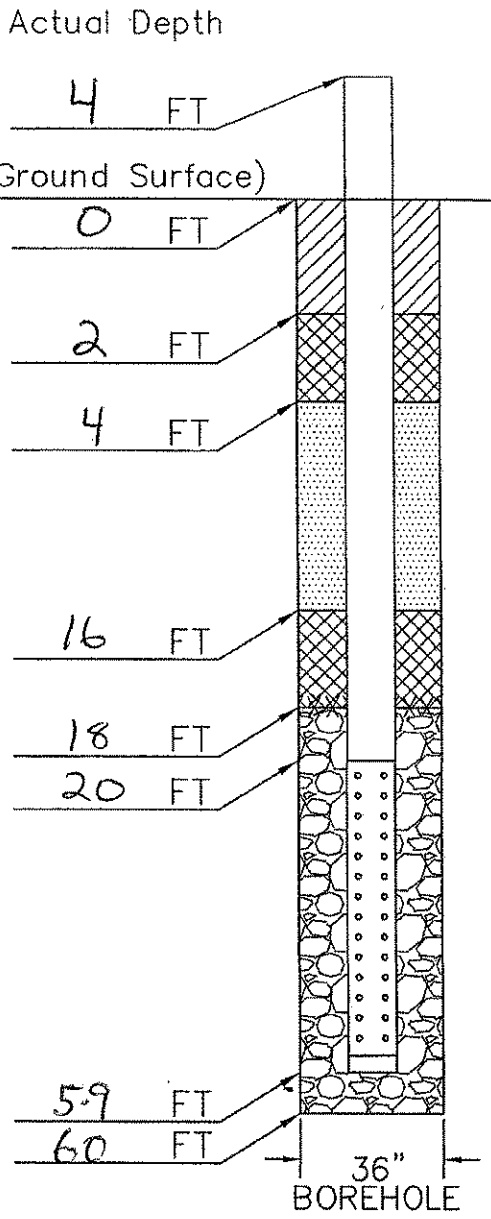
Comments: 50 feet east of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	91	
2-4	soil/dry	91	
4-6	soil/dry	93	
6-10	soil/dry	93	
10-15	trash/dry	96	
15-20	trash/dry	96	
20-25	trash/dry	99	
25-30	trash/dry	98	
30-35	trash/dry	103	
35-40	trash/dry	104	
40-45	trash/dry	104	
45-50	trash/dry	107	
50-55	trash/dry	109	
55-60	trash/dry	113	
60-65			
65-70			
70-75			
75-80			
80-85			
85-90			
90-95			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 83
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-15-09 Completed Install.: 9-15-09
Time: 1:00pm Time: 3:00pm

Top of Flange Elevation: _____
Ground Surface Elevation: 560.8 Location: N 1067246.0 E 516252.0



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 feet
- Diameter: 6.n

Screen:
- Material: CPVC
- Quantity: 39
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

roject Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 84 | Elevation: Ground 532.8

Exact Location (Coordinates): N:1067402.1 E:516212.8

Date Started: 9/16/2009 | Date Completed: 9/16/2009

Boring Size: 36 inch | Total Depth: 60

Length of Perforated Pipe: 39 | Length of Solid Pipe: 20

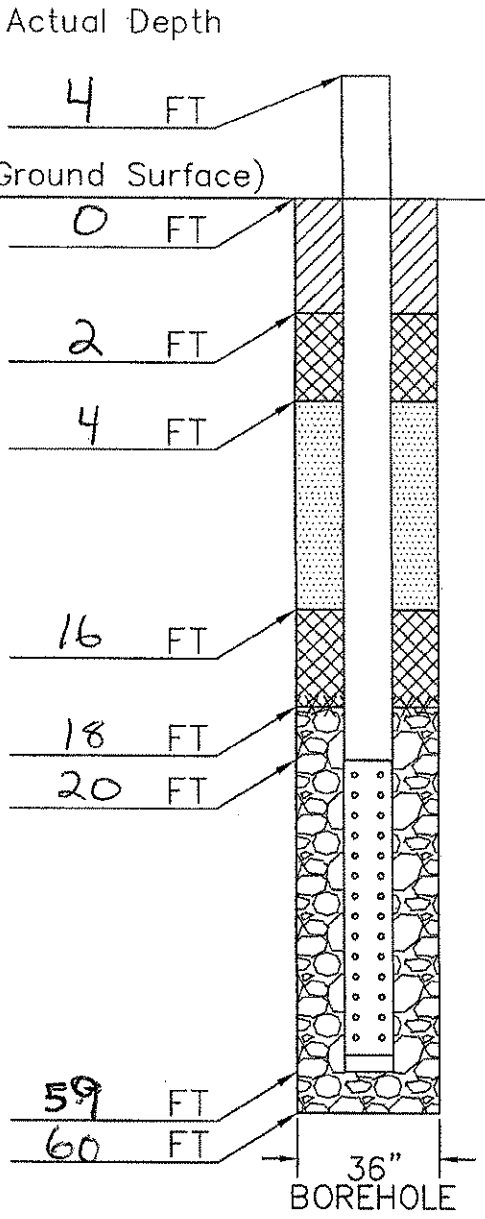
Comments: 50 feet north of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	93	
2-4	soil/dry	93	
4-6	soil/dry	93	
6-10	soil/dry	93	
10-15	trash/dry	95	
15-20	trash/dry	97	
20-25	trash/dry	97	
25-30	trash/dry	99	
30-35	trash/dry	99	
35-40	trash/dry	99	
40-45	trash/dry	104	
45-50	trash/dry	107	
50-55	trash/dry	110	
55-60	trash/dry	110	
60-65			
65-70			
70-75			
75-80			
80-85			
85-90			
90-95			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 84
Drilling Contractor: A.E.G.L Observed By: Joshua Ross
Started Install.: 9-16-09 Completed Install.: 9-16-09
Time: 6:00am Time: 9:00am

Top of Flange Elevation: _____
Ground Surface Elevation: 532.8 Location: N 1067402.1 E 516212.8



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6in

Screen:
- Material: CPVC
- Quantity: 39
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

Gas Extraction Well Drilling Summary

Weaver Boos Consultants

oject Name: 2009 Gas System | Project Number: 0120-131-17

Project Location: Bridgeton Landfill | QA/QC Monitor: Joshua Ross

Well No.: 85 | Elevation: Ground 549.3

Exact Location (Coordinates): N:1067250.3 E:516088.8

Date Started: 8/15/2009 | Date Completed: 8/15/2009

Boring Size: 36 inch | Total Depth: 60

Length of Perforated Pipe: 39 | Length of Solid Pipe: 20

Comments: 50 foot east of existing well

Depth	Material Drilled	Temp.	Comment
0-2	soil/dry	94	
2-4	soil/dry	94	
4-6	soil/dry	96	
6-10	soil/dry	96	
10-15	trash/dry	99	
15-20	trash/dry	101	
20-25	trash/dry	104	
25-30	trash/dry	104	
30-35	trash/dry	105	
35-40	trash/dry	107	
40-45	trash/dry	109	
45-50	trash/dry	109	
50-55	trash/dry	114	
55-60	trash/dry	116	
60-65			
65-70			
70-75			
75-80			
80-85			
85-90			
90-95			

Record of Gas Well Installation

Job Number: 0120-131-17 Job Name: 2009 gas system Well Number: 85

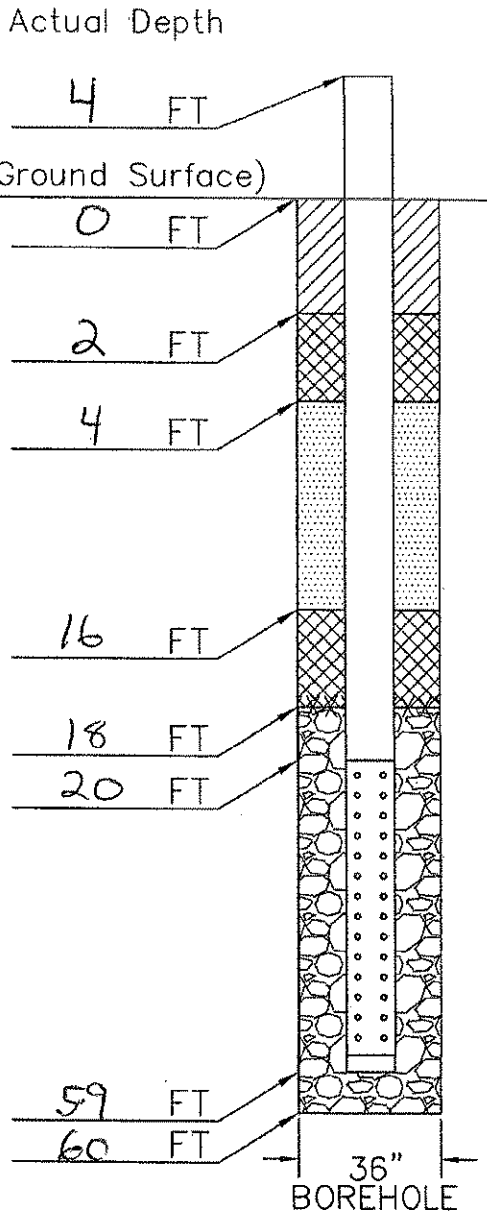
Drilling Contractor: A.E.G.L Observed By: Joslyn Ross

Started Install.: 9-15-09 Completed Install.: 9-15-09

Time: 10:30am Time: 12:30pm

Top of Flange Elevation: _____

Ground Surface Elevation: 549.3 Location: N 1067250.3 E 516088.8



Materials

Intermediate or Final Cover:
- Material: clay soil material

Top Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Backfill:
- Material: clay soil material

Bottom Seal:
- Material: Granular bentonite
- Quntity: 12 bags
- Hydrated: yes

Filter Pack:
- Material: 1" to 3" gravel

Riser:
- Material: CPVC
- Quantity: 24 Feet
- Diameter: 6.n

Screen:
- Material: CPVC
- Quantity: 39
- Diameter: 6in
- Plug: 6in cap

Weaver Boos Consultants

LANDFILL GAS COLLECTION SYSTEM
WELL FIELD SCHEDULE (Updated 10/27/2012)

Well No.	Location Coordinates		Surface Elevation (ft MSL)	Waste Bottom Elevation (ft MSL)	Landfill Depth (ft)	Borehole Depth (ft)	Well Pipe Depth (ft)	Slotted Pipe Depth (ft)	Solid Pipe Depth (ft)	Above Grade Riser (ft)	Thickness of Gravel Pack (ft)	Completed (Y/N)	Actual Installed Depth (ft)
	N-S	E-W											
New Perimeter Wells													
GEW-100	1,066,744	516,375	496.9	337	160	140	139	114	25	3	117		
GEW-101	1,066,858	516,491	499.5	337	163	140	139	114	25	3	117		
GEW-102	1,066,967	516,598	495.1	335	160	140	139	114	25	3	117		
GEW-103	1,067,092	516,723	499.2	330	169	140	139	114	25	3	117		
GEW-104	1,067,223	516,669	535.8	330	206	140	139	114	25	3	117		
GEW-105	1,067,311	516,783	505.5	320	186	140	139	114	25	3	117		
GEW-106	1,067,418	516,686	509.2	330	179	140	139	114	25	3	117		
GEW-107	1,067,552	516,598	504.4	350	154	140	139	114	25	3	117		
GEW-108	1,067,677	516,505	504.5	360	145	135	134	109	25	3	112		
GEW-109	1,067,791	516,434	500.2	385	115	105	104	79	25	3	82		
GEW-110	1,067,785	516,258	482.8	380	103	93	92	67	25	3	70		
GEW-111	1,067,634	516,209	491.1	305	186	140	139	114	25	3	117		
GEW-112	1,067,568	515,917	479.8	330	150	140	139	114	25	3	117		
GEW-113	1,067,470	515,781	499	270	229	140	139	114	25	3	117		
GEW-116	1,067,078	515,418	473	337	137	136	135	110	25	3	113		
GEW-117	1,066,966	515,397	467	322	145	140	139	114	25	3	117		
GEW-118	1,066,863	515,417	473	406	67	66	65	45	20	3	48		
New Interior Wells													
GEW-86	1,067,204	516,154	553.1	310	243	140	139	114	25	3	117		
GEW-87	1,067,413	515,942	519.9	270	250	140	139	114	25	3	117		
GEW-88	1,067,361	516,107	523.5	285	238	140	139	114	25	3	117		
GEW-89	1,067,363	516,273	543.5	325	219	140	139	114	25	3	117		
GEW-90	1,067,498	516,335	533.9	330	204	140	139	114	25	3	117	Y	119
GEW-91	1,067,636	516,366	511.5	351	161	140	139	114	25	3	117		
New Replacement Wells													
GEW-13R	1,067,532	516,068	482.6	320	163	140	139	114	25	3	117		
GEW-18B	1,067,078	515,522	500.9	372	129	119	118	93	25	4	96	Y	120
GEW-34R	1,067,199	516,799	510.0	440	??	140	139	114	25	3	117		
GEW-57B	1,067,229	516,546	546.2	390	156	140	139	114	25	6	117		
GEW-58R	1,067,366	516,547	543.6	335	209	140	139	114	25	7	117		
GEW-61B	1,067,299	516,406	550.1	335	215	140	139	114	25	8	117		
GEW-64A	1,067,008	516,395	539.4	390	149	139	138	113	25	9	116		
GEW-67R	1,067,499	516,197	507.2	295	212	140	139	114	25	10	117		
GEW-68A	1,066,934	516,297	544.7	380	165	140	139	114	25	11	117		
GEW-71B	1,067,264	516,011	544.3	280	264	140	139	114	25	3	117		
Total						4,432	4,399	3,579	820				

PERIMETER LANDFILL GAS EXTRACTION WELLS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314898
CR NO:
DATE RECEIVED: 05/23/2005
STATE CERT NO APPROVED DATE: A131522 05/27/2005
CHECK NO.: 5032106
DATE ENTERED: PHASE 1 PHASE 2 PHASE 3 05/23/2005 05/26/2005 02/17/2006
ROUTE: PCD
REVENUE NO.: 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2780 — Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
SITE NAME: , PGW-1D
CONTACT NAME:
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 29.0 FT. RISER HOLE DIAMETER 8.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [X] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH40 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 50.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 8.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 55.0 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 21.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

COPY

LOCATION OF WELL

LAT. 38° 45' 7.9" COUNTY
LONG. 90° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL)
1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	5	FILL CLY
5	16	BRN SILTY CLY
16	76	LS

TOTAL DEPTH 76.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 04/19/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314913
CR NO:
DATE RECEIVED: 05/23/2005
STATE CERT NO APPROVED DATE: A131523 05/27/2005
CHECK NO.: 5032106
DATE ENTERED: PHASE 1 05/23/2005 PHASE 2 05/26/2005 PHASE 3 02/17/2006
ROUTE: PCD
REVENUE NO.: 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2780 Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW-2
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 22.5 FT. RISER HOLE DIAMETER 8.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [X] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [ ] SCH80 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 30.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 8.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 33.5 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 14.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38° 45' 7.9" COUNTY
LONG. 90° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

ELEVATION (OPTIONAL): 0 FT.
LEGAL LOCATION (OPTIONAL): 1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	13	FILL CLY MIX
13	15	GRY SND
15	17	CLY
17	50	LS

TOTAL DEPTH 50.5 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 03/25/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314908
CR NO:
DATE RECEIVED: 05/23/2005
STATE CERT NO APPROVED DATE: A131524 05/27/2005
CHECK NO.: 5032106
DATE ENTERED: PHASE 1 PHASE 2 PHASE 3 05/23/2005 05/26/2005 02/17/2006
ROUTE: PCD
REVENUE NO.: 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2780 — Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW-3
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH
CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER
CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN.
RISER PIPE MATERIAL [X] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER
RISER PIPE LENGTH 24.0 FT.
RISER PIPE WEIGHT [X] SCH40 [ ] SCH80 [ ] 304/316 [ ] OTHER
RISER HOLE DIAMETER 8.0 IN.
DRILLING METHOD [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER 4.0 IN.
SCREEN MATERIAL [ ] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER
SCREEN LENGTH 30.0 FT.
SCREEN HOLE DIAMETER
IF DIFFERENT FROM RISER 8.0 IN.
BENTONITE SEAL LENGTH 3.0 FT.
SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 34.0 FT.
SECONDARY FILTER PACK LENGTH 0.0 FT.
PRIMARY FILTER MATERIAL [ ] SAND [ ] PREPACKED

ANNULAR SEAL LENGTH 14.0 FT.
ANNULAR SEAL PLACED BY [ ] GRAVITY [ ] TREMIE [ ] PRESSURE GROUT THRU TREMIE
ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

COPY

LOCATION OF WELL

LAT. 38° 45' 7.8" COUNTY
LONG. 90° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL)
1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	15	CLY RX
15	51	LS

TOTAL DEPTH 51.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 03/24/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO	DATE RECEIVED
00314907	05/23/2005
CR NO	
STATE CERT NO APPROVED DATE	CHECK NO.
A131525 05/27/2005	5032106
DATE ENTERED	ROUTE / REVENUE NO.
PHASE 1 PHASE 2 PHASE 3	PCD / 052305
05/23/2005 05/26/2005 02/17/2006	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2780 (Applicable only if variance was obtained from DNR)
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW-4
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 18.0 FT. RISER HOLE DIAMETER 8.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [X] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH40 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 60.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 8.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 62.0 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 10.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38 ° 45' 7.9" COUNTY
LONG. 90 ° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.

LEGAL LOCATION (OPTIONAL)
1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	6	FILL
6	14	SILTY CLY
14	75	LS W/ CHT

TOTAL DEPTH 75.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 04/08/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE

OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO 00314905	DATE RECEIVED 05/23/2005
CR NO	
STATE CERT NO APPROVED DATE A131526 05/27/2005	CHECK NO. 5032106
DATE ENTERED PHASE 1 PHASE 2 PHASE 3 05/23/2005 05/26/2005 02/17/2006	ROUTE PCD
	REVENUE NO. 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2780 — Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW-5
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 23.0 FT. RISER HOLE DIAMETER 8.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 65.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 8.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 57.0 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 18.5 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38° 45' 7.9" COUNTY
LONG. 90° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL) ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL) 1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	25	SILTY CLY
25	44	SH
44	50	BLK SH
50	75	LS

TOTAL DEPTH 75.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 04/13/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314911
CR NO:
DATE RECEIVED: 05/23/2005
STATE CERT NO APPROVED DATE: A131527 05/27/2005
CHECK NO.: 5032106
DATE ENTERED: PHASE 1 PHASE 2 PHASE 3 05/23/2005 05/26/2005 02/17/2006
ROUTE: PCD
REVENUE NO.: 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2780 — Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW-6
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 18.0 FT. RISER HOLE DIAMETER 8.0 IN.
RISER PIPE MATERIAL [X] PLASTIC [ ] SCH40 [ ] SCH80 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH40 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 60.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 8.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 62.0 FT. PRIMARY FILTER MATERIAL [ ] SAND [ ] PREPACKED
SECONDARY FILTER PACK LENGTH 0.0 FT.

ANNULAR SEAL LENGTH 10.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38 ° 45' 7.9" COUNTY
LONG. 90 ° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL)
1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	3	CLY FILL
3	12	BRN SILTY CLY
12	75	LS

TOTAL DEPTH 75.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 04/07/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	PERMIT NUMBER 001251	DATE
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x	PERMIT NUMBER	DATE
APPRENTICE WELL DRILLER SIGNATURE x	PERMIT NUMBER	DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO	DATE RECEIVED
00314910	05/23/2005
CR NO	
STATE CERT NO APPROVED DATE	CHECK NO.
A131528 05/27/2005	5032106
DATE ENTERED	ROUTE / REVENUE NO.
PHASE 1 PHASE 2 PHASE 3 05/23/2005 05/26/2005 02/17/2006	PCD / 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2780 — Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RO
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW-7
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 18.0 FT. RISER HOLE DIAMETER 8.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 60.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 8.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 62.0 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 10.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

COPY

LOCATION OF WELL

LAT. 38 ° 45' 7.9" COUNTY
LONG. 90 ° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL) ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL) 1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	3	FILL CLY
3	12	SILTY CLY
12	75	LS CHT

TOTAL DEPTH 75.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 04/07/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314906
CR NO:
DATE RECEIVED: 05/23/2005
STATE CERT NO APPROVED DATE: A131529 05/27/2005
CHECK NO.: 5032106
DATE ENTERED: 05/23/2005
PHASE 1 PHASE 2 PHASE 3: 05/26/2005 02/17/2006
ROUTE: PCD
REVENUE NO.: 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER: 2780 (Applicable only if variance was obtained from DNR)
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW-8
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER: 4.0 IN.
RISER PIPE MATERIAL: [X] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER
RISER PIPE LENGTH: 27.0 FT.
RISER PIPE WEIGHT: [X] SCH40 [ ] SCH80 [ ] 304/316 [ ] OTHER
RISER HOLE DIAMETER: 8.0 IN.
DRILLING METHOD: [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER: 4.0 IN.
SCREEN MATERIAL: [ ] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER
SCREEN LENGTH: 25.0 FT.
SCREEN HOLE DIAMETER IF DIFFERENT FROM RISER: 8.0 IN.
BENTONITE SEAL LENGTH: 3.0 FT.
SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH: 27.5 FT.
SECONDARY FILTER PACK LENGTH: 0.0 FT.
PRIMARY FILTER MATERIAL [ ] SAND [ ] PREPACKED

ANNULAR SEAL LENGTH: 15.0 FT.
ANNULAR SEAL PLACED BY [ ] GRAVITY [ ] TREMIE [ ] PRESSURE GROUT THRU TREMIE
ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

COPY

LOCATION OF WELL

LAT. 38° 45' 7.9" COUNTY
LONG. 90° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL)
1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	4	CLY FILL
4	17	SILTY CLY SND
17	21	LS
21	26	CLY
26	45	LS

TOTAL DEPTH 45.5 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 03/31/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER — PERMIT NUMBER 001251 — DATE
WELL DRILLER SIGNATURE x DAVID MEYER — PERMIT NUMBER 001251 — DATE
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x — PERMIT NUMBER — DATE
APPRENTICE WELL DRILLER SIGNATURE x — PERMIT NUMBER — DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO 00314904	DATE RECEIVED 05/23/2005		
CR NO			
STATE CERT NO APPROVED DATE A131530 05/27/2005	CHECK NO. 5032106		
DATE ENTERED PHASE 1 PHASE 2 PHASE 3 05/23/2005 05/26/2005 02/17/2006	ROUTE PCD	REVENUE NO. 052305	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL)
DNR VARIANCE NUMBER 2780 — Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME
SITE NAME: , PGW=9
SITE ADDRESS (IF DIFFERENT THAN ABOVE)
CITY
STATE: MO
ZIP

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH — CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER — CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. — RISER PIPE LENGTH 22.6 FT. — RISER HOLE DIAMETER 8.0 IN.
RISER PIPE MATERIAL [X] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER — RISER PIPE WEIGHT [X] SCH40 [ ] SCH80 [ ] 304/316 [ ] OTHER — DRILLING METHOD [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 4.0 IN. — SCREEN LENGTH 55.0 FT. — BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER — SCREEN HOLE DIAMETER IF DIFFERENT FROM RISER 8.0 IN. — SEAL ABOVE SWL [ ] — SEAL BELOW SWL [ ] — SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 57.0 FT. — PRIMARY FILTER MATERIAL [ ] SAND [ ] PREPACKED
SECONDARY FILTER PACK LENGTH 0.0 FT.

ANNULAR SEAL LENGTH 15.5 FT. — ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE — [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38 ° 45' 7.9" COUNTY
LONG. 90 ° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

ELEVATION (OPTIONAL) 0 FT.
LEGAL LOCATION (OPTIONAL) ____ 1/4 ____ 1/4 ____ 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	5	FILL
5	14	SILTY CLY SND
14	19	LS
19	21	BRN SILTY CLY
21	75	LS

TOTAL DEPTH 75.5 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
WELL COMPLETION DATE 04/01/2005
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	PERMIT NUMBER 001251	DATE
WELL DRILLER SIGNATURE x DAVID MEYER	PERMIT NUMBER 001251	DATE
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x	PERMIT NUMBER	DATE
APPRENTICE WELL DRILLER SIGNATURE x	PERMIT NUMBER	DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO 00314903		DATE RECEIVED 05/23/2005	
CR NO			
STATE CERT NO A131531	APPROVED DATE 05/27/2005	CHECK NO. 5032106	
DATE ENTERED PHASE 1 05/23/2005	PHASE 2 05/26/2005	PHASE 3 02/17/2006	ROUTE PCD / REVENUE NO. 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2780 (Applicable only if variance was obtained from DNR)
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
SITE NAME: , PGW 10
CONTACT NAME:
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.

PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 23.0 FT. RISER HOLE DIAMETER 8.0 IN.

RISER PIPE MATERIAL [X] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER

RISER PIPE WEIGHT [X] SCH40 [ ] SCH80 [ ] 304/316 [ ] OTHER

DRILLING METHOD [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 55.0 FT. BENTONITE SEAL LENGTH 3.0 FT.

SCREEN MATERIAL [ ] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER

SCREEN HOLE DIAMETER IF DIFFERENT FROM RISER 8.0 IN.

SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ] SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 58.0 FT. PRIMARY FILTER MATERIAL [ ] SAND [ ] PREPACKED

SECONDARY FILTER PACK LENGTH 0.0 FT.

ANNULAR SEAL LENGTH 15.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT

ANNULAR SEAL PLACED BY [ ] TREMIE [ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE

[ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER

IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS

ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38° 45' 7.9" COUNTY ST LOUIS COUNTY

LONG. 90° 26' 7.5"

Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL) LEGAL LOCATION (OPTIONAL)

ELEVATION 0 FT.

1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	8	CLY FILL
8	18	SILTY CLY
18	76	LS

TOTAL DEPTH 76.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 04/04/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE

OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314902
CR NO:
DATE RECEIVED: 05/23/2005
STATE CERT NO APPROVED DATE: A131532 05/27/2005
CHECK NO.: 5032106
DATE ENTERED: PHASE 1 05/23/2005 PHASE 2 05/26/2005 PHASE 3 02/17/2006
ROUTE: PCD
REVENUE NO.: 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER: 2780 Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW 11
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 28.0 FT. RISER HOLE DIAMETER 6.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 75.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 0.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 78.0 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 19.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38 ° 45' 7.9" COUNTY
LONG. 90 ° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL) ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL) 1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	6	CLY FILL
6	20	SILTY CLY SND
20	100	LS

TOTAL DEPTH 100.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 03/28/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE

OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER PERMIT NUMBER 001251 DATE
WELL DRILLER SIGNATURE x DAVID MEYER PERMIT NUMBER 001251 DATE
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x PERMIT NUMBER DATE
APPRENTICE WELL DRILLER SIGNATURE x PERMIT NUMBER DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314900
CR NO:
DATE RECEIVED: 05/23/2005
STATE CERT NO APPROVED DATE: A131533 05/27/2005
CHECK NO.: 5032106
DATE ENTERED: PHASE 1 PHASE 2 PHASE 3 05/23/2005 05/26/2005 02/17/2006
ROUTE: PCD
REVENUE NO.: 052305

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2760 — Applicable only if variance was obtained from DNR
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044
CONTACT NAME:
SITE NAME: , PGW 12
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 23.0 FT. RISER HOLE DIAMETER 8.25 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 55.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 8.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 57.5 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 15.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38 ° 45' 7.9" COUNTY
LONG. 90 ° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL) ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL) 1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	5	FILL
5	20	SILTY CLY
20	22	SND
22	75	LS

TOTAL DEPTH 75.5 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 04/05/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314901	DATE RECEIVED: 05/23/2005		
CR NO:			
STATE CERT NO APPROVED DATE: A131534 05/27/2005	CHECK NO.: 5032106		
DATE ENTERED: PHASE 1 05/23/2005 PHASE 2 05/26/2005 PHASE 3 02/17/2006	ROUTE: PCD	REVENUE NO.: 052305	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER: 2780 (Applicable only if variance was obtained from DNR)
OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON STATE: MO ZIP: 63044
SITE NAME: , PGW 13
CONTACT NAME:
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY: STATE: MO ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.
PROTECTIVE CASE MATERIAL [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 19.0 FT. RISER HOLE DIAMETER 8.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 60.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 8.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 62.0 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 11.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

COPY

LOCATION OF WELL

LAT. 38° 45' 7.9" COUNTY
LONG. 90° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL)
1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	30	SILTY CLY
30	33	SND
33	76	LS

TOTAL DEPTH 76.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (SWL) 0.0 FT
WELL COMPLETION DATE 04/14/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	PERMIT NUMBER 001251	DATE
WELL DRILLER SIGNATURE x DAVID MEYER	PERMIT NUMBER 001251	DATE
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x	PERMIT NUMBER	DATE
APPRENTICE WELL DRILLER SIGNATURE x	PERMIT NUMBER	DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00314899	CR NO:	DATE RECEIVED: 05/23/2005	
STATE CERT NO: A131521	APPROVED DATE: 05/27/2005	CHECK NO.: 5032106	
DATE ENTERED: PHASE 1 05/23/2005 PHASE 2 05/26/2005 PHASE 3 02/17/2006	ROUTE: PCD	REVENUE NO.: 052305	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL LLC
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 2760 — Applicable only if variance was obtained from DNR

OWNER ADDRESS: C/O ALLEN STEINKAMP 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63044

SITE NAME:
CONTACT NAME:

SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[ ] MONITORING [X] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[ ] ABOVE GROUND [ ] FLUSH CASE LENGTH 0.0 IN. CASE HOLE DEPTH 0.0 IN.

PROTECTIVE CASE MATERIAL: [ ] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 0.0 IN. CASE HOLE DIAMETER 0.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 4.0 IN. RISER PIPE LENGTH 19.0 FT. RISER HOLE DIAMETER 8.0 IN.

RISER PIPE MATERIAL: [X] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER
RISER PIPE WEIGHT: [X] SCH40 [ ] SCH80 [ ] 304/316 [ ] OTHER
DRILLING METHOD: [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER 4.0 IN. SCREEN LENGTH 60.0 FT. BENTONITE SEAL LENGTH 3.0 FT.

SCREEN MATERIAL: [ ] PLASTIC [ ] STEEL [ ] PTFE [ ] OTHER
SCREEN HOLE DIAMETER IF DIFFERENT FROM RISER 8.0 IN.
SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ] SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 62.0 FT. SECONDARY FILTER PACK LENGTH 0.0 FT.
PRIMARY FILTER MATERIAL: [ ] SAND [ ] PREPACKED

ANNULAR SEAL LENGTH 11.0 FT.
ANNULAR SEAL PLACED BY: [ ] GRAVITY [ ] TREMIE [ ] PRESSURE GROUT THRU TREMIE
ANNULAR SEAL MATERIAL: [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
IF NON-SLURRY BENTONITE: [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

COPY

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 38° 45' 7.9" COUNTY
LONG. 90° 26' 7.5" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL): 1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	11	FILL
11	27	SILTY CLY
27	28	SND
28	76	LS

TOTAL DEPTH 76.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (SWL) 0.0 FT
WELL COMPLETION DATE 04/18/2005
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x DAVID MEYER	001251	
WELL DRILLER SIGNATURE x DAVID MEYER	001251	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

Why drilled log type

Aquaterra Drilling Log

HOLE NO. PGW-15 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Wells	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): T. Eggers
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schram T660
HOLE LOCATION: PGW # 15	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4" ID HSA; 6" Rotary Air
SURFACE ELEVATION: 480 ±	
OVERBURDEN THICKNESS: 35'	DRILLING START DATE: 9-20-05 / DRILLING END DATE: 9-21-05
DEPTH DRILLED INTO ROCK: ± 8'	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 83'	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0					1000	
5	STRUCTURAL FILL	BENTONITE PLUG		← 3'		65' Screen - 4" Sch 80 #20 PVC
	7'			← 8'		
10	GRAY SILTY CLAY 10'					15' Solid - 4" Sch 80
	13' TAN SILTY CLAY			← 12'		5 Bags of 50 lb. Enviroplug
15	GRAY SILTY CLAY (WARM)					59 Bags of Backfill material
20						
25	25'					
	WET GRAY SILTY/SAND CLAY					
30	32'				1130	
	GRAY SHALE 34'					
35						
40	LIMESTONE BEDROCK					
45						
50						
55						
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

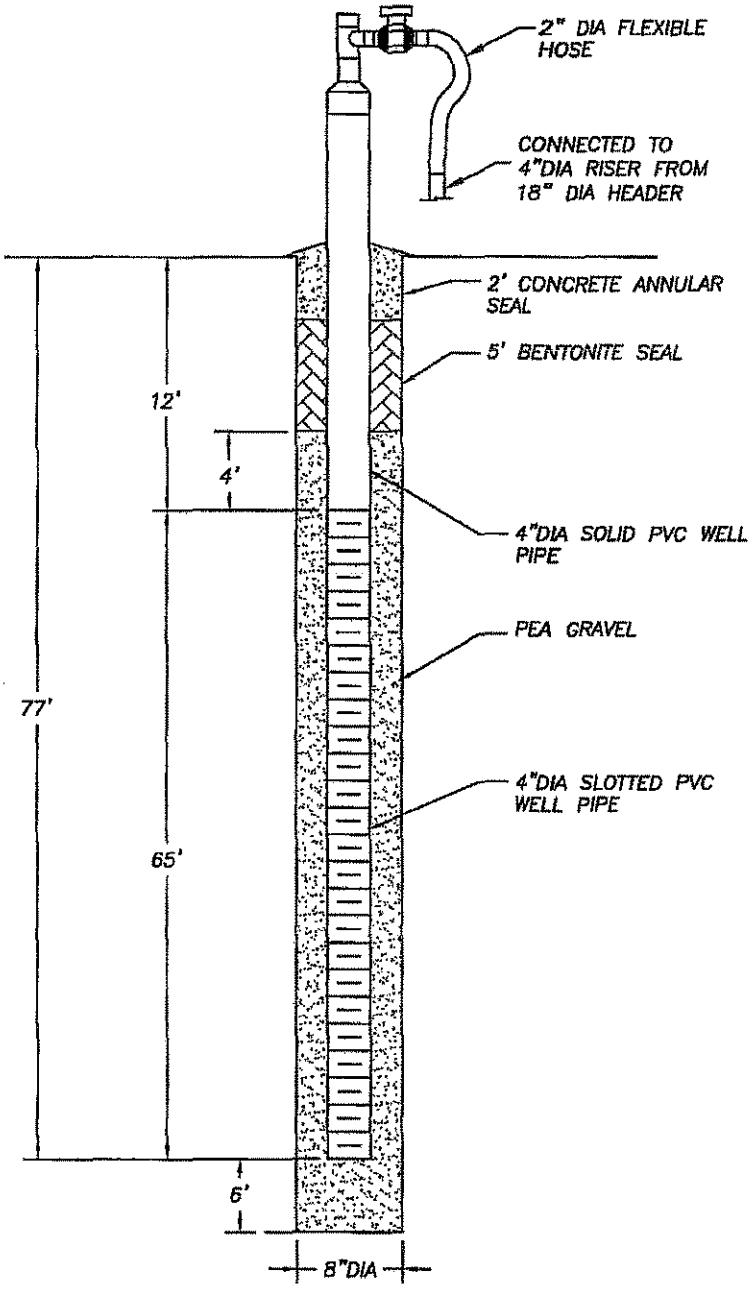
PROJECT NAME: Additional Perimeter LFG Collection Wells | HOLE NO.: PGW-15

Aquaterra Drilling Log

HOLE NO. PGW-15 | SHEET 2 OF SHEETS 3

PROJECT NAME: Additional Perimeter LFG Collection Wells | INSPECTOR: Terry L. Mueller

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60						
65						
70	LIMESTONE BEDROCK					
75					77 / 1500	
80						
83'	83'			83'		
85						



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-15 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-15_DETAIL.dwg	1

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359605	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME	WELL NUMBER	VARIANCE GRANTED BY THE D.N.R.
Bridgeton Landfill LLC	RGW-15	☐ NO
OWNER ADDRESS	**CITY**	**STATE**	**ZIP CODE**	☒ YES, ATTACH A COPY OF THE VARIANCE
13570 St. Charles Rock Rd	Bridgeton	MO	63044	
SITE NAME	**CONTACT NAME**	
Same	Rod Bluese	
SITE ADDRESS	**CITY**	**STATE**	**ZIP CODE**	**VARIANCE NUMBER**
Same				3786

PROPOSED USE OF WELL
☒ GAS MONITORING WELL ☐ MONITORING
☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE
☐ HAZARDOUS MATERIAL ☒ LANDFILL
☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T.
☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY)
☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☐ METALS ☐ V.O.C.
☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL
LAT. 38 : 45 : 43
LONG. 90 : 26 : 38
AREA
ELEV
COUNTY St. Louis
SMALLEST 1/4 LARGEST 1/4 1/4
SEC. 3 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: MW-1 West on St. Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☒ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN	IN. FT.	☒ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	GLUED
15 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER	☒ YES ☒ NO

BENTONITE SEAL

LENGTH OF SEAL	MATERIAL
3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK

LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
67 FT.	8 FT.	N/A FT.

ANNULAR SEAL
☐ BENTONITE SLURRY ☐ CEMENT/BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE
BAGS OF CEMENT USED 5
% OF BENTONITE USED 5
WATER USED/BAG 2.5 GAL
LENGTH 5 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
65 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	32	silty clay
32	37	Sandy silt
37	57	shale
57	58	Limestone
58	69	Limestone & shale
69	83	Limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 83'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
[signature]	2001051 WRM		7-21-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X [signature]	2001051 WRM	11-1-05	X N/A		

MO 780-1418 (1-02)

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-16 | SHEET 1 OF SHEETS

PROJECT NAME: Addtional Perimeter LFG Wells	DRILLING SUBCONTRACTOR: LAYNE WESTERN
PROJECT NUMBER: 1634.10	NAME OF DRILLER(S): Tim Elders, Bill Pinson, Dave Jones
LOCATION: Bridgeton Landfill, LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈ 480 FT MSL	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" ID HSA x 5 ft; 3" D rod x 20 ft
OVERBURDEN THICKNESS: 35 FT	
BEDROCK FOOTAGE: 42 FT	DRILLING START DATE: 8-22-05
DRILLING END DATE: 8-22-05	
DEPTH GROUNDWATER ENCOUNTERED: 15 FT	TOTAL NUMBER OF CORE BOXES: Ø
TOTAL NUMBER OF SAMPLES: Ø	
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 38 ft 20 hrs	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0–5	Brown, silty CLAY, possible structural fill	CL		5'		6'	Silt flowing in open borehole. HSAs advanced to 35 feet for casing.
10–15	Dark grayish brown, SILT with fine sand, saturated	ML/SM					
25–30							
35	35						
40	Dark gray SHALE, moderately hard, clayey	SH					
45	46						
50–55	Light gray LIMESTONE	LMS					
60–65							

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
Kansas City-Jefferson City-Omaha-St. Louis

PROJECT NAME: ADD'L Perimeter LFG Wells

HOLE NO.: PGW-16

Aquaterra Drilling Log

HOLE NO. PGW-16 | SHEET 2 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Wells - Bridgeton LF | LOGGED BY: AJL

DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
Light gray LIMESTONE	Lms				← 71'	
Boring Terminated at 77 feet						

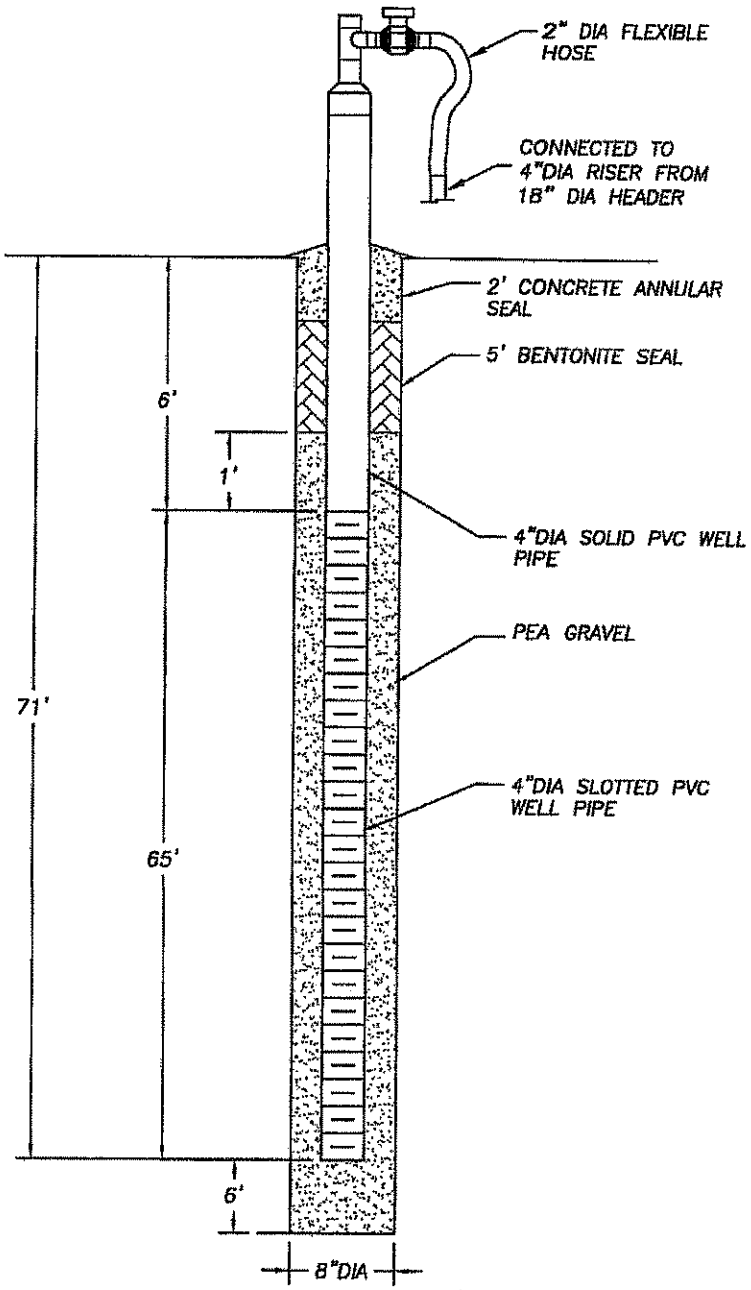
75

80

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
Kansas City-Jefferson City-Omaha-St. Louis

PROJECT NAME: ADD'L Perimeter LFG Wells

HOLE NO.: PGW-16



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-16 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-16_DETAIL.dwg	2

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 914929	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME	WELL NUMBER	VARIANCE GRANTED BY THE D.N.R.
Bridgeton Landfill LLC	PGW-16	☐ NO
OWNER ADDRESS: 13570 St. Charles Rock Rd	CITY: Bridgeton	STATE: Mo ZIP CODE: 63044
SITE NAME: Same	CONTACT NAME: Rod Bleec	☒ YES, ATTACH A COPY OF THE VARIANCE
SITE ADDRESS: Same	CITY:	STATE: ZIP CODE: VARIANCE NUMBER: 21165

PROPOSED USE OF WELL	TYPE OF POTENTIAL SITE	MONITORING FOR: (CHECK ALL THAT APPLY)
☒ GAS MONITORING WELL ☐ MONITORING	☐ HAZARDOUS MATERIAL ☒ LANDFILL	☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXTRACTION WELL ☐ PIEZOMETERS	☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T.	☐ EXPLOSIVES ☐ METALS ☐ V.O.C.
	☐ WATER LEVEL DRAWDOWN	☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL: LAT. 38 : 45 : 44 . LONG. 90 : 34 : 37 .

AREA ELEV

COUNTY

SMALLEST LARGEST

SEC. 2 1/4 TWN. 46 N. 1/4 RNG. 5 1/4 E OR W.

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 270, West on St. Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND N/A ☐ FLUSH MOUNT	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☐ YES ☒ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL
110 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

BENTONITE SEAL

LENGTH OF SEAL	MATERIAL
3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED: ☐ YES ☒ NO

SECONDARY FILTER PACK

☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO

PRIMARY FILTER PACK LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
66 FT.	5 FT.	N/A FT.

ANNULAR SEAL

☐ BENTONITE SLURRY ☒ CEMENT/BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE
BAGS OF CEMENT USED 2
% OF BENTONITE USED 5
WATER USED/BAG 10 GAL

LENGTH: 3 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
60 FT.	4 IN.	8 IN.	110 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	34	OVERBURDEN
34	41	SHALE
41	70	LIMESTONE
70	71	LIMESTONE W/ INT SHALE LAYERS

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 71

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL	DATE WELL DRILLING WAS COMPLETED
	0020231WPA	FEET FROM MEASURING POINT	8-23-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	0020231WPA	10/6/05	X N/A		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-17 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Wells	DRILLING SUBCONTRACTOR: LAYNE WESTERN
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Ebbets, Bill Pinson, Dave Jones
LOCATION: Bridgeton Landfill, LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈ 490	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/2" HSA x 5' ft; 8" D Air bit w/ 4" D x 20' rods
OVERBURDEN THICKNESS: 34	
BEDROCK FOOTAGE: 13.5	DRILLING START DATE: 8-23-05
DRILLING END DATE: 8-24-05	
DEPTH GROUNDWATER ENCOUNTERED: 27'	TOTAL NUMBER OF CORE BOXES: 0
TOTAL NUMBER OF SAMPLES: 0	
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0	Structural Fill: brown silty CLAY						
5	Brown silty CLAY, low plasticity			6' →			
10						8'	52 x 50 x 1L bags of "Aquarium Gravel" WB-50
15	16 Dark brown, low plastic silty CLAY, with woody debr.	CL-ML					4" D SCH 40 w 20 slot x 65 ft - PVC
	22 Dark grayish brown, low plastic, silty CLAY saturated below 27 ft.						4" D SCH 40 x 10' x 1 x 6' RISER - PVC
20	30 Dark gray, fine SAND, saturated	SP					
25	34 Gray SHALE, moderately hard) clayey	SH					
	42 Light gray LIMESTONE						
30		LMS					
35							
40							
45							
50							

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC. KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: ADD'L Perimeter LFG Wells

HOLE NO. PGW-17

Aquaterra Drilling Log

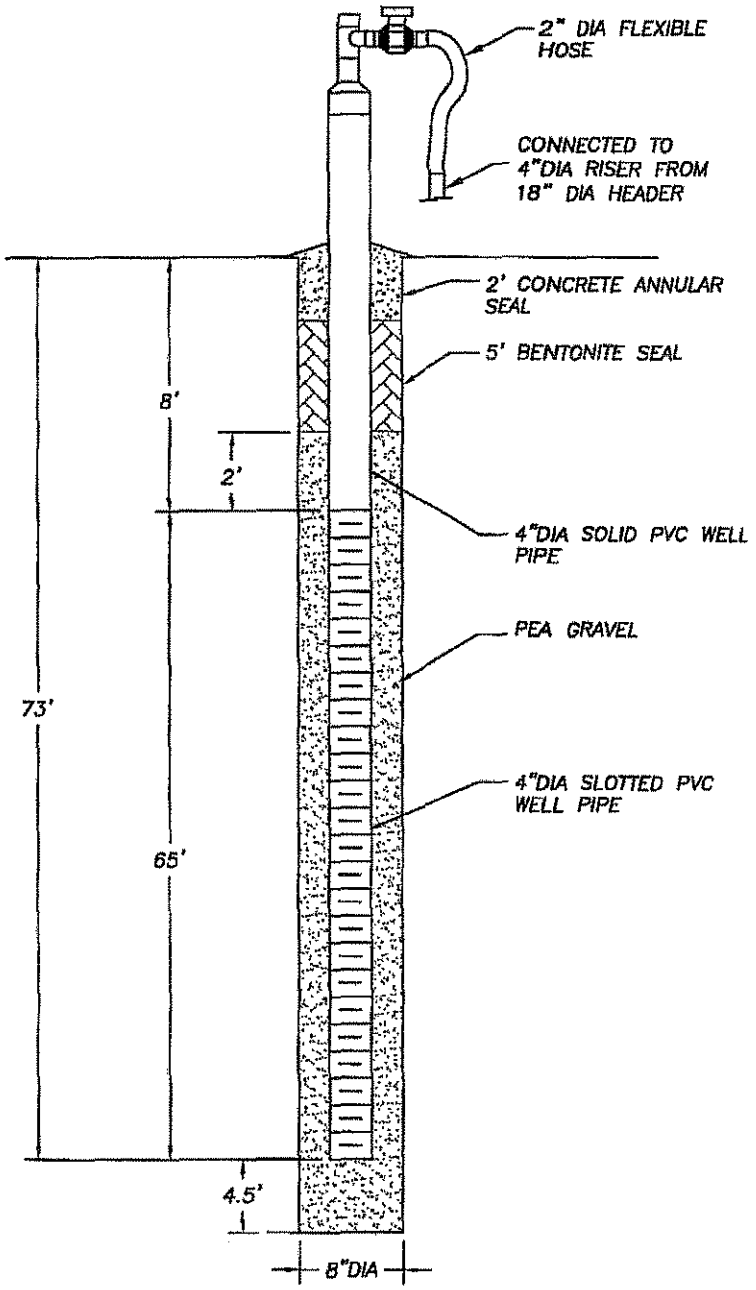
HOLE NO. PGW-17 | SHEET 2 OF 2 SHEETS

CT NAME: Additional Perimeter LFG Wells | LOGGED BY: AJL

DE:	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING - RESULTS	REMARKS
	Interbedded Limestone and Shale	LS/SH				73'	
75	74 Light Grey Limestone	LS					
	77.5 Boring Terminated at 77.5 feet						
80							

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
INDIANAPOLIS-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Add'l Perimeter LFG - Bridgeton | HOLE NO. PGW-17



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-17 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-17_DETAIL.dwg	3

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 214030	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC
WELL NUMBER: PGW-11
VARIANCE GRANTED BY THE D.N.R.: ☐ NO ☑ YES, ATTACH A COPY OF THE VARIANCE

OWNER ADDRESS: 13570 St. Charles Rock Rd
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044

SITE NAME: Same
CONTACT NAME: Paul Bloese

SITE ADDRESS: Same
CITY:
STATE:
ZIP CODE:
VARIANCE NUMBER: 2150

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL
LAT 38 45 44
LONG 90 36 51
AREA
ELEV.
COUNTY St. Louis
SMALLEST 1/4 LARGEST 1/4 1/4
SEC. 6 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 0.6, West on St. Charles Rock Rd, side on left
DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☒ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT	
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A	

RISER PIPE DETAIL	LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
	10 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER		3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED: ☐ YES ☒ NO

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO

PRIMARY FILTER PACK	LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
	69 FT.	6 FT.	N/A FT.

ANNULAR SEAL			LENGTH
☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE	☒ CEMENT/BENTONITE SLURRY	BAGS OF CEMENT USED 3 % OF BENTONITE USED 5 WATER USED/BAG 15 GAL.	3 FT.

WELL SCREEN	LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
	65 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	34	Overburden
34	41	Shale
41	70	Limestone
70	75	Limestone w/interbedded shale layers

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 75

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	00136 WPM		10-24-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	00136 WPM	10-24-05	X N/A		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-18 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Wells	DRILLING SUBCONTRACTOR: LAYNE WESTERN
PROJECT NUMBER: 16234.10	NAME OF DRILLER(S): Tim Elders, Bill Pinson, Dave Jones
LOCATION: Brickyard LF, LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈430	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4 HSA; 8" A.R. rotary
OVERBURDEN THICKNESS: 32	
BEDROCK FOOTAGE: 45	DRILLING START DATE: 8-24-05
DRILLING END DATE: 8-25-05	
DEPTH GROUNDWATER ENCOUNTERED: ≈28	TOTAL NUMBER OF CORE BOXES: 0
TOTAL NUMBER OF SAMPLES: 0	
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
5	Structural Fill: brown, silty CLAY						5 bags of chips
	5						50 lb bags of Enviroplug Medium
0	Brown + grayish brown silty CLAY	CL-ML	7.5'			9'	51 bags of Gravel
5							4 inch D SCH 80 PVC RISER IX 10 FT + 1 X 5 FT
	20						
	Gray SILT, saturated below 28 feet	ML					4 inch D SCH 80 #20 PVC SCREEN X 65 FT
0	29 with fine sand						
	32						
	Dark gray SHALE clayey	SH					
	36						
	light gray LIMESTONE						
5		LMS					
0							
5							
	65						
	Interbedded light gray LIMESTONE and dark gray argillaceous						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
KAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: ADD'L Perimeter LFG Wells

HOLE NO.: PGW-18

Aquaterra Drilling Log

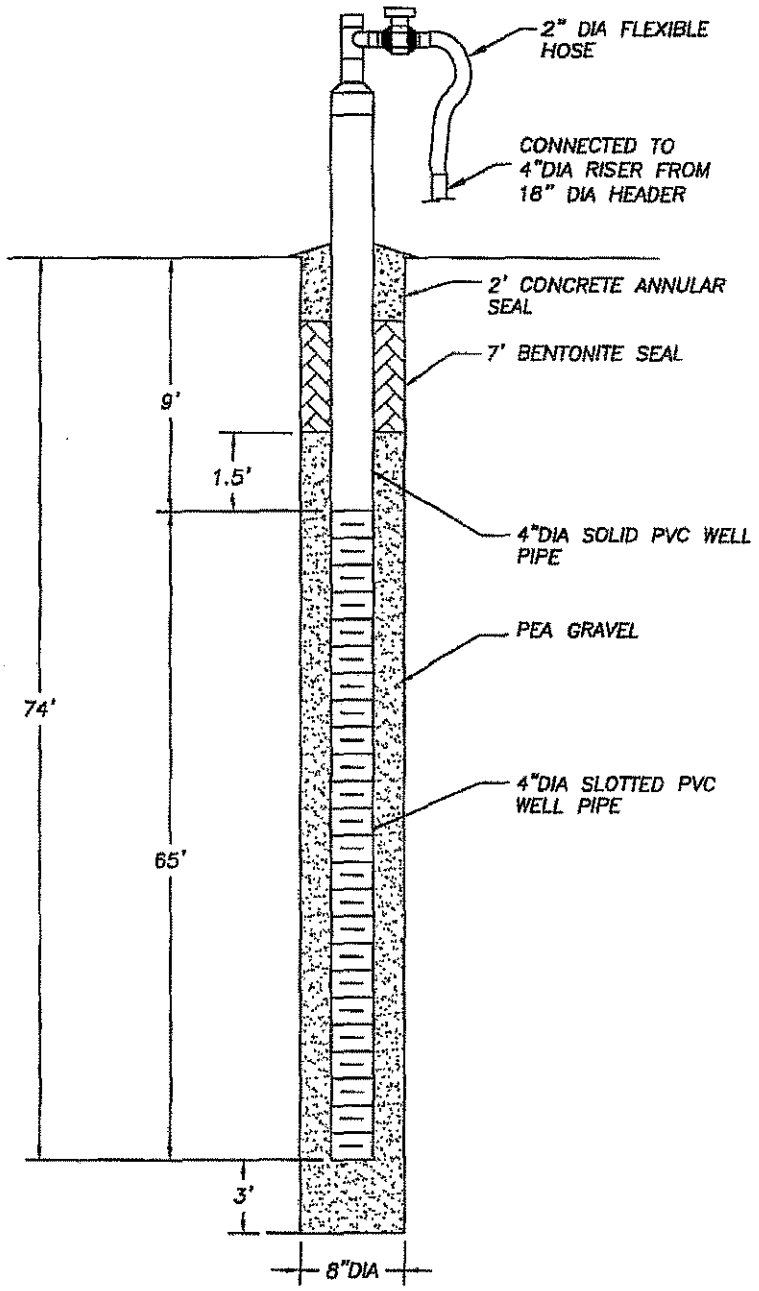
HOLE NO. PGW-18 | SHEET 2 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Wells | LOGGED BY: MJL

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
75	LIMESTONE	LMS				74'	
80	Boring Terminated @ 77 feet						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
LINCOLN CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: ADD'L Perimeter LFG Wells | HOLE NO.: PGW-18



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-18 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-18_DETAIL.dwg	4

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 31403	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC | WELL NUMBER: PGW1-18 | VARIANCE GRANTED BY THE D.N.R.: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE

OWNER ADDRESS: 13570 St. Charles Rock Rd | CITY: Bridgeton | STATE: MO | ZIP CODE: 63044

SITE NAME: Same | CONTACT NAME: Pat Bloese

SITE ADDRESS: Same | CITY | STATE | ZIP CODE | VARIANCE NUMBER: 31403

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ U.S.T. ☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL: LAT. 38 45 45 . LONG. 90 26 31 . | AREA | ELEV | COUNTY: St. Louis

SMALLEST ¼ ¼ ¼ LARGEST | SEC. 8 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 370, West on St. Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT	
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A	

RISER PIPE DETAIL	LENGTH	DIAMETER	WEIGHT OR SCH#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
	10 FT.	4 IN.	80	12" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER		3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED: ☐ YES ☒ NO

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☒ UNSATURATED ZONE TYP HYDRATED ☐ YES ☐ NO BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO

PRIMARY FILTER PACK	LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
	69 FT.	6 FT.	N/A FT.

ANNULAR SEAL			LENGTH
	☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE	☒ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED 3 % OF BENTONITE USED 5 WATER USED/BAG 15 GAL.	3 FT.

WELL SCREEN	LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
	65 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	31	Overburden
31	36	Shale
36	65	Limestone
65	75	Limestone w/interbedded shale layers

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 75'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	D0185WIPM		6-15-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	D0135WIPM	6/15/05	X N/A		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-19 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Wells	DRILLING SUBCONTRACTOR: LAYNE WESTERN
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Elders, Bill Pinson, Dave Jones
LOCATION: Bridgeton LF, LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈480	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" ID HSA; 8" air rotary
OVERBURDEN THICKNESS: 31	
BEDROCK FOOTAGE: 45	DRILLING START DATE: 8-29-05 / DRILLING END DATE: 8-29-05
DEPTH GROUNDWATER ENCOUNTERED: ≈26	TOTAL NUMBER OF CORE BOXES: 0 / TOTAL NUMBER OF SAMPLES: 0
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0	Structural Fill: brown silty CLAY			7'		9'	49 bags of 50 lb manganese gravel
10	Brown silty CLAY, low Plasticity	CL-ML					5 bags of 50 lb Enviroplug
17	Grayish brown SILT	ML					65' of 4 inch id SCH 80 #20 slot x 10 feet of 4 inch id SCH 80 riser x 5 feet
31	dark gray, shale, clayey	SH					
33	Light gray LIMESTONE	LMS					

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC. (AS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS)

PROJECT NAME: ADD'L Perimeter LFG Wells

HOLE NO.: PGW-19

Aquaterra Drilling Log

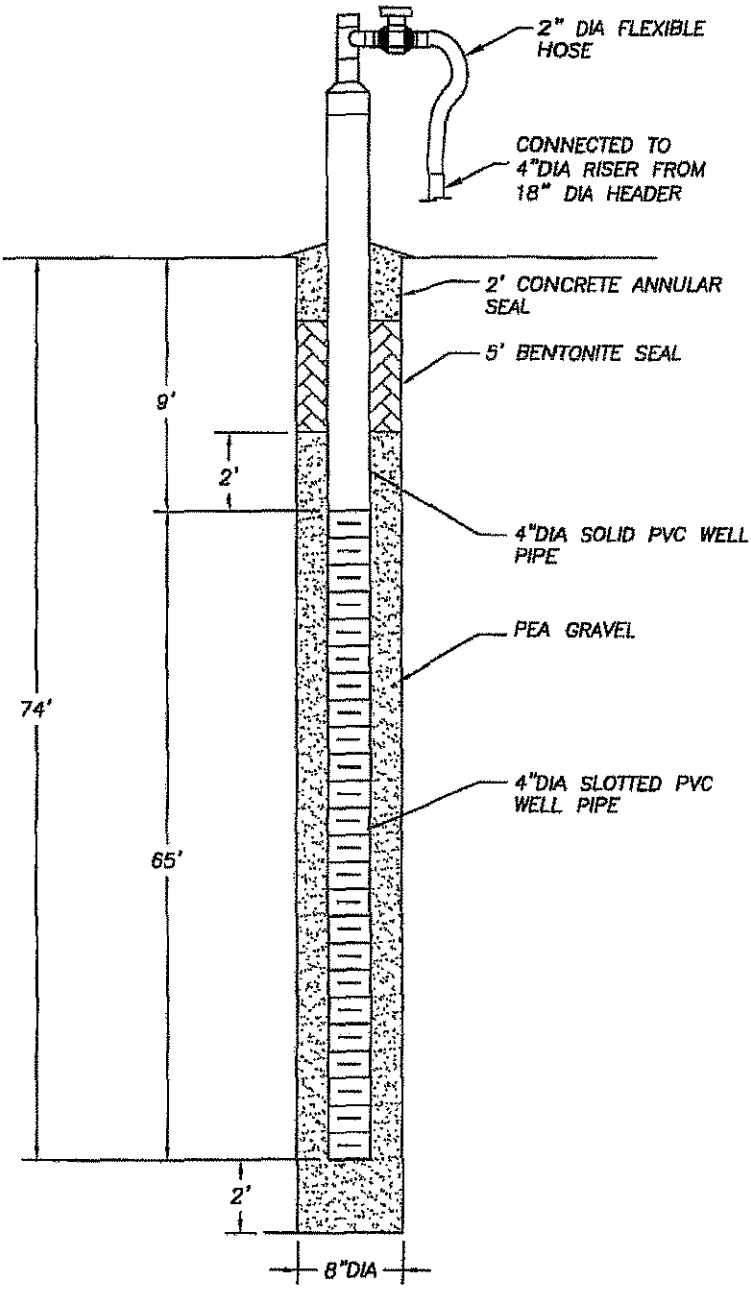
HOLE NO. PGW-19 | SHEET OF SHEETS 2 2

T NAME: Additional Perimeter LFG Wells | LOGGED BY: AJL

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
	Light gray, LIMESTONE	LMS				74'	
	Boring Terminated at 76 feet						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
IAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: ADD'L Perimeter LFG Wells | HOLE NO.: PGW-19



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-19 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-19_DETAIL.dwg	5

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED	
REF. NO. 314932		
O.R. NO.	CHECK NO.	
STATE WELL NUMBER	REVENUE NO.	
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY	ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME		WELL NUMBER		VARIANCE GRANTED BY THE D.N.R.
Bridgeton Landfill LLC		OGW-19		
OWNER ADDRESS: 13570 St. Charles Rock Rd	CITY: Bridgeton	STATE: MO	ZIP CODE: 63044	☐ NO
SITE NAME: Same		CONTACT NAME: Rod Blosse		☒ YES, ATTACH A COPY OF THE VARIANCE
SITE ADDRESS: Same	CITY	STATE	ZIP CODE	VARIANCE NUMBER: 27802

PROPOSED USE OF WELL	TYPE OF POTENTIAL SITE	MONITORING FOR: (CHECK ALL THAT APPLY)
☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS	☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN	☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS

LOCATION OF WELL: LAT. 38 ° 45 ' 45 " LONG. 90 ° 26 ' 26 "
AREA | ELEV.
COUNTY: St. Louis
SMALLEST 1/4 1/4 LARGEST 1/4 SEC. 02 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 270 West on St. Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND N/A ☒ FLUSH MOUNT	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL LENGTH OF SEAL	MATERIAL
10 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER	3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED: ☐ YES ☒ NO

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO; BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO

PRIMARY FILTER PACK: LENGTH 68 FT. | DEPTH TO TOP OF PRIMARY FILTER PACK 7 FT. | SECONDARY FILTER PACK LENGTH n/A FT.

ANNULAR SEAL: ☐ BENTONITE SLURRY ☐ CEMENT/BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE; BAGS OF CEMENT USED 4; % OF BENTONITE USED 5; WATER USED/BAG 12 GAL; LENGTH 4 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
65 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	31	Overburden
31	32	Shale
32	62	Limestone
62	75	Limestone w/interbedded shale layers

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED.

TOTAL DEPTH: 75'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL	DATE WELL DRILLING WAS COMPLETED
[signature]	2013S1WPM	FEET FROM MEASURING POINT	10-3-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X [signature]	2013S1WPM	10-4-05	X N/A		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402.
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION.

Aquaterra Drilling Log

HOLE NO. PGW-20 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Added Perimeter LFG Wells	DRILLING SUBCONTRACTOR: LAYNE WESTERN
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Elders, Bill Pinson, Dave Jones
LOCATION: Bridgeton LF, LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈ 481	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4" id HSA; 5" A.I. rotary
OVERBURDEN THICKNESS: 27	
BEDROCK FOOTAGE: 49	DRILLING START DATE: 8-30-05
DRILLING END DATE: 8-30-05	
DEPTH GROUNDWATER ENCOUNTERED: 24 ft	TOTAL NUMBER OF CORE BOXES: 0
TOTAL NUMBER OF SAMPLES: 0	
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 36 ft / 2 Hrs 40 ft / 48 Hrs	LOGGED BY: Andy Lummer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0	Structural Fill: brown silty CLAY	CL		2' →			6 bags of 50 lb bentonite
5				7.5' →			49 bags of 50 lb gravel
10	Brown, silty CLAY, low plasticity, slightly sticky	CL-ML				10'	4 inch id SCH 80 screen x 65 feet
17	Grayish brown to dark brownish gray, SILT, trace clay	ML					4 inch id SCH 80 riser x 10 feet + 5 feet
20	with sand below 24 feet						
27	Gray SHALE, clayey, soft	SH					
31	Light gray LIMESTONE	LMS					
65	with intermittent brown and light gray clay seams						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
IAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: ADD'L Perimeter LFG Wells

HOLE NO.: PGW-20

Aquaterra Drilling Log

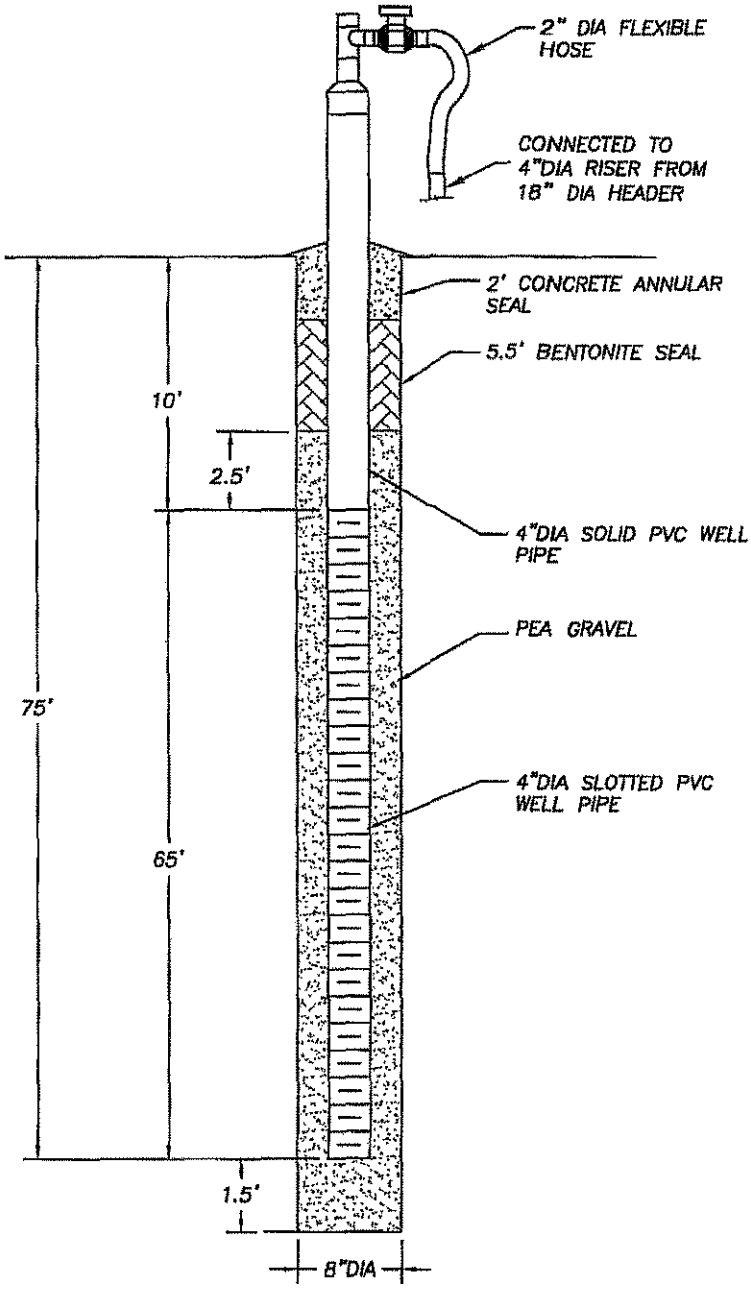
HOLE NO. PGW-20 | SHEET OF SHEETS 2 2

PROJECT NAME: Add'l Perimeter LFG Wells | LOGGED BY: AJL

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
75	Light gray LIMESTONE with light gray clay seams	LMS				75'	
76.5	Boring terminated @ 76.5 feet						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: ADD'L Perimeter LFG Wells | HOLE NO.: PGW-20



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-20 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-20_DETAIL.dwg	6

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 314033	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED PH 1 PH 2 PH 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME	WELL NUMBER	VARIANCE GRANTED BY THE D.N.R.
Bridgeton Landfill LLC.	DGW-20	☐ NO
OWNER ADDRESS: 13570 St. Charles Rock Rd	CITY: Bridgeton	STATE: MO ZIP CODE: 63044
SITE NAME: Same	CONTACT NAME: Pat Bloese	☒ YES, ATTACH A COPY OF THE VARIANCE
SITE ADDRESS: Same	CITY	STATE ZIP CODE: VARIANCE NUMBER: 02-18-12

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ U.S.T. ☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ EXPLOSIVES ☐ SVOCS ☐ PETROLEUM PRODUCTS ONLY ☐ METALS ☐ V.O.C. ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL: LAT. 38 45 46. LONG. 90 26 34. AREA ELEV. COUNTY St. Louis

SMALLEST 1/4 1/4 1/4 LARGEST; SEC. 0 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 270, West on St. Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT	
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A	

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	GLUED
10 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER	☐ YES ☒ NO

BENTONITE SEAL: LENGTH OF SEAL: 35 FT. MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO; BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO

PRIMARY FILTER PACK: LENGTH 67.5 FT. DEPTH TO TOP OF PRIMARY FILTER PACK 7.5 FT. SECONDARY FILTER PACK LENGTH N/A FT.

ANNULAR SEAL: ☐ BENTONITE SLURRY ☒ CEMENT/BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE; BAGS OF CEMENT USED 4; % OF BENTONITE USED 5; WATER USED/BAG 20 GAL; LENGTH 45 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
65 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	28	Overburden
28	30.5	Shale
30.5	53	Limestone
53	60	Limestone w/ some interbedded shale
60	70	Limestone fractured w/clay seams
70	75	Limestone w/some interbedded shale

TOTAL DEPTH: 75

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	D12351WPM		8-30-23

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	D12351WPM	10-4-23	X N/A		

MO 780-1416 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITH IN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-21 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Wells	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Elders, Bill Pinson, Dave Jones
LOCATION: Bridgeton Landfill LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈ 482	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" HSA; 8" Air Rotary
OVERBURDEN THICKNESS: 27	
BEDROCK FOOTAGE: 74	DRILLING START DATE: 8-31-05 / DRILLING END DATE: 9-1-05
DEPTH GROUNDWATER ENCOUNTERED: ≈ 20	TOTAL NUMBER OF CORE BOXES: Ø / TOTAL NUMBER OF SAMPLES: Ø
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0	Structural Fill: brown silty CLAY with gravel					← 2'	Well set at 100 feet with 8 x 10 ft + 2 x 5 ft 4 inch id SCH 80 #20 slot PVC well screen. 1 x 10 ft + 1 x 5 ft 4 inch id SCH 80 PVC riser. 61 bags of sand 6 bags of bentonite chips
5	5					← 7'	
10	Brown, silty CLAY	CL				← 16'	
15	15						
	Grayish brown to brownish gray SILT	ML					
25	27						
	SHALE and CLAY with LIMESTONE layers or cobbles	SH					
35	34						
	Tan and light gray LIMESTONE						
50	50	LMS					
	Light gray LIMESTONE						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC. KAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: ADD'L Perimeter LFG Wells

HOLE NO. PGW-21

Aquaterra Drilling Log

HOLE NO. PGW-21 | SHEET OF SHEETS 2 2

PROJECT NAME: A "Dnal Perimeter LFG Wells

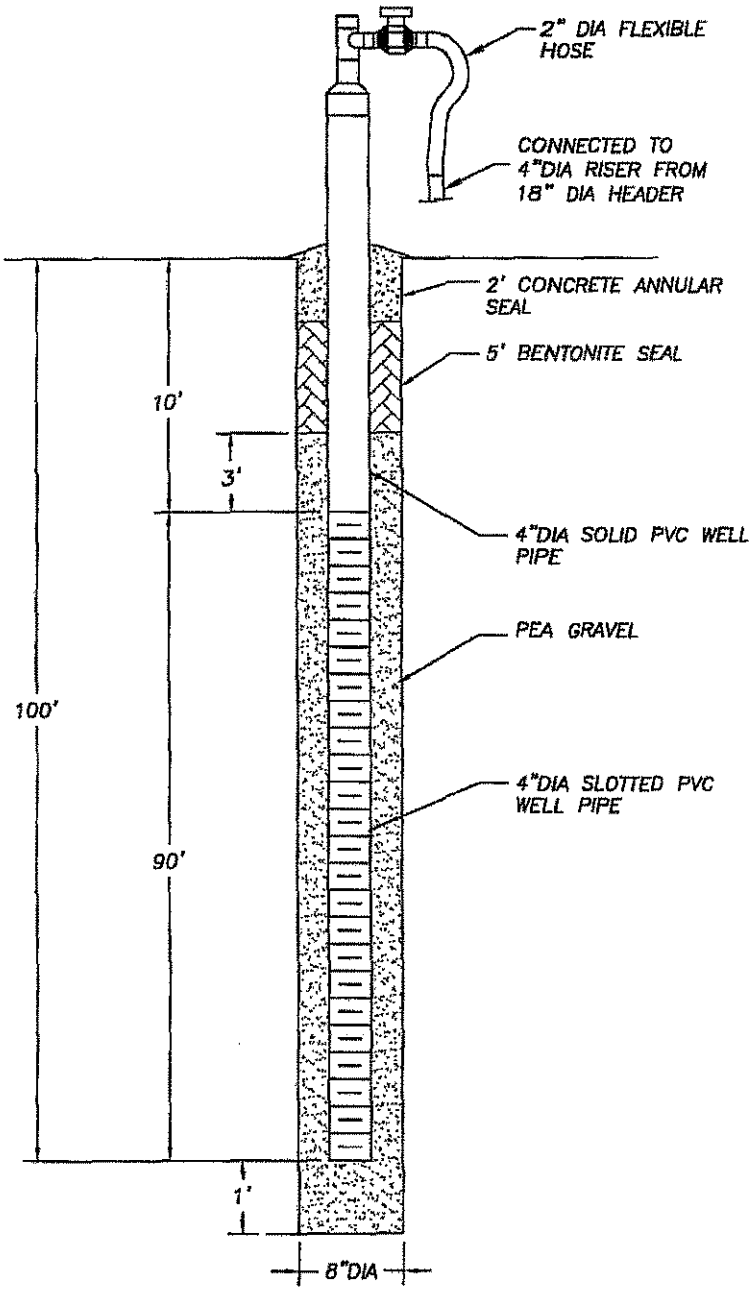
LOGGED BY: AJL

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
75	Light gray LIMESTONE with light gray clayey SHALE seams	LMS					
80							
85							
90							
95							
100					100'		
	Boring Terminated @ 101 ft						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
An City-Jefferson City-Omaha-St. Louis

PROJECT NAME: ADD'L Perimeter LFG Wells

HOLE NO. PGW-21



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-21 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-21_DETAIL.dwg	7

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 33934	
O.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC — WELL NUMBER: PGW-21 — VARIANCE GRANTED BY THE D.N.R.: [X] NO

OWNER ADDRESS: 10570 St. Charles Rock Rd — CITY: Bridgeton — STATE: MO — ZIP CODE: 63044 — [X] YES, ATTACH A COPY OF THE VARIANCE

SITE NAME: Same — CONTACT NAME: Rod Bloese

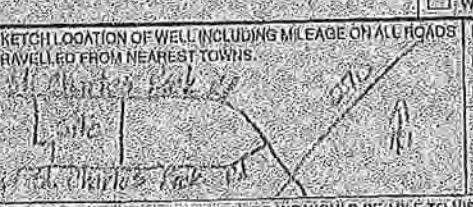
SITE ADDRESS: same — CITY — STATE — ZIP CODE — VARIANCE NUMBER

PROPOSED USE OF WELL: [X] GAS MONITORING WELL [ ] MONITORING [ ] EXTRACTION WELL [ ] PIEZOMETERS

TYPE OF POTENTIAL SITE: [ ] HAZARDOUS MATERIAL [X] LANDFILL [ ] INITIAL SITE ASSESSMENT [X] L.U.S.T. [ ] WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) [ ] RADIONUCLIDES [ ] PETROLEUM PRODUCTS ONLY [ ] EXPLOSIVES [ ] METALS [ ] V.O.C. [ ] SVOCS [ ] PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.



LOCATION OF WELL: LAT. 38 45 17 — LONG. 90 26 33 — AREA — ELEV — COUNTY: St. Louis

SMALLEST 1/4 — LARGEST 1/4 — SEC. 2 — TWN. 46 N — RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 270, West on St. Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
[ ] ABOVE GROUND [ ] FLUSH MOUNT N/A	FT.	IN.	IN. FT.	[ ] STEEL [ ] ALUMINUM [ ] PLASTIC	[ ] YES [ ] NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT	
[ ] YES [ ] NO	[ ] YES [X] NO	FT.	IN.	IN. FT.	[ ] CONCRETE [ ] OTHER	N/A

	LENGTH	DIAMETER	WEIGHT OR SCH#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
RISER PIPE DETAIL	10 FT.	4 IN.	80	8" FT.	[ ] STEEL [X] THERMOPLASTIC (PVC) [ ] OTHER		3 FT.	[ ] SLURRY [ ] PELLETS [ ] GRANULAR [X] CHIPS

GLUED: [ ] YES [X] NO — SECONDARY FILTER PACK: [ ] SATURATED ZONE [ ] UNSATURATED ZONE HYDRATED [ ] YES [ ] NO — BOTH ZONES [ ] IF YES, HYDRATED [ ] YES [ ] NO

PRIMARY FILTER PACK	LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
	16.5 FT.	33.5 FT.	N/A FT.

ANNULAR SEAL			LENGTH
	[ ] BENTONITE SLURRY [ ] NON SLURRY BENTONITE TYPE	[X] CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED 4 # OF BENTONITE USED 5 WATER USED/BAG 2.12 GAL.	9.5 FT.

WELL SCREEN	LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
	10 FT.	4 IN.	8 IN.	10 FT.	[ ] STEEL [X] THERMOPLASTIC (PVC) [ ] OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	28	Overburden
28	34	Shale
34	110	Limestone
110	122	Limestone, shaley

MULTIPLE CASED WELLS: [ ] YES [X] NO — PUMP INSTALLED FOR REMEDIATION: [ ] YES [X] NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 122'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	002851 WPM		2/14/05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	002851 WPM	2/14/05	X N/A		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-22 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Wells	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Elders, Bill Pinson, Dave Jones
LOCATION: Bridgeton Landfill, LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
HOLE LOCATION: ~~2483 ft~~ PGW-22	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4" HSA; 8" Air rotary
SURFACE ELEVATION: ± 483 ft	
OVERBURDEN THICKNESS: 32 ft	DRILLING START DATE: 9/2/05 — DRILLING END DATE: 9/2/05
DEPTH DRILLED INTO ROCK: 70 ft	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 102	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
				Nathan Hagg

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
5	Structural Fill: brown silty clay w/ gravel	5' 7'			800	
10	Brown silty clay		10			
15						
20						
25	25					
30	Shale with clay				1030	
35	~~Shale with clay~~ Light gray limestone					
40						
45					1230	
50						
55	Light gray limestone					
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Additional Perimeter LFG Wells | HOLE NO.: PGW-22

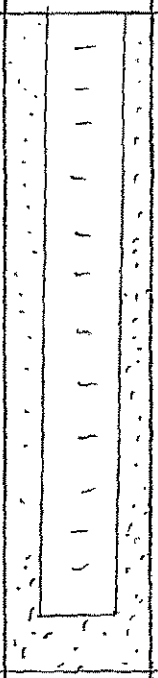
Additional LFG wells

Aquaterra Drilling Log

HOLE NO. PGW-22 | SHEET OF SHEETS 2 2

PROJECT NAME

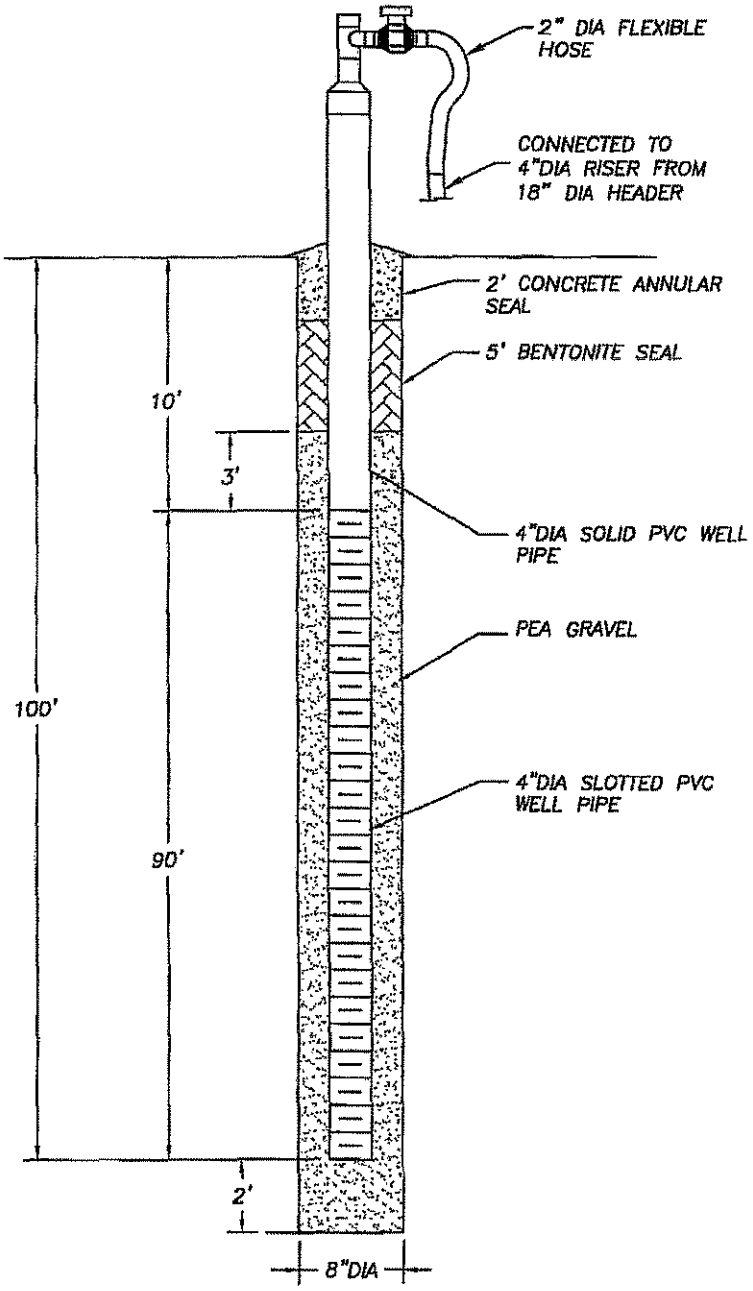
INSPECTOR N Hizzoner

DEPT	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Limestone					TD 102 Bottom of well [redacted] / 100 feet
102	TD Borehole					

PROJECT NAME

HOLE NO.

QUATERRA



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-22 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-22_DETAIL.dwg	8

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 214935	
C.D. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC
WELL NUMBER: PGW-33
VARIANCE GRANTED BY THE D.N.R.: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE

OWNER ADDRESS: 13570 St Charles Rock Rd
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044

SITE NAME: Same
CONTACT NAME: Rod Bloese

SITE ADDRESS: Same
CITY:
STATE:
ZIP CODE:
VARIANCE NUMBER: 2702

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.
St. Charles Rock Rd
Site
Old St. Charles Rock Rd
3/10 mi
N

LOCATION OF WELL
LAT 38 ° 45 ' 48 "
LONG 90 ° 26 ' 31 "
AREA
ELEV
COUNTY St. Louis
SMALLEST 1/4 1/4 1/4 LARGEST
SEC. 0 TWN. 46 N. RNG. 6 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE
270' west on St. Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION: ☐ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH OF PROTECTIVE CASING: n/a FT.
DIAMETER OF PROTECTIVE CASING: IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: IN. FT.
PROTECTIVE CASING MATERIAL: ☐ STEEL ☐ ALUMINUM ☐ PLASTIC
LOCKING CAP? ☐ YES ☐ NO

WEEP HOLE? ☐ YES ☐ NO
VENTED CAP? ☐ YES ☐ NO
LENGTH OF FLUSH MOUNT: FT.
DIAMETER OF FLUSH MOUNT: IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: IN. FT.
SURFACE COMPLETION GROUT: ☐ CONCRETE ☐ OTHER n/a

RISER PIPE DETAIL: LENGTH 10 FT. | DIAMETER 4 IN. | WEIGHT OR SCH 80 | DIAMETER OF DRILL HOLE 8" FT. | MATERIAL ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

BENTONITE SEAL: LENGTH OF SEAL 3 FT. | MATERIAL ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED ☒ YES ☐ NO

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO

PRIMARY FILTER PACK: LENGTH 94 FT. | DEPTH TO TOP OF PRIMARY FILTER PACK 6 FT. | SECONDARY FILTER PACK LENGTH n/a FT.

ANNULAR SEAL: ☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE ☒ CEMENT/BENTONITE SLURRY
BAGS OF CEMENT USED 3
% OF BENTONITE USED 5
WATER USED/BAG 1.5 GAL.
LENGTH 3 FT.

WELL SCREEN: LENGTH 90 FT. | DIAMETER 4 IN. | DIAMETER OF DRILL HOLE 8 IN. | DEPTH TO TOP OF SCREEN 10 FT.
MATERIAL ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	27	Overburden
27	31	Silty sand
31	32	Limestone - weathered
32	63	Limestone
63	79	Limestone - shaley
79	100	Limestone w/ thin shale layers

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 100'

SIGNATURE (PRIMARY CONTRACTOR):
PERMIT NUMBER: 00125WPM
STATIC WATER LEVEL FEET FROM MEASURING POINT:
DATE WELL DRILLING WAS COMPLETED: 07-26-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	00125WPM	10-19-05	X n/a		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW 23 | SHEET 1 OF SHEETS

PROJECT NAME: Additional Perimeter Gas wells	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Eckles
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: SCHramm T660
HOLE LOCATION: PGW 23	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 5¼ HSA; 8" Air Rotary
SURFACE ELEVATION: ≈ 485	
OVERBURDEN THICKNESS: 34'	DRILLING START DATE: 9/7/05 — DRILLING END DATE: 9/7/05
DEPTH DRILLED INTO ROCK: 64	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 102	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	-	—	

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	-	-	-	-	-	-

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	✓	-	-	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
5	Structural Fill 5 Brown silty clay Brown Silty Clay		Bentonite		2' 7' 10'	6 Bags of Bentonite 90 feet Screen 10 Feet Solid
15	15 Grayish Brown silt					
31	31 Gray Shale					
38	38 Limestone Bedrock					

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.	PROJECT NAME: Additional Perimeter LFG wells	HOLE NO.: PGW-23

Additional Perimeter LFG wells

Aquaterra Drilling Log

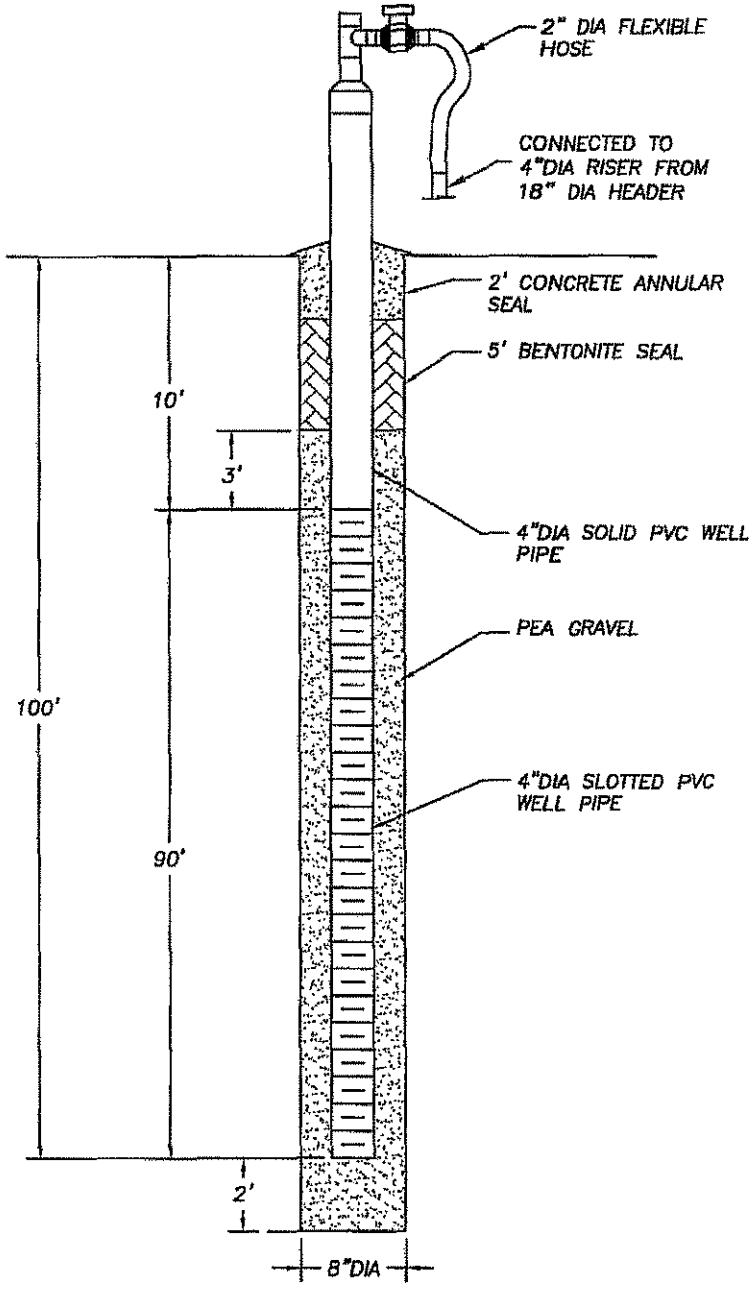
HOLE NO. PGW-23 | SHEET 2 OF SHEETS 2

PROJECT NAME

INSPECTOR J. Jordan

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	Limestone					
100					100'	
102	TD 102 feet					

QUATERRA PROJECT NAME HOLE NO.



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-23 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-23_DETAIL.dwg	9

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 31496	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED PH 1 PH 2 PH 3	APPROVED BY / ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC
WELL NUMBER: RGW-93
VARIANCE GRANTED BY THE D.N.R: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE

OWNER ADDRESS: 13570 St. Charles Rock Rd
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044

SITE NAME: Same
CONTACT NAME: Rod Bloese

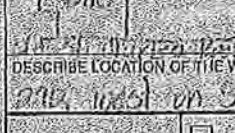
SITE ADDRESS: Same
CITY:
STATE:
ZIP CODE:
VARIANCE NUMBER: 6760

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ EXTRACTION WELL ☐ MONITORING ☒ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☐ INITIAL SITE ASSESSMENT ☐ WATER LEVEL DRAWDOWN ☒ LANDFILL ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ EXPLOSIVES ☐ SVOCS ☐ PETROLEUM PRODUCTS ONLY ☐ METALS ☒ V.O.C. ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.



LOCATION OF WELL: LAT. 38 45 48 LONG. 90 26 31
AREA:
ELEV:
COUNTY: St. Louis
SMALLEST 1/4 1/4 LARGEST 1/4 SEC. 12 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 390 west on St. Charles Rock Rd, site on left
DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND N/A ☐ FLUSH MOUNT	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT	
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER	N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL: LENGTH OF SEAL	MATERIAL
112 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER	2 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED? ☐ YES ☒ NO

SECONDARY FILTER PACK
☐ SATURATED ZONE ☒ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO

PRIMARY FILTER PACK: LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
92 FT.	82 FT.	N/A FT.

ANNULAR SEAL
☐ BENTONITE SLURRY ☒ CEMENT/BENTONITE SLURRY
☒ NON SLURRY BENTONITE TYPE BAGS OF CEMENT USED 5
% OF BENTONITE USED 5
WATER USED/BAG 2.5 GAL
LENGTH 43 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
92 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	30	Overburden
30	38	Shale
38	53	Limestone
53	71	Limestone + shale
71	100	Limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 100'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	0124ESLWPM		10-17-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	0124ESLWPM	10-17-05	X N/A		

MO 780-1416 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-24 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional perimeter gas wells	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Elders
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
HOLE LOCATION: PGW 24	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼ HSA; 8" Air Rotary
SURFACE ELEVATION: ≈ 495	
OVERBURDEN THICKNESS: 44 feet	DRILLING START DATE: 9/8/05
DRILLING END DATE: 9/9/05	
DEPTH DRILLED INTO ROCK: 58 feet	DEPTH GROUNDWATER ENCOUNTERED: 22
TOTAL DEPTH OF HOLE: 102	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Structural fill			0'	1300	10 foot Solid 70 foot Screen Borehole stopped at 84 foot due To quantity of water Reading Level 9/8/05 ↑ 9/9/05 ↓
5	5ft Brown Silty clay			7'		
10				10'		
15	15ft Grayish Brown Silt					
20						
25						
30						
35	~~33ft~~ Gray Shale mixed with Limestone chunks				1400	
40						
45	44ft Limestone Bedrock				900	
50						
55						
60						

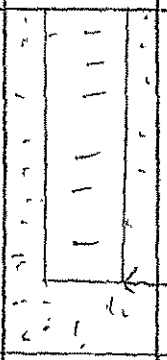
AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Additional PGW | HOLE NO.: PGW-24

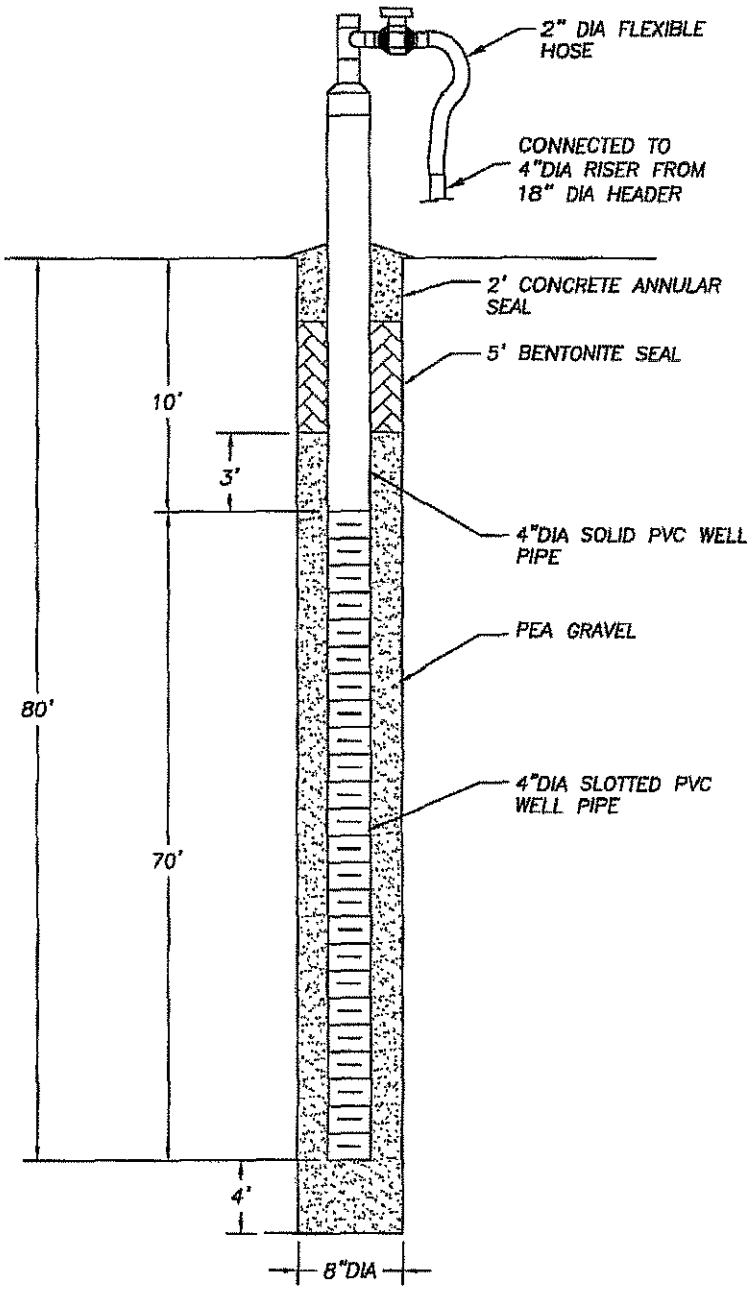
Aquaterra Drilling Log

HOLE NO. PGW-24 | SHEET 2 OF SHEETS 2

PROJECT NAME: Additional Perimeter Gas wells | INSPECTOR:

DEPT	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
80	Limestone Bedrock					TD 84 feet Borehole stopped Per R. Walker Due TD amount of water Recharging hole

AQUATERRA | PROJECT NAME: Additional Perimeter Gaswells | HOLE NO. PGW-24



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-24 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-24_DETAIL.dwg	10

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 31527	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED PH 1 PH 2 PH 3	APPROVED BY / ROUTE 1 / 1

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME	WELL NUMBER	VARIANCE GRANTED BY THE D.N.R.
Bridgeton Landfill LLC	PSW-24	☐ NO
OWNER ADDRESS: 13570 St. Charles Rock Rd	CITY: Bridgeton	STATE: MO ZIP CODE: 63044
SITE NAME: Same	CONTACT NAME: Rod Bloese	☒ YES, ATTACH A COPY OF THE VARIANCE
SITE ADDRESS: Same	CITY	STATE ZIP CODE: VARIANCE NUMBER: SP160

PROPOSED USE OF WELL
☒ GAS MONITORING WELL ☐ MONITORING
☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE
☐ HAZARDOUS MATERIAL ☒ LANDFILL
☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T.
☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY)
☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☐ METALS ☐ V.O.C.
☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL
LAT. 38 : 45 : 49
LONG. 90 : 26 : 30

AREA ELEV
COUNTY: St. Louis

SMALLEST 1/4 1/4 LARGEST 1/4
SEC. 10 TWN. 44 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE

DRILLER NOTES

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL
10 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

BENTONITE SEAL: LENGTH OF SEAL: 3 FT. MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED ☐ YES ☒ NO

SECONDARY FILTER PACK
☒ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO

PRIMARY FILTER PACK LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
735 FT.	715 FT.	N/A FT.

ANNULAR SEAL
☐ BENTONITE SLURRY ☐ CEMENT/BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE BAGS OF CEMENT USED 4
% OF BENTONITE USED 5
WATER USED/BAG 7.0 GAL.
LENGTH 45 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
70 FT.	4 IN.	8 IN.	710 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	37	Overburden
37	49	shale, silty sand
49	80	Limestone

TOTAL DEPTH: 80'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
[signature]	000251 WPM		09-01-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X [signature]	000251 WPM	11-10-05	X N/A		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-25 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter Gas wells	DRILLING SUBCONTRACTOR: Layne western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): T. Elders
LOCATION: PGW-25 Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T160
HOLE LOCATION: East Perimeter	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" HSA; 8" Air Rotary
SURFACE ELEVATION: ≈ 484	
OVERBURDEN THICKNESS: 38	DRILLING START DATE: 9/12/05 — DRILLING END DATE: 9/12/05
DEPTH DRILLED INTO ROCK: 64	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 102	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
–	–	–	–

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
–	–	–	–	–	–	–

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
–	–	–	–	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Structural fill					90 Ft Screen
5 ft	Brown Silty clay w/ Gravel			3'	1110	10 ft solid
10				8'		5 ft stickup
15				10'		
20 ft	Light gray clay shale mix (moist)				1115	
25						
30						
35					1350	
38 ft	Lime Stone Bedrock					
40						
45						
50						
55						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Additional Perimeter Gas wells | HOLE NO.: PGW-25

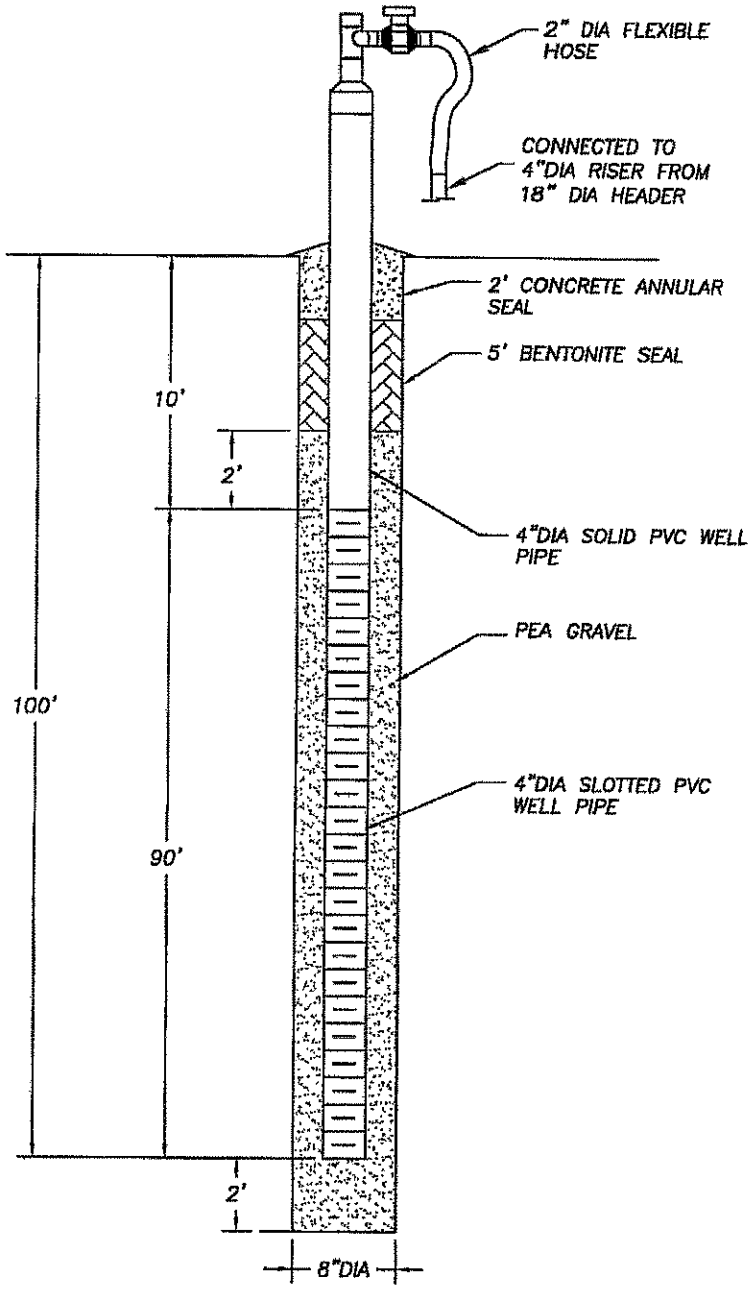
Aquaterra Drilling Log

HOLE NO. PGW-25 | SHEET 2 OF 2 SHEETS

NAME Additional Perimeter Gas wells | INSPECTOR D. Jordan

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
5	Limestone					
			100'			TD 102'

AQUATERRA | PROJECT NAME Additional Perimeter Gas wells | HOLE NO. PGW-25



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-25 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-25_DETAIL.dwg	11

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 350602	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC
WELL NUMBER: PSW 35
OWNER ADDRESS: 13570 St. Charles Rock Rd
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
CONTACT NAME: Paul Place
SITE NAME: Same
SITE ADDRESS: Same
CITY:
STATE:
ZIP CODE:

VARIANCE GRANTED BY THE D.N.R
- [ ] NO
- [X] YES, ATTACH A COPY OF THE VARIANCE

VARIANCE NUMBER: 2782

PROPOSED USE OF WELL
- [X] GAS MONITORING WELL
- [ ] EXTRACTION WELL
- [ ] MONITORING
- [ ] PIEZOMETERS

TYPE OF POTENTIAL SITE
- [ ] HAZARDOUS MATERIAL
- [ ] INITIAL SITE ASSESSMENT
- [ ] WATER LEVEL DRAWDOWN
- [X] LANDFILL
- [ ] L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY)
- [ ] RADIONUCLIDES
- [ ] EXPLOSIVES
- [ ] OVOCS
- [ ] PETROLEUM PRODUCTS ONLY
- [ ] METALS
- [ ] V.O.C.
- [ ] PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWN:
St. Charles Rock Rd
Site
Old St. Charles Rock Rd
1/2 mi
N

LOCATION OF WELL
LAT. 38 46 49
LONG. 90 26 30
AREA
ELEV
COUNTY: St. Louis
SMALLEST 1/4 1/4 1/4 LARGEST
SEC. 0 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE:
3.7D. West on St. Charles Rock Rd, site on left

DRILLER NOTES:
Methane collection well

TYPE OF SURFACE COMPLETION
- [X] ABOVE GROUND
- [ ] FLUSH MOUNT
- N/A

LENGTH OF PROTECTIVE CASING: FT.
DIAMETER OF PROTECTIVE CASING: IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: IN. FT.
PROTECTIVE CASING MATERIAL
- [ ] STEEL
- [ ] ALUMINUM
- [ ] PLASTIC

LOCKING CAP?
- [ ] YES
- [ ] NO

WEEP HOLE?
- [ ] YES
- [ ] NO

VENTED CAP?
- [ ] YES
- [X] NO

LENGTH OF FLUSH MOUNT: FT.
DIAMETER OF FLUSH MOUNT: IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: IN. FT.
SURFACE COMPLETION GROUT
- [ ] CONCRETE
- [ ] OTHER N/A

RISER PIPE DETAIL
LENGTH: 15 FT.
DIAMETER: 4 IN.
WEIGHT OR SDR#: SD
DIAMETER OF DRILL HOLE: 8" FT.
MATERIAL
- [ ] STEEL
- [X] THERMOPLASTIC (PVC)
- [ ] OTHER

BENTONITE SEAL
LENGTH OF SEAL: 3 FT.
MATERIAL
- [ ] SLURRY
- [ ] PELLETS
- [ ] GRANULAR
- [X] CHIPS

GLUED
- [ ] YES
- [X] NO

SECONDARY FILTER PACK
- [X] SATURATED ZONE
- [ ] UNSATURATED ZONE
- HYDRATED [ ] YES [ ] NO
- BOTH ZONES [ ]
- IF YES, HYDRATED [ ] YES [ ] NO N/A

PRIMARY FILTER PACK
LENGTH: 91.5 FT.
DEPTH TO TOP OF PRIMARY FILTER PACK: 7.5 FT.
SECONDARY FILTER PACK LENGTH: N/A FT.

ANNULAR SEAL
- [ ] BENTONITE SLURRY
- [ ] NON SLURRY BENTONITE TYPE
- [X] CEMENT/BENTONITE SLURRY
- BAGS OF CEMENT USED 4
- % OF BENTONITE USED 5
- WATER USED/BAG 2.0 GAL
- LENGTH 4.5 FT.

WELL SCREEN
LENGTH: 90 FT.
DIAMETER: 4 IN.
DIAMETER OF DRILL HOLE: 8 IN.
DEPTH TO TOP OF SCREEN: 12 FT.
MATERIAL
- [ ] STEEL
- [X] THERMOPLASTIC (PVC)
- [ ] OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	36	overburden
36	84	silty sand
84	87	shale & cobble
87	51	limestone w/thin shale layers
51	102	limestone

MULTIPLE CASED WELLS [ ] YES [X] NO PUMP INSTALLED FOR REMEDIATION [ ] YES [X] NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED.

TOTAL DEPTH: 102'

SIGNATURE (PRIMARY CONTRACTOR)
PERMIT NUMBER: 001851 WIPM
STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED: 7-13-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	001851	11/7/05	X N/A		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
RETURN TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION.

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

Aquaterra Drilling Log

HOLE NO. PGW-26 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter Gas wells	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): T. Elders
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
HOLE LOCATION: PGW-26	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 ¼ HSA; 9" AR Rotary
SURFACE ELEVATION: ≈ 484	
OVERBURDEN THICKNESS: 38	DRILLING START DATE: 9/13 — DRILLING END DATE: 9/13
DEPTH DRILLED INTO ROCK: 64	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 102	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—		—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
5	Structural fill	Bentonite plug			1110	90 foot Screen 10 foot Solid
	2ft				29ft	
					7ft	
10	Brown silty clay				10ft	
15	15				1125	
	Gray silty clay shale mix					
25						
30						
35	35'				1200	
	shale					
	38'					
40	Limestone Bedrock					
45						
50						
55						
60						
65						
70						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

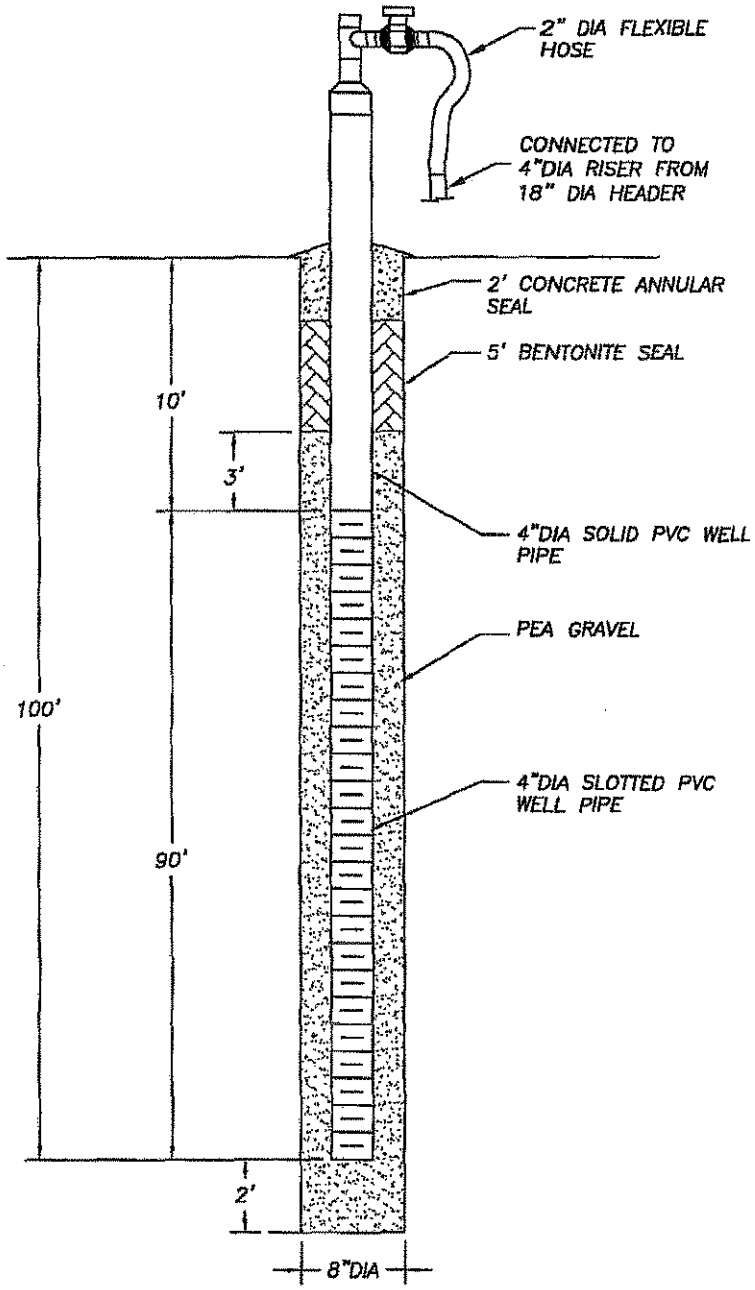
PROJECT NAME: Additional Perimeter Gas wells | HOLE NO.: PGW-26

Aquaterra Drilling Log

HOLE NO. PGW-26 | SHEET 2 OF 2 SHEETS

PROJECT NAME Additional Perimeter Gas wells | INSPECTOR J. Jordan

EPT	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	Limestone Bedrock				1400	
					100'	
					102'	TD 102'
					1500 Drilling Stopped at 102'	



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-26 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-26_DETAIL.dwg	12

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359603	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED: PH 1 PH 2 PH 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC | WELL NUMBER: MW-516 | VARIANCE GRANTED BY THE D.N.R.: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE

OWNER ADDRESS: 15570 St Charles Rock Rd | CITY: Bridgeton | STATE: Mo | ZIP CODE: 63044

SITE NAME: Same | CONTACT NAME: Rick Gibson

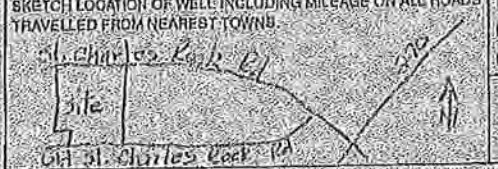
SITE ADDRESS: Same | CITY | STATE | ZIP CODE | VARIANCE NUMBER: 8760

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ EXTRACTION WELL ☐ MONITORING ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☐ INITIAL SITE ASSESSMENT ☐ WATER LEVEL DRAWDOWN ☒ LANDFILL ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ EXPLOSIVES ☐ SVOCS ☐ PETROLEUM PRODUCTS ONLY ☐ METALS ☐ V.O.C. ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWN.



LOCATION OF WELL: LAT. 38 43 50. LONG. 90 33 38. AREA | ELEV | COUNTY St. Louis

SMALLEST 1/4 LARGEST 1/4 1/4 SEC. 8 TWN. 45 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 2.9 mi West on St Charles Rock Rd, 0.1 mi on left

DRILLER NOTES: Matthew Ashworth Mail

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
15 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER		3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK

GLUED: ☐ YES ☒ NO

☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO

BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK

LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
94.5 FT.	7.5 FT.	N/A FT.

ANNULAR SEAL

☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE ☒ CEMENT/BENTONITE SLURRY

BAGS OF CEMENT USED 4

% OF BENTONITE USED 5

WATER USED/BAG 5.0 GAL.

LENGTH 4.5 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
10 FT.	4 IN.	8 IN.	13 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	31	Overburden, silty clay
31	37	Limestone, highly weathered, sandy silt
37	102	Limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 102

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	0125/WRM		7/14/25

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	0125/WRM	7-9-25	X N/A		

MO 780-1715 (1-02)

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
RETURN TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW 27 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Wells	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): T. Elders
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
HOLE LOCATION: PGW 27	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4" I.D. HSA; 8" Rotary Air
SURFACE ELEVATION: 484 ±	
OVERBURDEN THICKNESS: 35'	DRILLING START DATE: 9-14-05 / DRILLING END DATE: 9-19-05
DEPTH DRILLED INTO ROCK: 48'	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 83'	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Structural Fill	Bentonite Plug		← 2'		65' Screen - 4" Sch 80 #20 PVC
6'				← 7'		15' Solid - 4" Sch 80
10	Brown Silty Clay			← 12'		5 Bags of 50/D Envirotrug
15'						60 Bags of Backfill Material
20						
25	Gray Silty Clay					
30						
32'						
35'	Gray Shale				0800	
40						
45	Limestone Bedrock					
50						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Additional Perimeter LFG Collection Wells | HOLE NO.: PGW 27

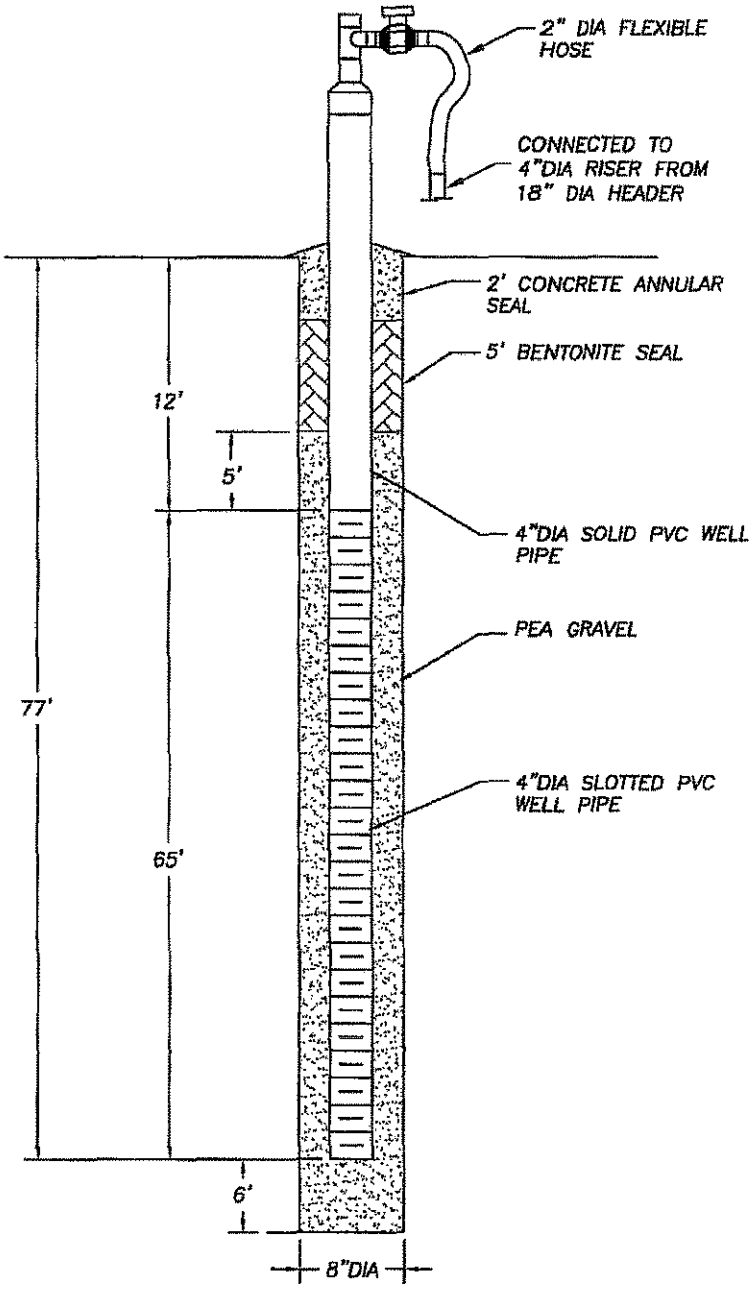
Aquaterra Drilling Log

HOLE NO. PGW 27 | SHEET 2 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Wells | INSPECTOR: Terry L. Mueller

EP'	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60						
65						
10	Limestone Bedrock					
5						
0						
5	83'		77' / 83'	83'	1000	

AQUATERRA | PROJECT NAME: Additional Perimeter LFG Collection Wells | HOLE NO. PGW 27



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-27 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-27_DETAIL.dwg	13

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 350604	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED PH 1 PH 2 PH 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME	WELL NUMBER	VARIANCE GRANTED BY THE D.N.R.
Bridgeton Landfill LLC	MW-37	☐ NO
OWNER ADDRESS: 13570 St. Charles Rock Rd	CITY: Bridgeton	STATE: MO ZIP CODE: 63044
SITE NAME: Same	CONTACT NAME: Rod Blaese	☒ YES, ATTACH A COPY OF THE VARIANCE
SITE ADDRESS: Same	CITY	STATE ZIP CODE VARIANCE NUMBER: 2480

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWN:

LOCATION OF WELL: LAT. 38 ° 45 ' 53 " LONG. 90 ° 26 ' 34 "

AREA ELEV. COUNTY St. Louis

SMALLEST 1/4 1/4 LARGEST 1/4 SEC. 2 TWN. 46 N RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 370 west on St. Charles Rock Rd, site on left

DRILLER NOTES: methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT	
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER	N/A

RISER PIPE DETAIL	LENGTH	DIAMETER	WEIGHT OR SCH.	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
	15 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER		3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED ☐ YES ☒ NO

SECONDARY FILTER PACK: ☒ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☒ YES ☐ NO ☐ BOTH ZONES IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK	LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
	6.5 FT.	7.5 FT.	N/A FT.

ANNULAR SEAL			
☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE	☒ CEMENT/BENTONITE SLURRY	BAGS OF CEMENT USED 4	LENGTH 4.5 FT.
		% OF BENTONITE USED 5	
		WATER USED/BAG 5.0 GAL	

WELL SCREEN	LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
	6.5 FT.	4 IN.	8 IN.	21 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	26	Silty clay
26	34	Sandy silt
34	36	shale
36	63	Limestone

TOTAL DEPTH: 63'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	pw126-WM		7-17-25

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	pw126-WM	7-17-25	X N/A		

MO 780-1416 (1-02)

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MO. DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-28 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Wells	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 684.10	NAME OF DRILLER(S): Bill Pinson
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
HOLE LOCATION: PGW-28	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¾" ID HSA; 8" Rotary Air
SURFACE ELEVATION: 484 ±	
OVERBURDEN THICKNESS: 38	DRILLING START DATE: 10-21-05 / DRILLING END DATE: 10-21-05
DEPTH DRILLED INTO ROCK: 40	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 78	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0					~~0800~~	
	1' Structural Fill			1		65' Screen 4" Sch 80 #20 PVC
5	Tan Clay					
	7'			6		15' Solid 4" Sch 80 PVC
	Dark Brown Clay	Bentonite Plug				
10	11'			12		
						5 Bags of 5016, Enviroplug
15	Brown Clay					
						51 Bags of Backfill Material
20	23'					
	Dark Brown Clay					
	32'				0900	
25	Sandy Silty Wet Gray Clay					
	38'				0930	
30						
	Limestone Bedrock					
35						
40						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Additional Perimeter LFG Collection Wells

HOLE NO.: PGW-28

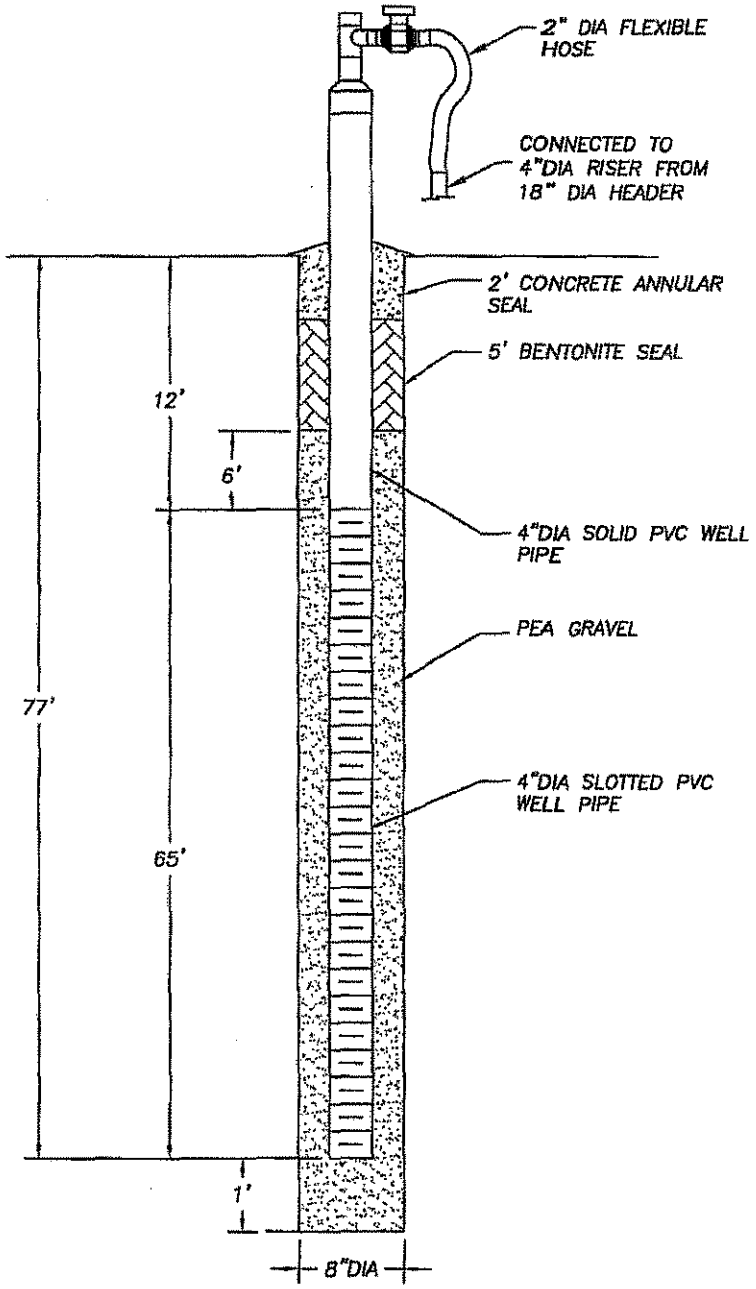
Aquaterra Drilling Log

HOLE NO. PGW-28 | SHEET 2 OF SHEETS 2

NAME: Additional Perimeter LFG Collection Wells

INSPECTOR: Terry L. Mueller

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	LIMESTONE BEDROCK					
	69'					
	SHALE					
	69'					
	LIMESTONE BEDROCK					
	78'			77 78	1015	



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-28 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale: No Scale	Date: 11/7/05	File Name: PGW-28_DETAIL.dwg	Drawing No. 14

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY REF. NO. 889611	DATE RECEIVED
O.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED PH 1 PH 2 PH 3	APPROVED BY / ROUTE / /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC		WELL NUMBER: PGW-3B			VARIANCE GRANTED BY THE D.N.R.
OWNER ADDRESS: 13570 St. Charles Rock Rd	CITY: Bridgeton	STATE: MO	ZIP CODE: 63044		☐ NO
SITE NAME: Same		CONTACT NAME: Brad Blouse			☒ YES, ATTACH A COPY OF THE VARIANCE
SITE ADDRESS: Same	CITY	STATE	ZIP CODE		VARIANCE NUMBER: 7780

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS: St. Charles Rock Rd; Site; 270; N; 13570 St. Charles Rock Rd

LOCATION OF WELL: LAT. 38° 45' 51" LONG. 90° 26' 38" AREA ELEV. COUNTY St. Louis

SMALLEST 1/4 1/4 LARGEST 1/4 SEC. ?? TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 270, west on St. Charles Rock Rd

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION: ☐ ABOVE GROUND N/A ☐ FLUSH MOUNT; LENGTH OF PROTECTIVE CASING FT.; DIAMETER OF PROTECTIVE CASING IN.; DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED IN. FT.; PROTECTIVE CASING MATERIAL: ☐ STEEL ☐ ALUMINUM ☒ PLASTIC; LOCKING CAP? ☐ YES ☒ NO

WEEP HOLE? ☐ YES ☐ NO; VENTED CAP? ☐ YES ☐ NO; LENGTH OF FLUSH MOUNT FT.; DIAMETER OF FLUSH MOUNT IN.; DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED IN. FT.; SURFACE COMPLETION GROUT: ☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL: LENGTH 15 FT.; DIAMETER 4 IN.; WEIGHT OR SDR# 80; DIAMETER OF DRILL HOLE 8" FT.; MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER; GLUED ☐ YES ☒ NO

BENTONITE SEAL: LENGTH OF SEAL 3 FT.; MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO; BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK: LENGTH 60 FT.; DEPTH TO TOP OF PRIMARY FILTER PACK 7 FT.; SECONDARY FILTER PACK LENGTH N/A FT.

ANNULAR SEAL: ☐ BENTONITE SLURRY ☒ CEMENT/BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE; BAGS OF CEMENT USED 4; % OF BENTONITE USED 5; WATER USED/BAG 8.0 GAL.; LENGTH 4 FT.

WELL SCREEN: LENGTH 65 FT.; DIAMETER 4 IN.; DIAMETER OF DRILL HOLE 8" IN.; DEPTH TO TOP OF SCREEN 10 FT.; MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	38	overburden
38	42	Limestone
42	64	Limestone some thin shale
64	68	Shale
68	78	Limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 78'

SIGNATURE (PRIMARY CONTRACTOR) [signature]; PERMIT NUMBER 001281 WPM; STATIC WATER LEVEL FEET FROM MEASURING POINT; DATE WELL DRILLING WAS COMPLETED 10-21-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER) X [signature]; PERMIT NUMBER 001281 WPM; DATE 11-9-05; SIGNATURE (PUMP INSTALLER) X n/a; PERMIT NUMBER; DATE

MO 780-1415 (1-02)

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

...TION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
... DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
...RING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-29 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Wells	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Eubens
LOCATION: Braddock Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Sprague T660
HOLE LOCATION: PGW-29	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" ID HSA; 8" Rotary Air
SURFACE ELEVATION: 484 ±	
OVERBURDEN THICKNESS: 40	DRILLING START DATE: 9-28-05
DRILLING END DATE: 9-28-05	
DEPTH DRILLED INTO ROCK: 42	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 82	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	STRUCTURAL FILL	BENTONITE PLUG		1050		
	7' BROWN CLAY			2'		
10	10'			7'		65' SCREEN - 4" SCH 80 @ 20 PVC
				12'		
15	LT. GRAY SILTY CLAY					15' SOLID - 4" SCH 80
20						5 BAGS OF 50 lb. ENVIROPLUG
25						54 BAGS OF BACKFILL MATERIAL
30	35'					
	GRAY SILTY CLAY					
35	37'					
	SILTY SEWAY WET GRAY CLAY					
40	39'					
	SHALE LIMESTONE					
45	46'			1125		
	LIMESTONE BEDROCK					
50						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Additional Perimeter LFG Collection Wells | HOLE NO.: PGW-29

Aquaterra Drilling Log

HOLE NO. PGW-29 | SHEET 2 OF SHEETS 2

PROJECT NAME: Additional Perimeter LFG Collection Wells

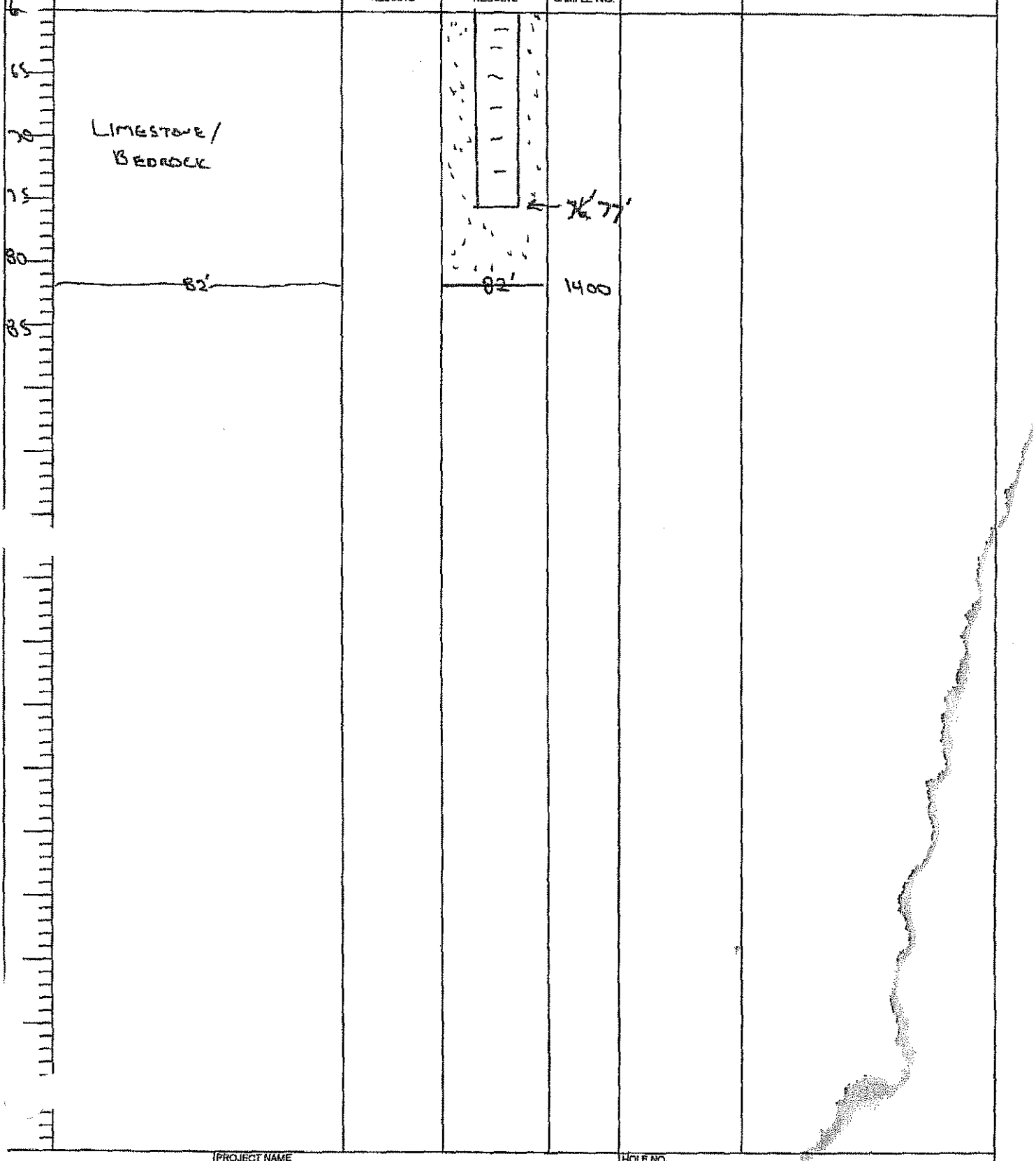
INSPECTOR: Terry L. Mower

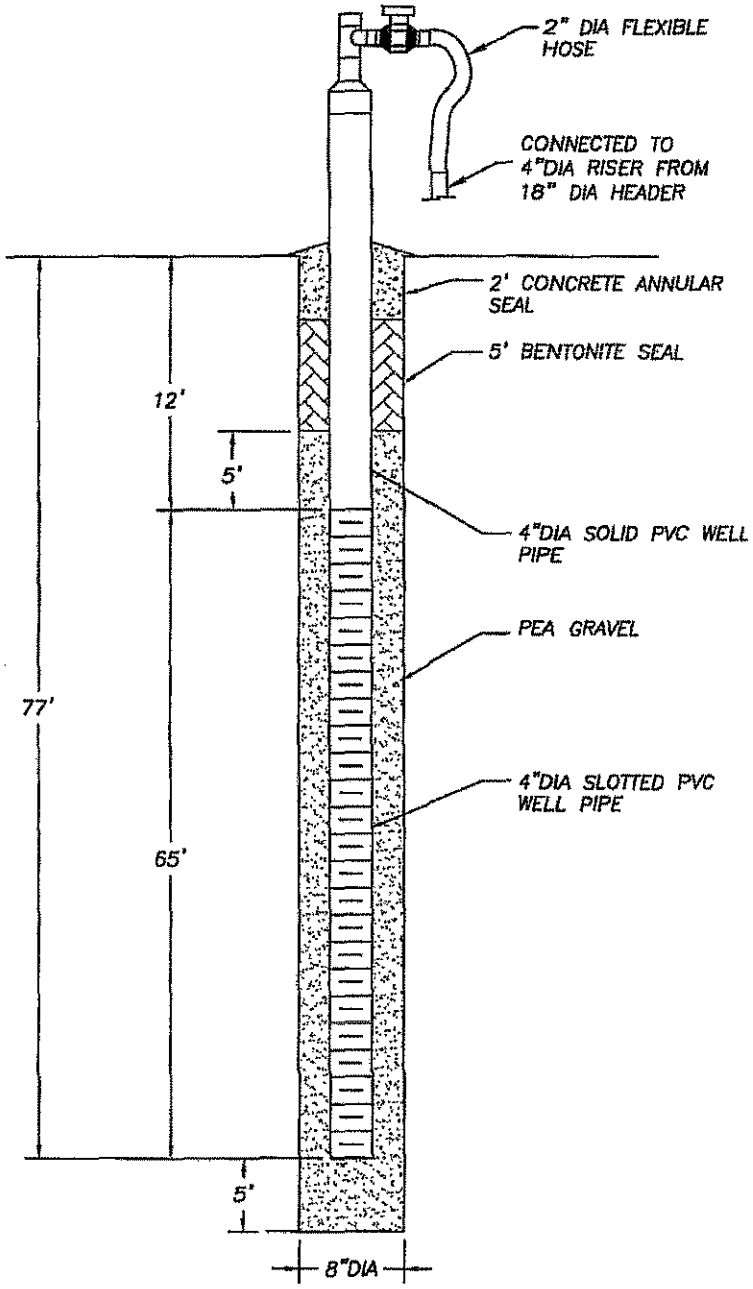
DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
Limestone / Bedrock			1400		

77'

82'

82'





NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-29 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-29_DETAIL.dwg	15

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359608	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill, LLC
WELL NUMBER: RSW-29
OWNER ADDRESS: 13570 St Charles Rock Rd
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Same
CONTACT NAME: Rod Bruce
SITE ADDRESS: Same
CITY:
STATE:
ZIP CODE:
VARIANCE GRANTED BY THE D.N.R: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE
VARIANCE NUMBER: 07-23

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☐ INITIAL SITE ASSESSMENT ☐ WATER LEVEL DRAWDOWN ☒ LANDFILL ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ EXPLOSIVES ☐ SVOCS ☒ PETROLEUM PRODUCTS ONLY ☐ METALS ☐ V.O.C ☒ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.
St Charles Rock Rd
Site
Old St Charles Rock Rd
500'

LOCATION OF WELL
LAT. 38 : 45 : 51.
LONG 70 : 26 : 27.
AREA
ELEV
COUNTY St Louis
SMALLEST 1/4 LARGEST 1/4 1/4
SEC. 5 TWN. 46 N RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE
370' west on St Charles Rock Rd. site on left

DRILLER NOTES:
methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☐ STEEL ☒ ALUMINUM ☐ PLASTIC	☒ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☐ YES ☐ NO	☒ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
15 FT.	4 IN.	SDR	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER		3 FT.	☐ SLURRY ☐ PELLETS ☒ GRANULAR ☒ CHIPS

GLUED: ☐ YES ☒ NO

SECONDARY FILTER PACK
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK	LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
	69 FT.	7 FT.	N/A FT.

ANNULAR SEAL
☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE ☒ CEMENT/BENTONITE SLURRY
BAGS OF CEMENT USED 4
% OF BENTONITE USED 5
WATER USED/BAG 2.2 GAL
LENGTH 4 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
65 FT.	4 IN.	8 IN.	11 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	40	silty clay
40	46	shale
46	83	limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 83'

SIGNATURE (PRIMARY CONTRACTOR) X
PERMIT NUMBER 000351 WRM
STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED 7-29-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER) X
PERMIT NUMBER 000351 WRM
DATE 11-9-05
SIGNATURE (PUMP INSTALLER) X N/A
PERMIT NUMBER
DATE

MO 780-1415 (1-02)

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

TION: WHITE/DIVISION; CANARY/CONTRACTOR; PINK/OWNER
DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-30 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Wells	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 1084.10	NAME OF DRILLER(S): Tim Elders
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
HOLE LOCATION: PGW-30	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¾" I.D. HSA; 8" Rotary Air
SURFACE ELEVATION: 484 ±	
OVERBURDEN THICKNESS: 41'	DRILLING START DATE: 9-26-05 / DRILLING END DATE: 9-27-05
DEPTH DRILLED INTO ROCK: 62'	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 103'	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0					0930	
5	STRUCTURAL FILL	BENTONITE PLUG		← 2'		30' SCREEN - 4" SCH 80 #20 PVC
10	10' WET TAN CLAY			← 7'		15' SOLID - 4" SCH 80
15	15' WET LT. GRAY CLAY 16'			← 12'		5 BAGS OF 50 lb. ENVIROPLUG.
20	BROWN CLAY					? BAGS OF BACKFILL MATERIAL (POURED LOOSE FROM STOCKPILE) 3½ CU. YDS.
25						
30	30'					
35	WET LT. GRAY CLAY					
40	40'					
45	41' WET SILTY/SANDY DK. GRAY CLAY					
50	GRAY SHALE					
55						
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Additional Perimeter Collection Wells

HOLE NO.: PGW-30

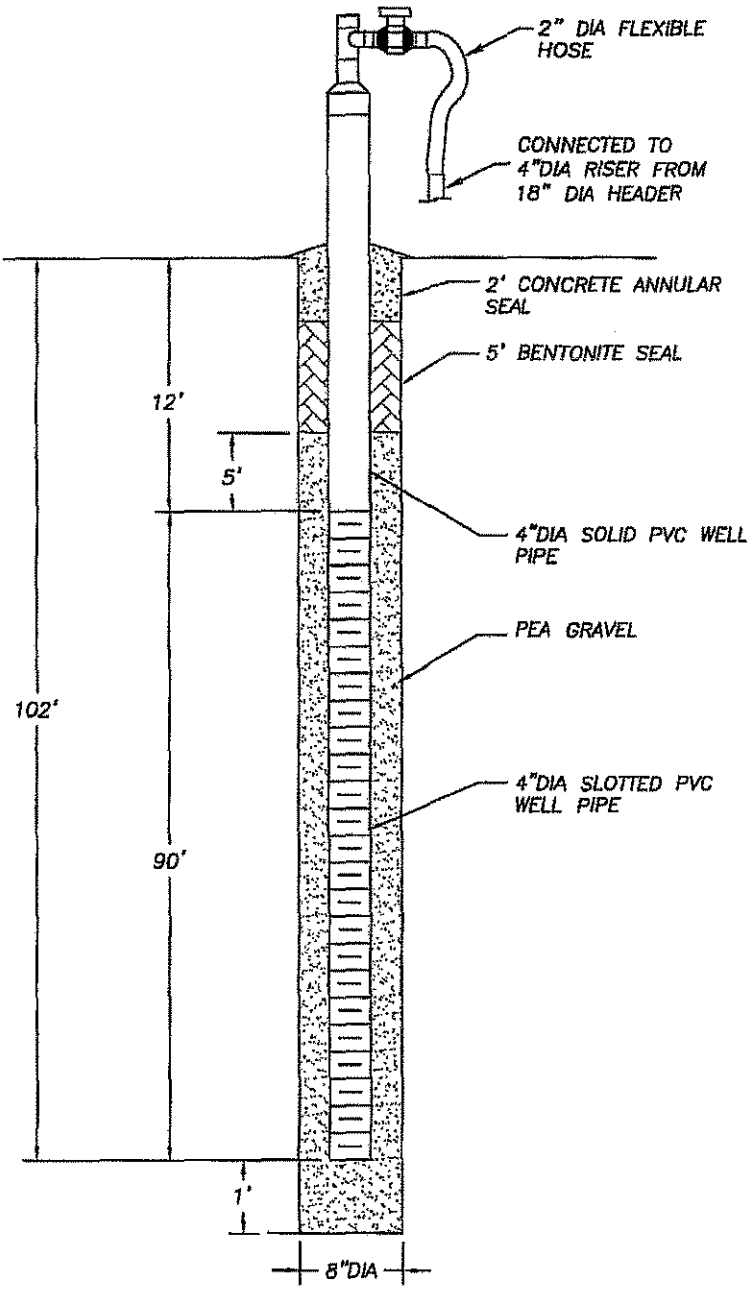
Aquaterra Drilling Log

HOLE NO. PGW-30 | SHEET 2 OF SHEETS 2

T NAME: ADDITIONAL PERIMETER LFG COLLECTION WELLS | INSPECTOR: TERRY L. MUELLER

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60						
65	GRAY SHALE					
70						
75						
80	81'				1030	
	LIMESTONE					
85	85'					
90	LIMESTONE/ GRAY SHEY					
95	103			102' 103	1420	
100						

AQUATERRA | PROJECT NAME: ADDITIONAL PERIMETER LFG COLLECTION WELLS | HOLE NO. PGW-30



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-30 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-30_DETAIL.dwg	16

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359607	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE 1 1

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC		WELL NUMBER: MW 30		VARIANCE GRANTED BY THE D.N.R. ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 13570 St. Charles Rock Rd.	CITY: Bridgeton	STATE: MO	ZIP CODE: 63044	
SITE NAME: Same	CONTACT NAME: Rod Bloese			VARIANCE NUMBER: 2900
SITE ADDRESS: Same	CITY	STATE	ZIP CODE	

PROPOSED USE OF WELL	TYPE OF POTENTIAL SITE	MONITORING FOR: (CHECK ALL THAT APPLY)
☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS	☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN	☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL: LAT. 38 ° 45 ' 51 " LONG. 90 ° 26 ' 27 " — AREA — ELEV — COUNTY: St. Louis

SMALLEST ___ 1/4 ___ 1/4 LARGEST ___ 1/4 SEC. 6 TWN. 46 N. RNG. 5 ☐E OR W.

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 270, west on St. Charles Rock Rd., site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND n/a ☐ FLUSH MOUNT	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER n/a

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL: LENGTH OF SEAL	MATERIAL
15 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER	3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED: ☐ YES ☒ NO

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE - HYDRATED ☐ YES ☐ NO; BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO n/a

PRIMARY FILTER PACK: LENGTH 93 FT. — DEPTH TO TOP OF PRIMARY FILTER PACK 7 FT. — SECONDARY FILTER PACK LENGTH n/a FT.

ANNULAR SEAL: ☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE ☒ CEMENT/BENTONITE SLURRY — BAGS OF CEMENT USED 1 — % OF BENTONITE USED 5 — WATER USED/BAG 20 GAL. — LENGTH 4 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
90 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	TO	FORMATION DESCRIPTION
0	31	Silty clay
31	40	Sandy silty clay
40	81	Shale
81	85	Limestone
85	103	Shaley limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED.

TOTAL DEPTH: 103'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL	DATE WELL DRILLING WAS COMPLETED
[signature]	001257 MWM	FEET FROM MEASURING POINT	8/29/05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X [signature]	001257MWM	11-9-05	X n/a		

MO 780-1416 (1-02) DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL ORIGINAL COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $75.00 MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
CERTIFICATION FEE

Aquaterra Drilling Log

HOLE NO. PGW-31 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter Gas wells	DRILLING SUBCONTRACTOR: Layne - western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): T. Elders
LOCATION: Bordertown Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T 660
HOLE LOCATION: PGW-31	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" ID HSA; 9" Rotary Air
SURFACE ELEVATION: ± 481'	
OVERBURDEN THICKNESS: 85'	DRILLING START DATE: 9-23-05
DRILLING END DATE: 9-23-05	
DEPTH DRILLED INTO ROCK: 17'	DEPTH GROUNDWATER ENCOUNTERED: 30'
TOTAL DEPTH OF HOLE: 102'	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—		—	—	

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Structural fill	Benzene		3'	7 45	TD Borehole 102'
5				8'		Limestone Bedrock encountered at 85'
10	9' Brown silty Clay					90 foot Screen
15						10 foot Solid
20					9 00	
25	30' Tan silty clay				8 15	
30	34' Dark Gray Shale Clay mix					
35						
40						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

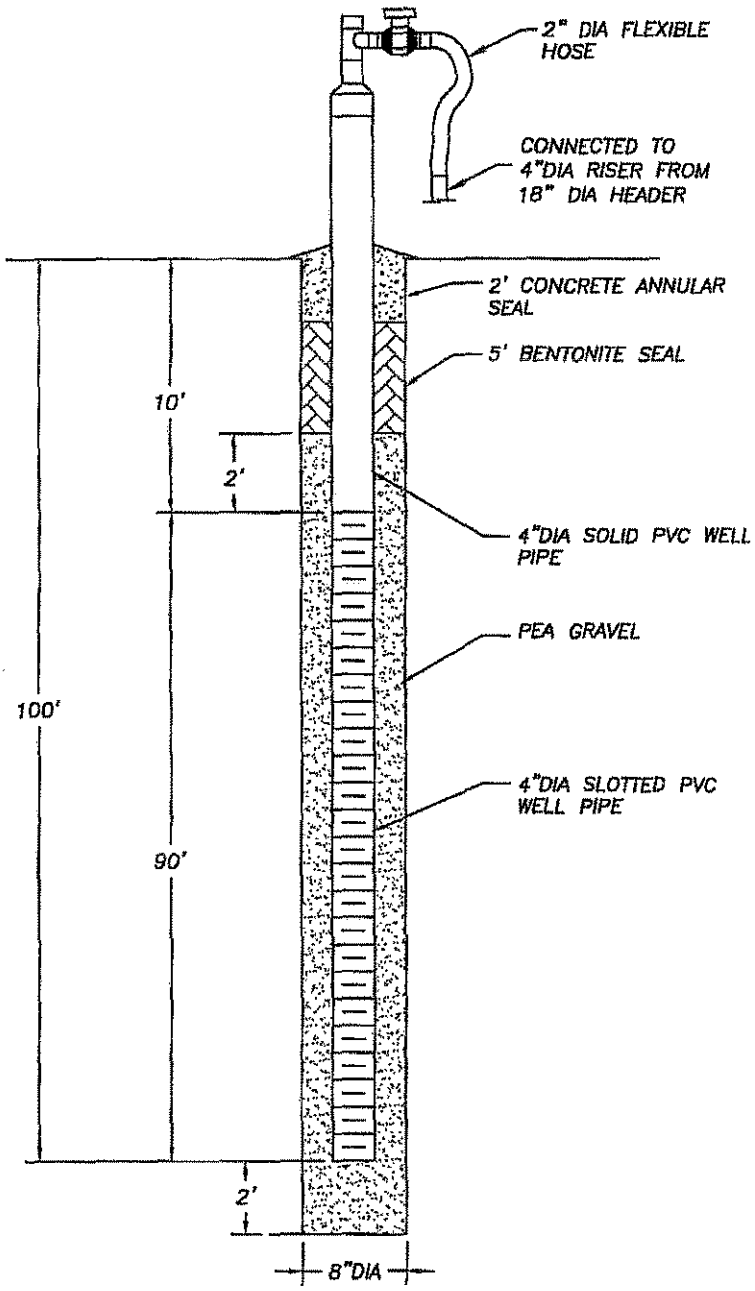
PROJECT NAME | HOLE NO.

Aquaterra Drilling Log

HOLE NO. PGw-31 | SHEET 2 OF 2 SHEETS

PROJECT NAME: Additional Perimeter Gas wells | INSPECTOR: J. Jordan

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	Dark Gray Shale					
64'	Light Gray Shale Limestone mix				945	
85'	Limestone Bed Rock				9 15	
102' TD					10 00	



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-31 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-31_DETAIL.dwg	17

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 355806	
D.N.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC
WELL NUMBER: RSW-31
VARIANCE GRANTED BY THE D.N.R.: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 13570 St. Charles Rock Rd
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
CONTACT NAME: Rod Nunn
SITE NAME: Same
CITY:
STATE:
ZIP CODE:
VARIANCE NUMBER: 4280
SITE ADDRESS: Same

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ U.I.S.T. ☐ WATER LEVEL DRAWDOWN
MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL: LAT. 38 46 32 · LONG. 90 46 36
AREA:
ELEV.
COUNTY: St. Louis
SMALLEST 1/4 1/4 1/4 LARGEST
SEC. 2 TWN. 46 N. RNG. 5 E OR W.

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 110 West on St. Charles Rock Rd, site on left
DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION: ☐ ABOVE GROUND ☐ FLUSH MOUNT N/A
LENGTH OF PROTECTIVE CASING: FT.
DIAMETER OF PROTECTIVE CASING: IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: IN. FT.
PROTECTIVE CASING MATERIAL: ☐ STEEL ☐ ALUMINUM ☐ PLASTIC
LOCKING CAP? ☐ YES ☐ NO

WEEP HOLE? ☐ YES ☐ NO
VENTED CAP? ☐ YES ☐ NO
LENGTH OF FLUSH MOUNT: FT.
DIAMETER OF FLUSH MOUNT: IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: IN. FT.
SURFACE COMPLETION GROUT: ☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL
LENGTH: 15 FT. DIAMETER: 4 IN. WEIGHT OR SDR#: 80 DIAMETER OF DRILL HOLE: 8" FT.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER
GLUED: ☐ YES ☒ NO

BENTONITE SEAL
LENGTH OF SEAL: 3 FT.
MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☒ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK
LENGTH: 93 FT.
DEPTH TO TOP OF PRIMARY FILTER PACK: 8 FT.
SECONDARY FILTER PACK LENGTH: N/A FT.

ANNULAR SEAL
☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE
☒ CEMENT/BENTONITE SLURRY
BAGS OF CEMENT USED: 5
% OF BENTONITE USED: 5
WATER USED/BAG: 6.2 GAL
LENGTH: 5 FT.

WELL SCREEN
LENGTH: 92 FT. DIAMETER: 4 IN. DIAMETER OF DRILL HOLE: 8 IN. DEPTH TO TOP OF SCREEN: 10 FT.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	20	Silty clay
20	31	Silty clay wet
31	39.5	Silty sandy clay
39.5	41	Shale
41	44	Limestone
44	69	Shale
69	85	Shaley limestone
85	122	Limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 122

SIGNATURE (PRIMARY CONTRACTOR):
PERMIT NUMBER: 00[illegible]
STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED: 9-23-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER): X
PERMIT NUMBER: 00[illegible]
DATE: 11-1-05
SIGNATURE (PUMP INSTALLER): X
PERMIT NUMBER:
DATE:

MO 780-1415 (1-02)

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

[illegible]TION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
[illegible]NG WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-32 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Wells	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Evans
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
HOLE LOCATION: PGW-32	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4" ID HSA; 8" Rotary Air
SURFACE ELEVATION: 484 ±	
OVERBURDEN THICKNESS: 33	DRILLING START DATE: 9-29-05 / DRILLING END DATE: 9-29-05
DEPTH DRILLED INTO ROCK: 48	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 81	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0					1030	
	Brown Clay	Bentonite Plug		2'		65' Screen - 4" Sch 80 #20 PVC
9'				7'		
10	Tan Clay			10'		15' Solid - 4" Sch 80 PVC
16'						
20	Wet Silty Tan Clay					5 Bags of 50 lb. Enviroplug
22'						52 Bags of Backfill Material
25	Silty Sand Grey Clay					
31'						
Weathered 33'	Limestone				1130	
35						
40						
45	Limestone Bedrock					
50						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Additional Perimeter LFG Collection Wells | HOLE NO.: PGW-32

Aquaterra Drilling Log

HOLE NO. PGW-32 | SHEET 2 OF SHEETS 2

NAME: ADDITIONAL PERIMETER LFG COLLECTION WELLS

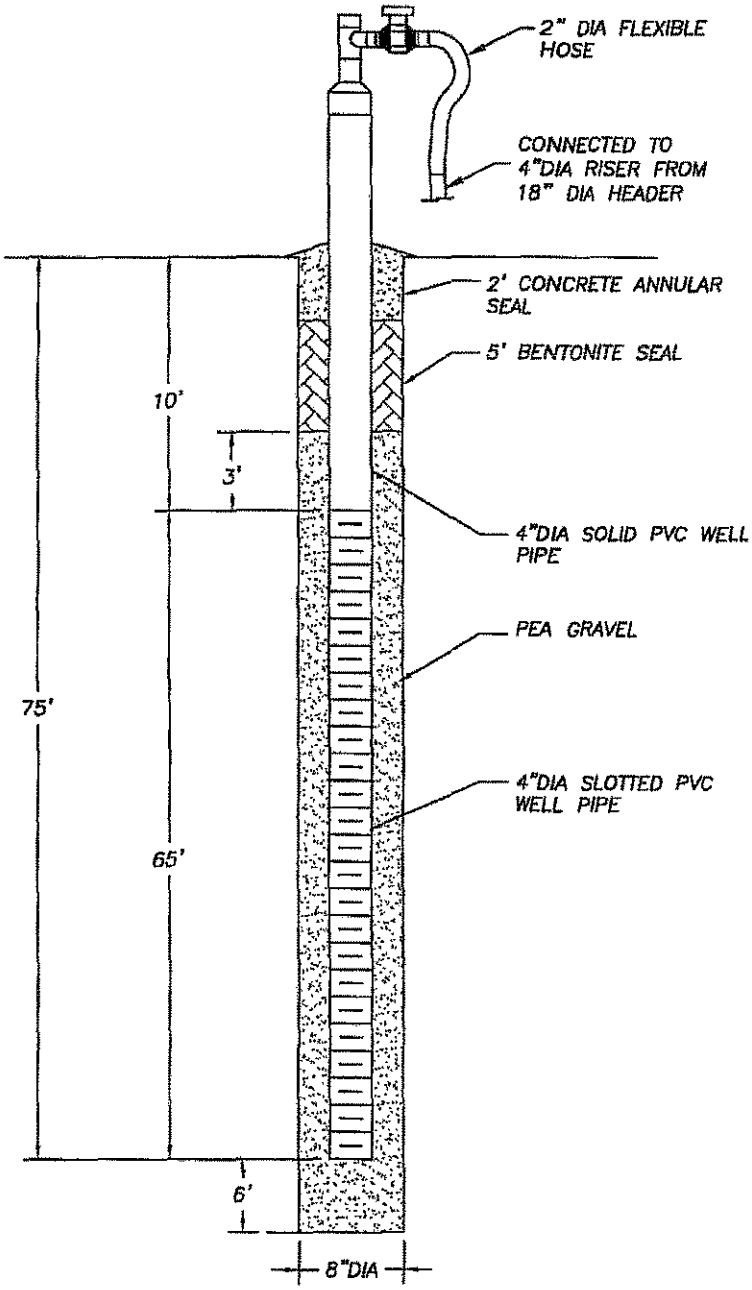
INSPECTOR: TERRY L. MUELLER

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60						
65						
70	LIMESTONE BEDROCK					
75				← 75'		
80	81'			← 81'	1300	
85						

QUATERRA

PROJECT NAME: ADDITIONAL PERIMETER LFG COLLECTION WELLS

HOLE NO. PGW-32



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-32 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-32_DETAIL.dwg	18

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359633	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC	WELL NUMBER: PZW-38			VARIANCE GRANTED BY THE D.N.R. ☐ NO
OWNER ADDRESS: 10549 St. Charles Rock Road	CITY: Bridgeton	STATE: Mo	ZIP CODE: 63044	☒ YES, ATTACH A COPY OF THE VARIANCE
SITE NAME: same	CONTACT NAME: Leah Bayless			
SITE ADDRESS: same	CITY	STATE	ZIP CODE	VARIANCE NUMBER: 3750

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☒ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN

MONITORING FOR (CHECK ALL THAT APPLY): ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ BVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS:

LOCATION OF WELL: LAT. 38 : 45 : 34 ; LONG. 90 : 26 : 37 ; AREA ; ELEV. ; COUNTY: St. Louis

SMALLEST 1/4 LARGEST 1/4 1/4 SEC. 0 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE able TO VISIT THE WELL SITE: 2.6 mi west on St. Charles Rock Rd, site on left

DRILLER NOTES: methane extraction well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT	
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A	

RISER PIPE DETAIL	LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
	15 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER		3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED ☐ YES ☒ NO

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO; BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK	LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
	6.1 FT.	6 FT.	N/A FT.

ANNULAR SEAL		LENGTH
☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE	☐ CEMENT/BENTONITE SLURRY; BAGS OF CEMENT USED 3; % OF BENTONITE USED 5; WATER USED/BAG 1.5 GAL.	3 FT.

WELL SCREEN	LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
	6.5 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0'	31'	overburden
31'	35'	limestone, weathered
35'	47'	shale
47'	63'	limestone - shaley
63'	81'	Limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS, INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED.

TOTAL DEPTH: 81'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	2013120111		9-30-15

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	2010120111	11-15	X N/A		

MO 780-1415 (1-02) ...TION: WHITE/DIVISION; CANARY/CONTRACTOR; PINK/OWNER
...DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
...RING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

Aquaterra Drilling Log

HOLE NO. PGW - 33 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Well	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Elders
LOCATION: Bridgeton LF LLC - Bridgeton MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈ 481	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/2" HSA; 8" air rotary
OVERBURDEN THICKNESS: 34	
BEDROCK FOOTAGE:	DRILLING START DATE: 10-3-05
DRILLING END DATE: 10-6-05	
DEPTH GROUNDWATER ENCOUNTERED: ≈ 14	TOTAL NUMBER OF CORE BOXES: 0
TOTAL NUMBER OF SAMPLES: 0	
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0	Structural fill: Brown silty CLAY, trace debris	CL	1' →				Logged from cuttings
10			8' →				Set 65 feet of 4-inch id SCH 80 0.20 slot screen + 15 feet of 4-inch id SCH 80 PVC risers
15	Tan, SILT with clay	ML-CL			11'		Filled annular space with pea gravel to 8 ft.
20	Greyish brown SILT						6 bags of soft bentonite to 1 ft.
25		ML					
30	Gray SILT, with v. fine sand						
34							
35	shale gray	SH					
44	Shaley LIMESTONE, with shale seams and layers	LMS					
66	Fractured LIMESTONE (U)						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Additional Perimeter LFG Collection

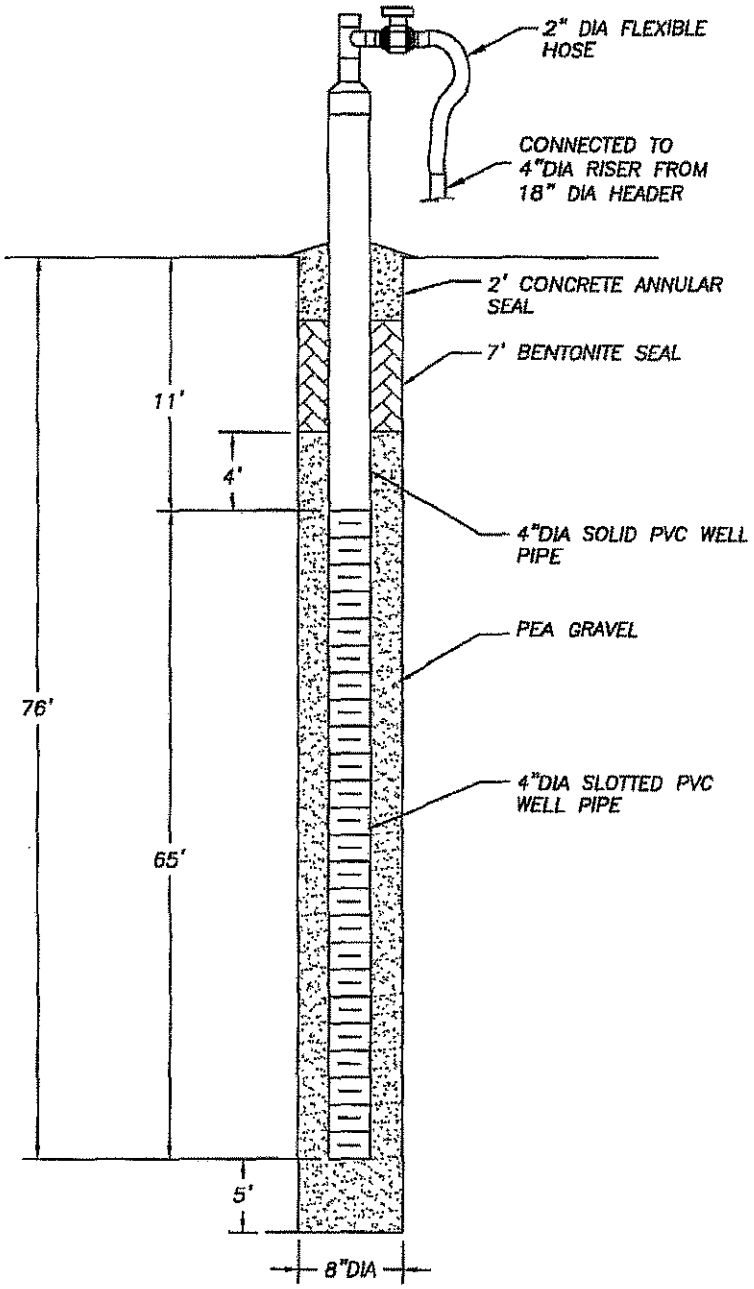
HOLE NO.: PGW-33

Aquaterra Drilling Log

HOLE NO. PGW-33 | SHEET 2 OF 2 SHEETS

PROJECT NAME Bridgeton LF Perimeter LFG Wells | INSPECTOR A. L

DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
Clay seams					Fractures noted by driller
75					
			76'		
Light gray LMS					
80					
Boring Terminated @ 81 ft					
85					



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-33 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-33_DETAIL.dwg	19

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 360014	DATE RECEIVED
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Pg 1 Pg 2 Pg 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC		WELL NUMBER: RSW-33		VARIANCE GRANTED BY THE D.N.R. ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 13570 St. Charles Rock Rd	CITY: Bridgeton	STATE: Mo	ZIP CODE: 63044	
SITE NAME: Same		CONTACT NAME: Rod Bloese		
SITE ADDRESS: Same	CITY	STATE	ZIP CODE	VARIANCE NUMBER: 2780

PROPOSED USE OF WELL	TYPE OF POTENTIAL SITE	MONITORING FOR: (CHECK ALL THAT APPLY)
☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS	☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN	☐ RADIONUCLIDES ☐ EXPLOSIVES ☐ SVOCS ☐ PETROLEUM PRODUCTS ONLY ☐ METALS ☐ V.O.C. ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.

LOCATION OF WELL
LAT. 38 45 34
LONG. 90 26 28
AREA | ELEV
COUNTY: St. Louis
SMALLEST ___ 1/4 ___ 1/4 LARGEST ___ 1/4
SEC. 0 TWN. 46 N RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 270, west on St. Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	☐ ABOVE GROUND N/A ☐ FLUSH MOUNT	LENGTH OF PROTECTIVE CASING: FT.	DIAMETER OF PROTECTIVE CASING: IN.	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: IN. FT.	PROTECTIVE CASING MATERIAL: ☐ STEEL ☐ ALUMINUM ☐ PLASTIC	LOCKING CAP? ☐ YES ☐ NO

WEEP HOLE? ☐ YES ☐ NO	VENTED CAP? ☐ YES ☐ NO	LENGTH OF FLUSH MOUNT: FT.	DIAMETER OF FLUSH MOUNT: IN.	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: IN. FT.	SURFACE COMPLETION GROUT: ☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL
15 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

GLUED: ☐ YES ☒ NO

BENTONITE SEAL — LENGTH OF SEAL: 3 FT. — MATERIAL: ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO; BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK: LENGTH 68 FT. | DEPTH TO TOP OF PRIMARY FILTER PACK 8 FT. | SECONDARY FILTER PACK LENGTH N/A FT.

ANNULAR SEAL: ☐ BENTONITE SLURRY ☒ CEMENT/BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE; BAGS OF CEMENT USED 5; % OF BENTONITE USED 5; WATER USED/BAG 8.5 GAL; LENGTH 5 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
15 FT.	4 IN.	8 IN.	11 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	34	overburden
34	40	Shale
40	66	Limestone - shaley
66	77	Limestone - fractured
77	81	Limestone w/ shale

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED.

TOTAL DEPTH: 81

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL	DATE WELL DRILLING WAS COMPLETED
[signature]	001351 MPM	FEET FROM MEASURING POINT	10-28-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X [signature]	001351 MPM	11-9-05	X N/A		

MO 780-1415 (1-02)

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

...IBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
...TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
...ITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW - 34 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Additional Perimeter LFG Wells	DRILLING SUBCONTRACTOR: LAYNE WESTERN
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Tim Elders
LOCATION: Bridgeton LF, LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: SCHRAMM T660
SURFACE ELEVATION: ≈ 481	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4" HSA; 8" air rotary
OVERBURDEN THICKNESS: ≈ 42	
BEDROCK FOOTAGE: 41	DRILLING START DATE: 10-7-2005
DRILLING END DATE:	
DEPTH GROUNDWATER ENCOUNTERED: ≈ 16	TOTAL NUMBER OF CORE BOXES: 0
TOTAL NUMBER OF SAMPLES: 0	
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
5	Structural fill: brown silty CLAY, some bricks	CL					Logged from cuttings
10	10						borehole collapsed to 55 ft after pulling rods
	Brown clayey SILT	CL-ML					
15	18						
	Brown SILT						
25							
30	30	ML					
	Brownish gray SILT with sand						
35	33 - Rubble layer noted by driller						
40	42						
	Light gray LIMESTONE	LMS					
45	50						
	void, olive gray cuttings, water filled void						
50	57						
	Tan LIMESTONE with olive gray clay lenses	LMS					
55	65						
	Light gray LIMESTONE interlayered black SHALE						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC. KANSAS CITY/JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Bridgeton LFG Wells

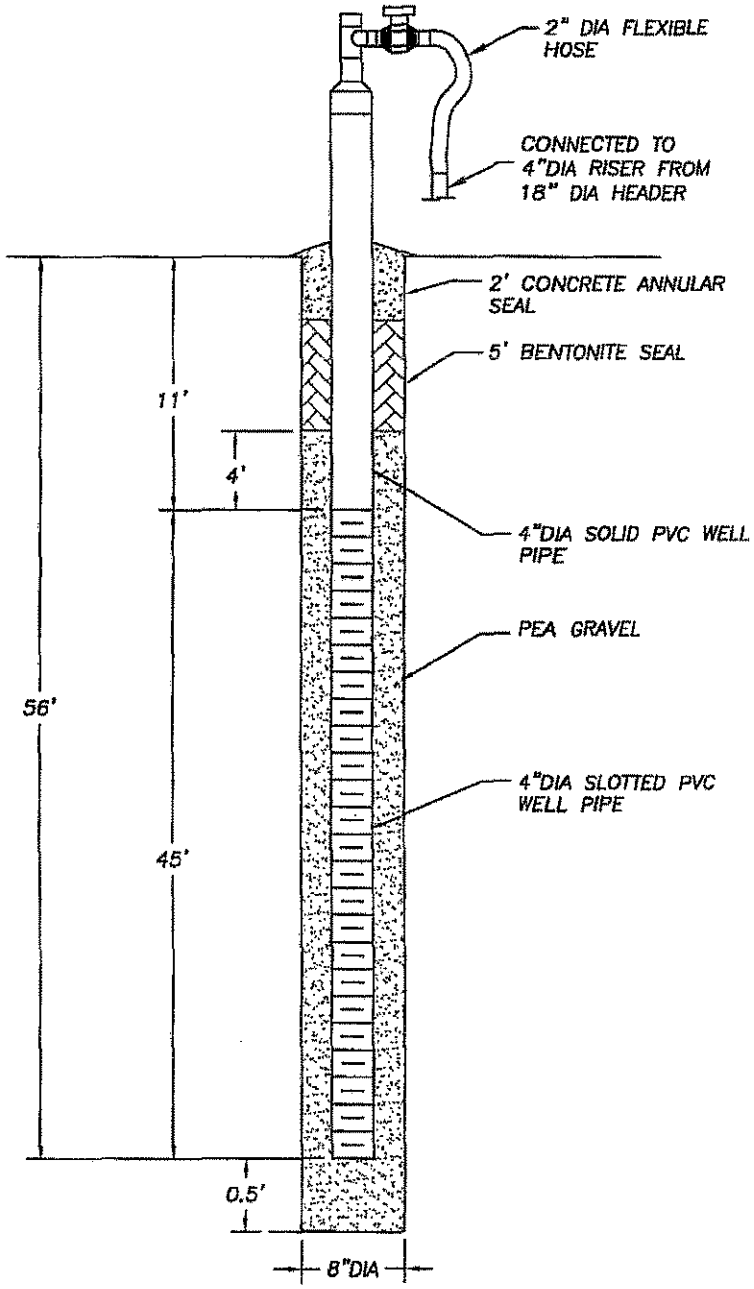
HOLE NO.: PGW-34

Aquaterra Drilling Log

HOLE NO. PGW-34 | SHEET OF SHEETS 2 2

PROJECT NAME: Additional Perimeter LFG Wells | INSPECTOR: AJL

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
75	Light gray LIMESTONE with black SHALE layers					
80						
85	Boring Terminated @ 83 feet					



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-34 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-34_DETAIL.dwg	20

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 85610	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC
WELL NUMBER: RMW-34
VARIANCE GRANTED BY THE D.N.R: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 13570 St. Charles Rock Rd
CITY: Bridgeton
STATE: Mo
ZIP CODE: 63044
CONTACT NAME: Earl Blevins
SITE NAME: Same
CITY:
STATE:
ZIP CODE:
VARIANCE NUMBER: N/A
SITE ADDRESS: Same

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☒ PIEZOMETERS
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☐ INITIAL SITE ASSESSMENT ☐ WATER LEVEL DRAWDOWN ☒ LANDFILL ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ EXPLOSIVES ☒ VOCS ☐ PETROLEUM PRODUCTS ONLY ☐ METALS ☒ V.O.C. ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS:
St. Charles Rock Rd
Site
Rt St Charles Rock Rd
50'
N

LOCATION OF WELL: LAT. 38 45 0255 LONG. 90 36 28
AREA:
ELEV:
COUNTY: St. Louis
SMALLEST: 1/4 1/4 1/4
LARGEST: 1/4 1/4 1/4
SEC. 2 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE able TO VISIT THE WELL SITE:
3/2 west on St Charles Rock Rd, site on left
DRILLER NOTES: methane collection well

TYPE OF SURFACE COMPLETION: ☐ ABOVE GROUND ☐ FLUSH MOUNT n/a
LENGTH OF PROTECTIVE CASING: FT.
DIAMETER OF PROTECTIVE CASING: IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: IN. FT.
PROTECTIVE CASING MATERIAL: ☐ STEEL ☐ ALUMINUM ☐ PLASTIC
LOCKING CAP? ☐ YES ☐ NO

WEEP HOLE? ☐ YES ☐ NO
VENTED CAP? ☐ YES ☐ NO
LENGTH OF FLUSH MOUNT: FT.
DIAMETER OF FLUSH MOUNT: IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: IN. FT.
SURFACE COMPLETION GROUT: ☐ CONCRETE ☐ OTHER n/a

RISER PIPE DETAIL: LENGTH 15 FT. DIAMETER 4 IN. WEIGHT OR SDR# 80 DIAMETER OF DRILL HOLE 8" FT. MATERIAL ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER
BENTONITE SEAL: LENGTH OF SEAL 3 FT. MATERIAL ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED: ☐ YES ☒ NO
SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE ☐ BOTH ZONES HYDRATED ☐ YES ☐ NO IF YES, HYDRATED ☐ YES ☐ NO n/a
PRIMARY FILTER PACK: LENGTH 17 FT. DEPTH TO TOP OF PRIMARY FILTER PACK 7 FT. SECONDARY FILTER PACK LENGTH n/a FT.

ANNULAR SEAL: ☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE ☒ CEMENT/BENTONITE SLURRY
BAGS OF CEMENT USED 3
% OF BENTONITE USED 6
WATER USED/BAG 30 GAL.
LENGTH 4 FT.

WELL SCREEN: LENGTH 45 FT. DIAMETER 4 IN. DIAMETER OF DRILL HOLE 8" IN. DEPTH TO TOP OF SCREEN 10 FT.
MATERIAL ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	32	Overburden
32	43	shale
43	50	limestone w/ trace shale
50	57	Void water
57	60	limestone w/ interbedded shale

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED.
TOTAL DEPTH: 60'

SIGNATURE (PRIMARY CONTRACTOR): T. Downs
PERMIT NUMBER: 2012051 WMR
STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED: 12-29-16

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES' REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER): X T. Downs
PERMIT NUMBER: 2012051 WMR
DATE: 12-29-16
SIGNATURE (PUMP INSTALLER): X n/a
PERMIT NUMBER:
DATE:

MO 780-1818 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

Aquaterra Drilling Log

HOLE NO. PGW-35 | SHEET 1 OF SHEETS

PROJECT NAME: Bridgeton LF Additional Perimeter LFG
PROJECT NUMBER: 1684.10
LOCATION: Bridgeton LF, LLC - Bridgeton, MO
SURFACE ELEVATION: ≈ 480
OVERBURDEN THICKNESS: ≈ 35
BEDROCK FOOTAGE: 28
DEPTH GROUNDWATER ENCOUNTERED: ≈ 18
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

DRILLING SUBCONTRACTOR: LAYNE WESTERN
NAME OF DRILLER(S): Bill Pinson
MANUFACTURER'S DESIGNATION OF DRILL: SCHRAMM T660
SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4" i.d. HSA; 5" ~~bit~~ air rotary
DRILLING START DATE: 10-11-05
DRILLING END DATE: 10-11-05
TOTAL NUMBER OF CORE BOXES: 0
TOTAL NUMBER OF SAMPLES: 0
LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0	Possible structural fill: Brown silty clay	CL		1'			Logged from cuttings
5				8'			Set 65 feet of 4-inch i.d. SCH 80 #20 slot screen
10	10 Brown clayey SILT					10'	15 feet of 4-inch i.d. SCH 80 PVC riser
15		CL-ML					
25	25 Olive gray SILT	ML					
30							
35	35 Limestone Rubble or ledge over clay with sand and gravel						
40	43 Light gray Limestone Driller noted rock was fractured	LMS					
50	51 VOID 52						
55	Light gray Limestone with black shale layers	LMS					
60	58 Olive Gray Clay 59						
65	Light gray Limestone	LMS					

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Bridgeton Additional Perimeter LFG
HOLE NO.: PGW-35

Aquaterra Drilling Log

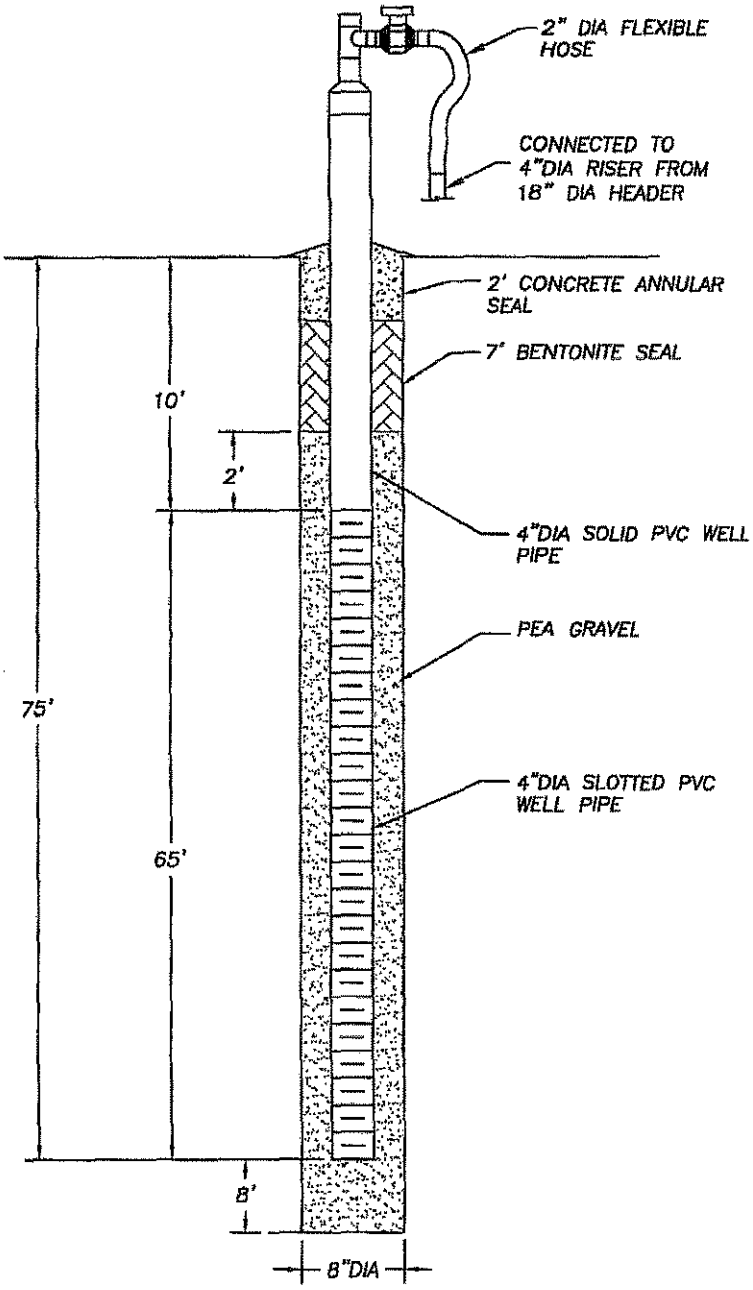
HOLE NO. PGW-35 | SHEET OF SHEETS 2 2

PROJECT NAME: Bridgeton LFG Wells | INSPECTOR: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
75	Light gray LIMESTONE	LMS			75'	
80	Black SHALE, mod. hard	SH				
85	Boring Terminated @ 83 ft					

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Bridgeton Add'l Perimeter LFG | HOLE NO. PGW-35



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-35 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-35_DETAIL.dwg	21

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359615	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE 1

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC
WELL NUMBER: P311-35
VARIANCE GRANTED BY THE D.N.R.: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE
OWNER ADDRESS: 13570 St. Charles Rock Road
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: same
CONTACT NAME: Paul Blome
SITE ADDRESS: same
CITY:
STATE:
ZIP CODE:
VARIANCE NUMBER: 5720

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN
MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☐ V.O.C. ☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL, INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.
St. Charles Rock Rd
site
NORTH
Hall St. Bridgeton

LOCATION OF WELL
LAT. 38 : 45 : 55 .
LONG. 90 : 26 : 39 .
AREA
ELEV
COUNTY St. Louis
SMALLEST 1/4 1/4 LARGEST 1/4
SEC. 20 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE
2725 West on St. Charles Rock Rd, site on left
DRILLER NOTES: Methane detection well

TYPE OF SURFACE COMPLETION: ☐ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH OF PROTECTIVE CASING: n/a FT.
DIAMETER OF PROTECTIVE CASING: IN.
DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: IN. FT.
PROTECTIVE CASING MATERIAL: ☐ STEEL ☐ ALUMINUM ☐ PLASTIC
LOCKING CAP? ☐ YES ☐ NO

WEEP HOLE? ☐ YES ☐ NO
VENTED CAP? ☐ YES ☐ NO
LENGTH OF FLUSH MOUNT: FT.
DIAMETER OF FLUSH MOUNT: IN.
DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: IN. FT.
SURFACE COMPLETION GROUT: ☐ CONCRETE ☐ OTHER n/a

RISER PIPE DETAIL
LENGTH: 15 FT.
DIAMETER: 4 IN.
WEIGHT OR SCH: 80
DIAMETER OF DRILL HOLE: 8" FT.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER
GLUED: ☐ YES ☒ NO

BENTONITE SEAL
LENGTH OF SEAL: 3 FT.
MATERIAL: ☒ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO n/a

PRIMARY FILTER PACK
LENGTH: 63 FT.
DEPTH TO TOP OF PRIMARY FILTER PACK: 7 FT.
SECONDARY FILTER PACK LENGTH: n/a FT.

ANNULAR SEAL
☐ BENTONITE SLURRY ☒ CEMENT/BENTONITE SLURRY
☐ NON SLURRY BENTONITE TYPE
BAGS OF CEMENT USED: 3
% OF BENTONITE USED: 5
WATER USED/BAG: 5 GAL
LENGTH: 4 FT.

WELL SCREEN
LENGTH: 65 FT.
DIAMETER: 4 IN.
DIAMETER OF DRILL HOLE: 8 IN.
DEPTH TO TOP OF SCREEN: 10 FT.
MATERIAL: ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	36	Overburden
36	43	Shale
43	53	Limestone
53	60	Void
60	68	Limestone - fractured
68	70	Limestone
70	83	Limestone - fractured

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 83'

SIGNATURE (PRIMARY CONTRACTOR): X
PERMIT NUMBER: 00035WRM
STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE WELL DRILLING WAS COMPLETED: 11-14-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER): X
PERMIT NUMBER: 00035WRM
DATE: 11-5-05
SIGNATURE (PUMP INSTALLER): X n/a
PERMIT NUMBER
DATE

MO 780-1415 (1-02)
WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

Aquaterra Drilling Log

HOLE NO. PGW-36 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton Additional LFG Collection Wells	DRILLING SUBCONTRACTOR: LAYNE WESTERN
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Bill Dixson Dean
LOCATION: Bridgeton LF LLC - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION:	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/2" id HSA; 8" air rotary
OVERBURDEN THICKNESS: 30	
BEDROCK FOOTAGE: 52	DRILLING START DATE: 10-12-05
DRILLING END DATE: 10-12-05	
DEPTH GROUNDWATER ENCOUNTERED: ~13	TOTAL NUMBER OF CORE BOXES: 0
TOTAL NUMBER OF SAMPLES: 0	
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0	Brown silty CLAY, possible structural fill to 5 feet	CL	11' → 35'				Logged from cuttings
5			16' → X				Set 65 feet of screen 4-inch id sch 80 #20 PVC to 80', 20 feet of 4-inch id sch 80 PVC risers.
10							
13							
15	Dark brown clayey SILT	CL-ML				15	Gravel to 7 feet
22							Bentonite chips to 3.5 ft
25	Dark gray SILT to SILT w/ sand	ML					
30							
30							
32	Limestone weathered	lms					
35	Light green SHALE, weathered	SH					
40							
41	Light gray LIMESTONE occasional dark gray black shale layers	lms					
45							
50							
55							
60							
65							

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Bridgeton Add'l LFG Collection Wells

HOLE NO. PGW-36

Aquaterra Drilling Log

HOLE NO. PGW-36 | SHEET OF SHEETS 2 2

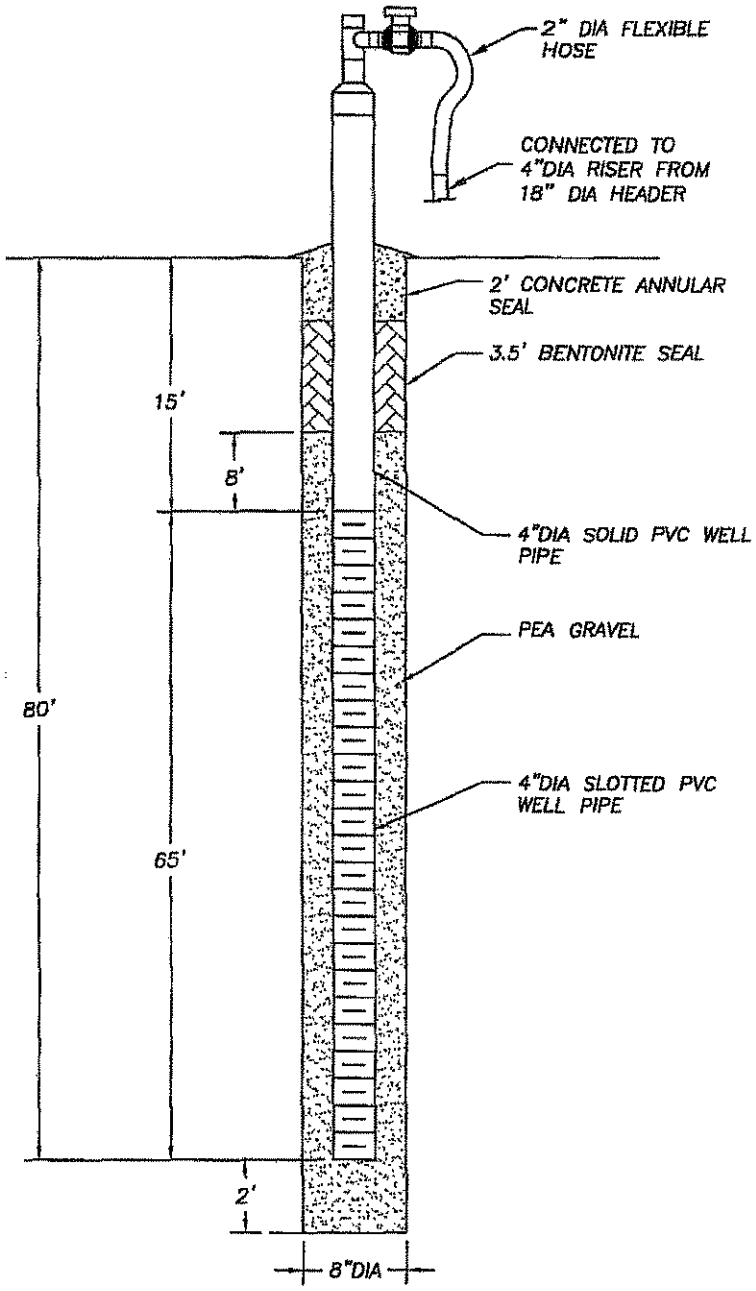
R... NAME Bl Tom Additional LFG Collection Wells | INSPECTOR ASL

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Light gray LIMESTONE, occasional dark gray + black SHALE layers					
5	Boring Terminated @ 82 ft				80'	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME Add'l LFG Wells

HOLE NO. PGW-36



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-36 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-36_DETAIL.dwg	22

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 368616	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC		WELL NUMBER: RGW-36		VARIANCE GRANTED BY THE D.N.R. ☐ NO
OWNER ADDRESS: 13570 St. Charles Rock Rd	CITY: Bridgeton	STATE: MO	ZIP CODE: 63044	☒ YES, ATTACH A COPY OF THE VARIANCE
SITE NAME: same	CONTACT NAME: Pat Sharpe			
SITE ADDRESS: same	CITY	STATE	ZIP CODE	VARIANCE NUMBER: 3760

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☒ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T. ☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☒ PETROLEUM PRODUCTS ONLY ☐ EXPLOSIVES ☐ METALS ☒ V.O.C. ☐ 6VOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS:

LOCATION OF WELL: LAT. 38° 45' 56" LONG. 90° 36' 39"

AREA: ELEV:

COUNTY: St Louis

SMALLEST 1/4: LARGEST 1/4: 1/4: SEC. 20 TWN. 46 N RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 2762, west of St Charles Rock Rd, site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION		LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
	☐ ABOVE GROUND N/A ☐ FLUSH MOUNT	FT.	IN.	IN. FT.	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☒ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT	
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A	

RISER PIPE DETAIL	LENGTH	DIAMETER	WEIGHT OR BOR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
	15 FT.	4 IN.	80	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER		3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

GLUED: ☒ YES ☒ NO

SECONDARY FILTER PACK: ☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK	LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
	12 FT.	3 FT.	N/A FT.

ANNULAR SEAL			LENGTH
	☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE	☒ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED 5 % OF BENTONITE USED 5 WATER USED/BAG 2.5 GAL	5 FT.

WELL SCREEN	LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
	65 FT.	4 IN.	8 IN.	15 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	31	Overburden
31	37	Limestone + weathered
37	41	Shale
41	52	Limestone
52	202	Void
202	204	Limestone

MULTIPLE CASED WELLS: ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION: ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 204'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	368616 WMM		10-12-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	368616 WMM	11-9-05	X N/A		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
RETURN TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

Aquaterra Drilling Log

HOLE NO. PGW-37 | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton LF Perimeter LFG Wells	DRILLING SUBCONTRACTOR: LAYNE WESTERN
PRL NUMBER: 1684.10	NAME OF DRILLER(S): Bill Pinson
LOCATION: Bridgeton LF - Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈ 484	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" I.D. HSA; 8" air rotary; 8" Tricone rotary
OVERBURDEN THICKNESS:	
BEDROCK FOOTAGE:	DRILLING START DATE: 10-13-05
DRILLING END DATE: 10-14-05	
DEPTH GROUNDWATER ENCOUNTERED:	TOTAL NUMBER OF CORE BOXES: 0
TOTAL NUMBER OF SAMPLES: 0	
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
0	Fill: Brown silty CLAY, trace trash.	CL		3'			Logged from cuttings
5				7'			Placed 80 feet of well material to 77 feet
5	Olive brown silty CLAY, slight odor of gas	CL					-65 feet of 4-inch i.d. SCH 80 + 15 ft of 4-inch i.d. SCH 80
10						12'	
15							
15	Brownish gray silty CLAY to clayey SILT	CL to ML					
30							
32							
34	Gravel	GP					
35	CLAY	CH					
50							
53	Weathered LIMESTONE - Driller noted rock was rubbly -						
60							
63	Light gray LIMESTONE with dark gray SHALE	LMS					

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
ANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Bridgeton LFG Wells

HOLE NO.: PGW-37

Aquaterra Drilling Log

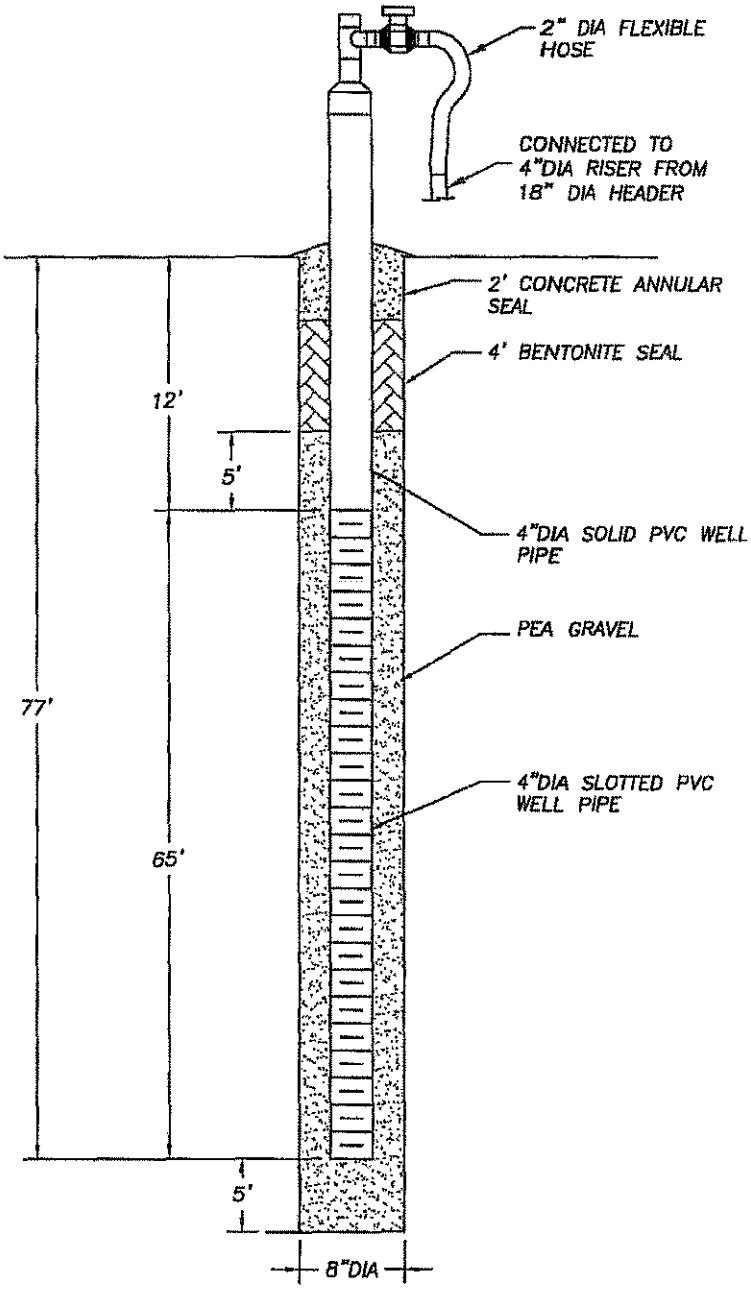
HOLE NO. PGW-37 | SHEET OF SHEETS 2 2

ECT NAME Bridgeton LF - Add'L LFG Wells | LOGGED BY: AJL / MSR

L	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
75		LMS			77'		
80	Boring Terminated @ 80' Plan						
85							

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME Bridgeton LFG | HOLE NO. PGW-37



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-37 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	11/7/05	PGW-37_DETAIL.dwg	23

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359617	
O.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Bridgeton Landfill LLC — WELL NUMBER: MW-37

VARIANCE GRANTED BY THE D.N.R: [ ] NO [X] YES, ATTACH A COPY OF THE VARIANCE

OWNER ADDRESS: 13570 St. Charles Rock Rd — CITY: Bridgeton — STATE: MO — ZIP CODE: 63044

CONTACT NAME: Pat Bloss

SITE NAME: same

CITY — STATE — ZIP CODE — VARIANCE NUMBER: 180

SITE ADDRESS: same

PROPOSED USE OF WELL: [X] GAS MONITORING WELL [ ] MONITORING [ ] EXTRACTION WELL [ ] PIEZOMETERS

TYPE OF POTENTIAL SITE: [ ] HAZARDOUS MATERIAL [X] LANDFILL [ ] INITIAL SITE ASSESSMENT [ ] L.U.S.T. [ ] WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) [ ] RADIONUCLIDES [ ] PETROLEUM PRODUCTS ONLY [ ] EXPLOSIVES [ ] METALS [ ] V.O.C. [ ] SVOCS [ ] PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS

LOCATION OF WELL: LAT. 38° 45' 56" LONG 90° 34' 30" — AREA — ELEV. — COUNTY St. Louis

SMALLEST / LARGEST 1/4 1/4 1/4 — SEC. 6 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: NW, West of St. Charles Rock Rd, Eastward of Maline Collection well

DRILLER NOTES:

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
[X] ABOVE GROUND [ ] FLUSH MOUNT	FT.	IN.	IN. FT.	[ ] STEEL [ ] ALUMINUM [ ] PLASTIC	[X] YES [ ] NO
n/a					

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
[ ] YES [ ] NO	[ ] YES [ ] NO	FT.	IN.	IN. FT.	[ ] CONCRETE [ ] OTHER n/a

	LENGTH	DIAMETER	WEIGHT OR SDR#	DIAMETER OF DRILL HOLE	MATERIAL	BENTONITE SEAL	LENGTH OF SEAL	MATERIAL
RISER PIPE DETAIL	15 FT.	4 IN.	80	8" FT.	[ ] STEEL [X] THERMOPLASTIC (PVC) [ ] OTHER		3 FT.	[ ] SLURRY [X] PELLETS [ ] GRANULAR [X] CHIPS

SECONDARY FILTER PACK — GLUED: [ ] YES [X] NO — [ ] SATURATED ZONE [ ] UNSATURATED ZONE — HYDRATED [ ] YES [ ] NO — BOTH ZONES [ ] — IF YES, HYDRATED [ ] YES [ ] NO n/a

PRIMARY FILTER PACK	LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
	60 FT.	7 FT.	n/a FT.

ANNULAR SEAL: [ ] BENTONITE SLURRY [X] CEMENT/BENTONITE SLURRY [ ] NON SLURRY BENTONITE TYPE — BAGS OF CEMENT USED 11 — % OF BENTONITE USED 2 — WATER USED/BAG 30 GAL — LENGTH 4 FT.

WELL SCREEN	LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
	65 FT.	4 IN.	8 IN.	70 FT.	[ ] STEEL [X] THERMOPLASTIC (PVC) [ ] OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	50	overburden
50	63	Limestone - highly fractured
63	69	Limestone

MULTIPLE CASED WELLS: [ ] YES [X] NO — PUMP INSTALLED FOR REMEDIATION: [ ] YES [X] NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 69'

SIGNATURE (PRIMARY CONTRACTOR) — PERMIT NUMBER 2005111MW — STATIC WATER LEVEL FEET FROM MEASURING POINT — DATE WELL DRILLING WAS COMPLETED 10-14-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	2005111MW	11-9-05	X n/a		

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
RETURN TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

Aquaterra Drilling Log

HOLE NO. PGW-3B | SHEET 1 OF 2 SHEETS

PROJECT NAME: Bridgeton LF LLC Add'l LFG wells	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1684.10	NAME OF DRILLER(S): Bill Pinson
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ≈ 495	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT:
OVERBURDEN THICKNESS:	
BEDROCK FOOTAGE:	DRILLING START DATE: 10-17-05 / DRILLING END DATE:
DEPTH GROUNDWATER ENCOUNTERED: ≈ 20	TOTAL NUMBER OF CORE BOXES: 0 / TOTAL NUMBER OF SAMPLES: 0
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	LOGGED BY: Andy Limmer

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
5	Fill: Brown silty CLAY + clayey SILT	CL-ML					Logged from cuttings
10				8' TO 13'	5' ENVIROPLUG		
12							
15	Olive brown clayey SILT	CL-ML					
25							
25	Light gray SILT with Yellow Clay	ML					
30							
32	Light gray LIMESTONE	Lms					
35	Tan CLAY	CH					
45							
52							
52	Light gray LIMESTONE with dark gray SHALE	Lms					Water @ Lms @ 52 ft. Gas odor below 52 ft
60							
65							

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC. KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Bridgeton LF Add'l LFG Wells

HOLE NO. PGW-33

Aquaterra Drilling Log

HOLE NO. PGW-38 | SHEET OF SHEETS 2 2

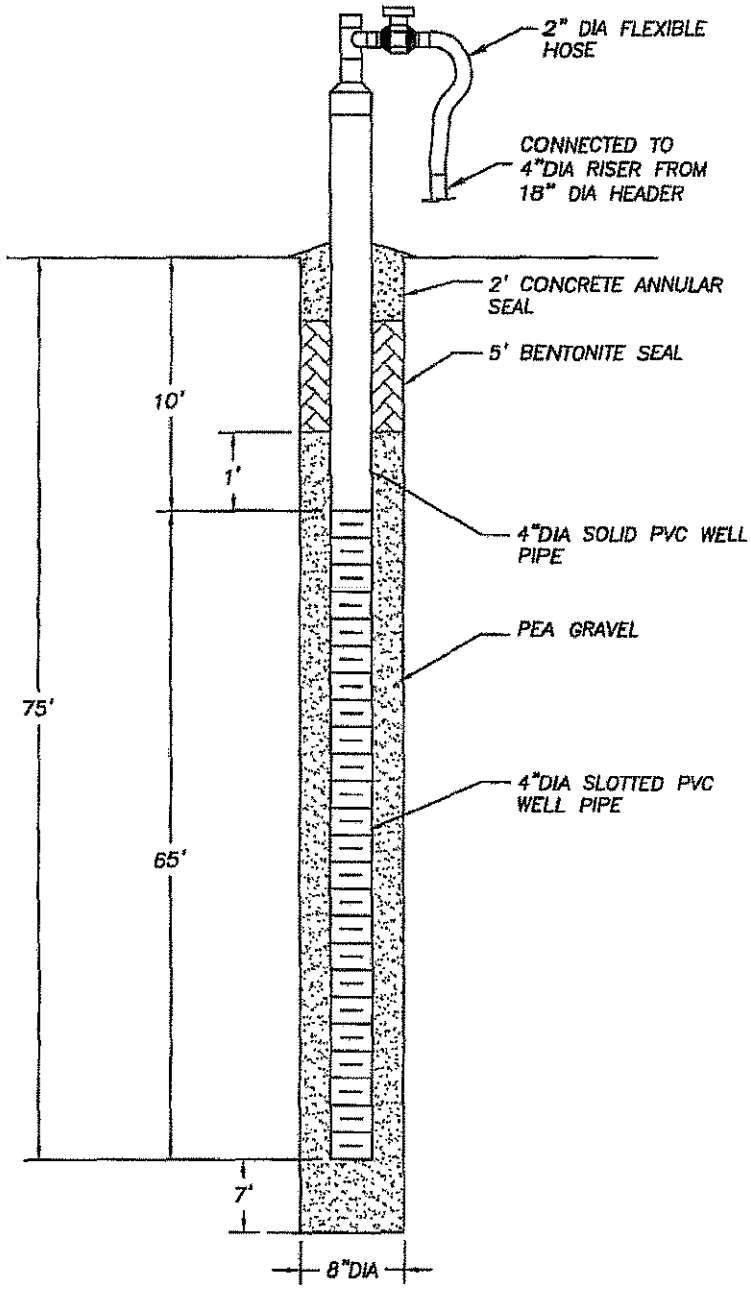
PROJECT NAME: Bridgeton | LOGGED BY: MJL

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
75							
80							
85	Boring Term. @ 82 Ft						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Bridgeton LF Perimeter Gas Wells

HOLE NO. PGW-38



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-38 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-38_DETAIL.dwg	24

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359616	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

WELL NUMBER: DSW-35

OWNER NAME: Bridgeton Landfill LLC

OWNER ADDRESS: 13570 St. Charles Rock Rd

CITY: Bridgeton

STATE: Mo

ZIP CODE: 63044

CONTACT NAME: Paul Place

SITE NAME: same

SITE ADDRESS: same

CITY:

STATE:

ZIP CODE:

VARIANCE GRANTED BY THE D.N.R.: [ ] NO [X] YES, ATTACH A COPY OF THE VARIANCE

VARIANCE NUMBER: 2760

PROPOSED USE OF WELL: [X] GAS MONITORING WELL [ ] MONITORING [ ] EXTRACTION WELL [ ] PIEZOMETERS

TYPE OF POTENTIAL SITE: [ ] HAZARDOUS MATERIAL [X] LANDFILL [ ] INITIAL SITE ASSESSMENT [ ] U.S.T. [ ] WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY) [ ] RADIONUCLIDES [ ] PETROLEUM PRODUCTS ONLY [ ] EXPLOSIVES [ ] METALS [ ] V.O.C. [X] SVOCS [ ] PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWN.

LOCATION OF WELL: LAT. _____ LONG. _____

AREA: _____ ELEV: _____

COUNTY: _____

SMALLEST 1/4 _____ 1/4 _____ LARGEST 1/4 _____ SEC. _____ TWN. _____ N. RNG. _____ E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: St. Charles Rock Rd

DRILLER NOTES:

TYPE OF SURFACE COMPLETION: [ ] ABOVE GROUND [ ] FLUSH MOUNT N/A

LENGTH OF PROTECTIVE CASING: _____ FT.

DIAMETER OF PROTECTIVE CASING: _____ IN.

DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED: _____ IN. _____ FT.

PROTECTIVE CASING MATERIAL: [ ] STEEL [X] ALUMINUM [ ] PLASTIC

LOCKING CAP? [ ] YES [ ] NO

WEEP HOLE? [ ] YES [ ] NO

VENTED CAP? [ ] YES [ ] NO

LENGTH OF FLUSH MOUNT: _____ FT.

DIAMETER OF FLUSH MOUNT: _____ IN.

DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED: _____ IN. _____ FT.

SURFACE COMPLETION GROUT: [ ] CONCRETE [ ] OTHER N/A

RISER PIPE DETAIL

LENGTH: 15 FT.

DIAMETER: 4 IN.

WEIGHT OR SDR#: 80

DIAMETER OF DRILL HOLE: 8 IN.

MATERIAL: [ ] STEEL [X] THERMOPLASTIC (PVC) [ ] OTHER

GLUED: [ ] YES [X] NO

BENTONITE SEAL

LENGTH OF SEAL: 3 FT.

MATERIAL: [ ] SLURRY [ ] PELLETS [X] GRANULAR [X] CHIPS

SECONDARY FILTER PACK

[ ] SATURATED ZONE [ ] UNSATURATED ZONE HYDRATED [ ] YES [ ] NO N/A

BOTH ZONES [ ] IF YES, HYDRATED [ ] YES [ ] NO

PRIMARY FILTER PACK

LENGTH: 17 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK: 8 FT.

SECONDARY FILTER PACK LENGTH: N/A FT.

ANNULAR SEAL

[ ] BENTONITE SLURRY [X] CEMENT/BENTONITE SLURRY

[ ] NON SLURRY BENTONITE TYPE

BAGS OF CEMENT USED: 5

% OF BENTONITE USED: 5

WATER USED/BAG: 2.5 GAL

LENGTH: 15 FT.

WELL SCREEN

LENGTH: 10 FT.

DIAMETER: 4 IN.

DIAMETER OF DRILL HOLE: 8 IN.

DEPTH TO TOP OF SCREEN: 10 FT.

MATERIAL: [ ] STEEL [X] THERMOPLASTIC (PVC) [ ] OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	10	overburden
10	35	clay
35	37	Limestone fractured
37	58	clay
58	60	Limestone
60	75	Limestone w/ intermittent clay
75	80	Limestone

MULTIPLE CASED WELLS [ ] YES [X] NO PUMP INSTALLED FOR REMEDIATION [ ] YES [X] NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED.

TOTAL DEPTH: 80'

SIGNATURE (PRIMARY CONTRACTOR): [signature]

PERMIT NUMBER: C-029511 WPM

STATIC WATER LEVEL: _____ FEET FROM MEASURING POINT

DATE WELL DRILLING WAS COMPLETED: 11-18-05

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER): X [signature]

PERMIT NUMBER: 1714

DATE: 11-9-05

SIGNATURE (PUMP INSTALLER): X N/A

PERMIT NUMBER:

DATE:

MO 780-1415 (1-02)

DISTRIBUTION: WHITE/DIVISION, CANARY/CONTRACTOR, PINK/OWNER

MAIL ORIGINAL, ENCLOSE $75.00 CERTIFICATION FEE

DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402

ING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Aquaterra Drilling Log

HOLE NO. PGW-39 | SHEET 1 OF SHEETS

PROJECT NAME: Bridgeton LF Add'l LFG Wells	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 164P4.10	NAME OF DRILLER(S): Bill Pinson
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
SURFACE ELEVATION: ± 485'	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT:
OVERBURDEN THICKNESS:	
BEDROCK FOOTAGE:	DRILLING START DATE: 10-18-05 / DRILLING END DATE:
DEPTH GROUNDWATER ENCOUNTERED:	TOTAL NUMBER OF CORE BOXES: / TOTAL NUMBER OF SAMPLES:
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	LOGGED BY: Michele Bowsard

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
5	Brown silty clay			6' TO 11'	5 BAGS ENVIRO LVL		Logged from cuttings
10							
15							
20	clayey silt - brown						TOP OF WELL 5' ABOVE GROUND SURFACE
25	sandy silty clay						
28							
30	dark brown silt w. very fine sand						
32							
35	gray silty sand clay						
	37' ± LIMESTONE TOP						
40	41' ± SHALE TOP						
42							
45	light gray limestone						
50							
	shaly						
55							
60							
65							

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME: Bridgeton LF Add'l LFG Wells | HOLE NO.: PGW-39

Aquaterra Drilling Log

HOLE NO.	SHEET OF SHEETS

PROJECT NAME: Additional Perimeter LFG Collection Wells

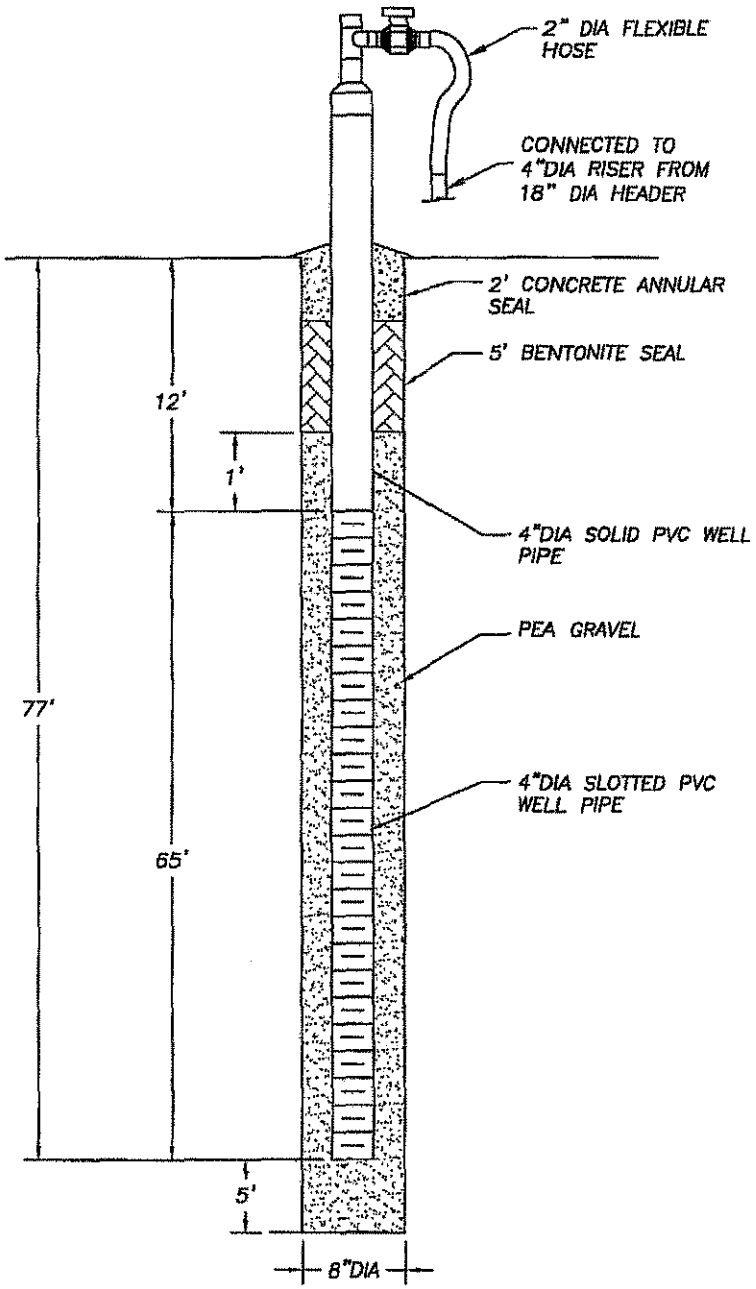
LOGGED BY: MAB

DEPTH	DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
75	Shale						
80							
92	total depth						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
KANSAS CITY-JEFFERSON CITY-OMAHA-ST. LOUIS

PROJECT NAME

HOLE NO.



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-39 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-39_DETAIL.dwg	25

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 350612	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY / ROUTE /

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME: Preston Landfill Inc — WELL NUMBER: RSW-39

OWNER ADDRESS: 15670 St. Charles Rock Rd — CITY: Bridgeton — STATE: Mo — ZIP CODE: 63044

SITE NAME: Same — CONTACT NAME: Earl Pitcher

SITE ADDRESS: Same — CITY — STATE — ZIP CODE

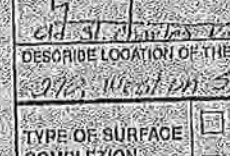
VARIANCE GRANTED BY THE D.N.R.: ☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE — VARIANCE NUMBER: 1750

PROPOSED USE OF WELL: ☒ GAS MONITORING WELL ☐ MONITORING ☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☐ INITIAL SITE ASSESSMENT ☐ WATER LEVEL DRAWDOWN ☒ LANDFILL ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ RADIONUCLIDES ☐ EXPLOSIVES ☐ SVOCS ☐ PETROLEUM PRODUCTS ONLY ☐ METALS ☐ V.O.C. ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL, INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWN:



LOCATION OF WELL: LAT. 38° 45' 37" — LONG. 90° 26' 31" — AREA — ELEV — COUNTY: St. Louis

SMALLEST 1/4 1/4 LARGEST 1/4 — SEC. 2 TWN. 46 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE: 3/4 Weston St. Charles Rock Rd. site on left

DRILLER NOTES: Methane collection well

TYPE OF SURFACE COMPLETION	☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	LENGTH OF PROTECTIVE CASING FT.	DIAMETER OF PROTECTIVE CASING IN.	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED IN. FT.	PROTECTIVE CASING MATERIAL	☐ STEEL ☐ ALUMINUM ☐ PLASTIC	LOCKING CAP?	☐ YES ☐ NO
WEEP HOLE?	☐ YES ☐ NO	VENTED CAP?	☐ YES ☐ NO	LENGTH OF FLUSH MOUNT FT.	DIAMETER OF FLUSH MOUNT IN.	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED IN. FT.	SURFACE COMPLETION GROUT	☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL	LENGTH 15 FT.	DIAMETER 4 IN.	WEIGHT OR SDR# SDR 80	DIAMETER OF DRILL HOLE 8" FT.	MATERIAL ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER	BENTONITE SEAL	LENGTH OF SEAL 3 FT.	MATERIAL ☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK — GLUED ☐ YES ☒ NO — ☐ SATURATED ZONE ☐ UNSATURATED ZONE ☐ BOTH ZONES — HYDRATED ☐ YES ☐ NO — IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK	LENGTH 10 FT.	DEPTH TO TOP OF PRIMARY FILTER PACK 7 FT.	SECONDARY FILTER PACK LENGTH N/A FT.

ANNULAR SEAL	☐ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE	☒ CEMENT/BENTONITE SLURRY — BAGS OF CEMENT USED 4 — % OF BENTONITE USED 5 — WATER USED/BAG 2.0 GAL	LENGTH 4 FT.

WELL SCREEN	LENGTH 15 FT.	DIAMETER 4 IN.	DIAMETER OF DRILL HOLE 8 IN.	DEPTH TO TOP OF SCREEN 15 FT.	MATERIAL ☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	37	Overburden
37	42	limestone
42	58	shale
58	64	Limestone
64	68	limestone w/shale layers
68	80	shale

MULTIPLE CASED WELLS ☐ YES ☒ NO — PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO

SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED.

TOTAL DEPTH: 80'

SIGNATURE (PRIMARY CONTRACTOR) — PERMIT NUMBER 000-1111 — STATIC WATER LEVEL FEET FROM MEASURING POINT — DATE WELL DRILLING WAS COMPLETED 11-18-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	000-1111	11-29-95	X N/A		

MO 780-1415 (11-92)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
RETURN TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION.

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

Aquaterra Drilling Log

HOLE NO.	SHEET 1 OF SHEETS
PLW-40	2

PROJECT NAME: Additional Perimeter LFG Collection Wells	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 10894.10	NAME OF DRILLER(S): Bill Pinson
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: Schramm T660
HOLE LOCATION: PLW-40	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8¼" ID HSA; 8" Rotary Air
SURFACE ELEVATION: 485 ±	
OVERBURDEN THICKNESS: 37	DRILLING START DATE: 10-19-05 / DRILLING END DATE: 10-20-05
DEPTH DRILLED INTO ROCK: 45	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 82	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0					1330	
5				5'		65' SCREEN 4" SCH 80 #20 PVC
10	TAN CLAY	BENTONITE PLUG		10' 12'		15' SOLID 4" SCH 80 PVC
15						5 BAGS OF 50 lb. ENVIROPLUG
20						56 BAGS OF BACKFILL MATERIAL
25	27'				↑ 10-19-05	
30	GRAY CLAY				↓	
35	33' WET SILTY SANDY GRAY CLAY					
40	37'				1500	
45	LIMESTONE BEDROCK				0800 ↓	
50					10-20-05	

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME	HOLE NO.
Additional Perimeter LFG Perimeter Wells	PLW-40

Aquaterra Drilling Log

HOLE NO. PGW-40 | SHEET 2 OF SHEETS 2

PROJECT NAME: Additional Perimeter LFG Collection Wells

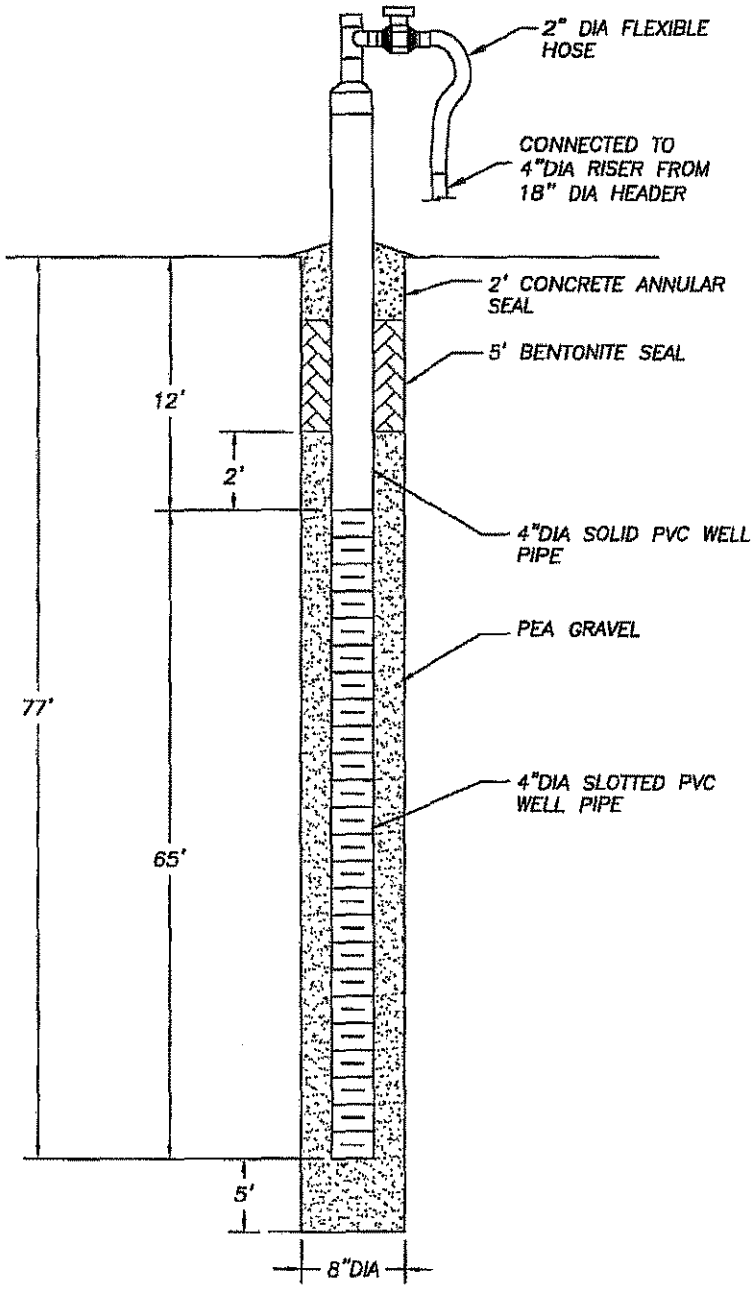
LOGGED BY: Terry L. Mueller

DESCRIPTION OF MATERIALS	CLASS.	BLOW COUNTS	RECOVERY	SAMPLE NO.	FIELD SCREENING RESULTS	REMARKS
60						
65						
70						
Limestone Bedrock			77'		10-20-05	
75						
80			82'		0 0 0	
82'						
85						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
Kansas City-Jefferson City-Omaha-St. Louis

PROJECT NAME: Additional Perimeter LFG Collection Wells

HOLE NO.: PGW-40



NOTES:

1. A PAINTED DESIGNATION NUMBER AND/OR TAG WILL BE PROVIDED TO IDENTIFY EACH WELL HEAD.
2. DEPTHS ARE APPROXIMATE.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

PGW-40 DETAIL

BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
MSB	AJF	NLH	1684.10
Scale	Date	File Name	Drawing No.
No Scale	11/7/05	PGW-40_DETAIL.dwg	26

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION
(573) 368-2165

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 359819	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph 1 Ph 2 Ph 3	APPROVED BY	ROUTE 1 / 1

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

OWNER NAME	WELL NUMBER	VARIANCE GRANTED BY THE D.N.R.
Bridgeton Landfill LLC	FGW-40	☐ NO ☒ YES, ATTACH A COPY OF THE VARIANCE

OWNER ADDRESS	CITY	STATE	ZIP CODE
13570 St. Charles Rock Rd	Bridgeton	MO	63044

SITE NAME	CONTACT NAME
same	Rick Bloore

SITE ADDRESS	CITY	STATE	ZIP CODE	VARIANCE NUMBER
same				21810

PROPOSED USE OF WELL
☒ GAS MONITORING WELL ☐ MONITORING
☐ EXTRACTION WELL ☐ PIEZOMETERS

TYPE OF POTENTIAL SITE
☐ HAZARDOUS MATERIAL ☒ LANDFILL
☐ INITIAL SITE ASSESSMENT ☐ L.U.S.T.
☐ WATER LEVEL DRAWDOWN

MONITORING FOR: (CHECK ALL THAT APPLY)
☐ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☐ METALS ☐ V.O.C.
☐ SVOCS ☐ PESTICIDES/HERBICIDES

SKETCH LOCATION OF WELL INCLUDING MILEAGE ON ALL ROADS TRAVELLED FROM NEAREST TOWNS.
St. Charles Rock Rd
1 mile
N
Off St. Charles Rock Rd

LOCATION OF WELL
LAT. 38° 45' 47"
LONG. 90° 26' 31"
AREA
ELEV
COUNTY St Louis
SMALLEST 1/4 LARGEST 1/4 1/4
SEC. 5 TWN. 44 N. RNG. 5 E OR W

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL SITE	DRILLER NOTES
270 West on St. Charles Rock Rd, site on left	Methane collection well

TYPE OF SURFACE COMPLETION	LENGTH OF PROTECTIVE CASING	DIAMETER OF PROTECTIVE CASING	DIAMETER AND DEPTH OF THE HOLE PROTECTIVE CASING WAS PLACED	PROTECTIVE CASING MATERIAL	LOCKING CAP?
☐ ABOVE GROUND ☐ FLUSH MOUNT N/A	FT.	IN.	IN. FT.	☒ STEEL ☐ ALUMINUM ☐ PLASTIC	☐ YES ☐ NO

WEEP HOLE?	VENTED CAP?	LENGTH OF FLUSH MOUNT	DIAMETER OF FLUSH MOUNT	DIAMETER AND DEPTH OF THE HOLE FLUSH MOUNT WAS PLACED	SURFACE COMPLETION GROUT
☐ YES ☐ NO	☐ YES ☐ NO	FT.	IN.	IN. FT.	☐ CONCRETE ☐ OTHER N/A

RISER PIPE DETAIL

LENGTH	DIAMETER	WEIGHT OR SCH#	DIAMETER OF DRILL HOLE	MATERIAL
15 FT.	4 IN.	SCH	8" FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

BENTONITE SEAL

LENGTH OF SEAL	MATERIAL
3 FT.	☐ SLURRY ☐ PELLETS ☐ GRANULAR ☒ CHIPS

SECONDARY FILTER PACK

GLUED ☐ YES ☒ NO
☐ SATURATED ZONE ☐ UNSATURATED ZONE HYDRATED ☐ YES ☐ NO
BOTH ZONES ☐ IF YES, HYDRATED ☐ YES ☐ NO N/A

PRIMARY FILTER PACK

LENGTH	DEPTH TO TOP OF PRIMARY FILTER PACK	SECONDARY FILTER PACK LENGTH
18 FT.	7 FT.	N/A FT.

ANNULAR SEAL

☐ BENTONITE SLURRY ☐ CEMENT/BENTONITE SLURRY
☒ NON SLURRY BENTONITE TYPE
BAGS OF CEMENT USED 4
% OF BENTONITE USED 5
WATER USED/BAG 2 GAL
LENGTH 4 FT.

WELL SCREEN

LENGTH	DIAMETER	DIAMETER OF DRILL HOLE	DEPTH TO TOP OF SCREEN	MATERIAL
15 FT.	4 IN.	8 IN.	10 FT.	☐ STEEL ☒ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	37	Overburden
37	18	Limestone bedrock
18	60	Limestone

MULTIPLE CASED WELLS ☐ YES ☒ NO PUMP INSTALLED FOR REMEDIATION ☐ YES ☒ NO
SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS AND GROUT USED

TOTAL DEPTH: 60'

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	STATIC WATER LEVEL FEET FROM MEASURING POINT	DATE WELL DRILLING WAS COMPLETED
	0025W0111		10-20-25

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	DATE	SIGNATURE (PUMP INSTALLER)	PERMIT NUMBER	DATE
X	0025W0111	11-5-25	X N/A		

MO 780-1415 (1-02)

MAIL ORIGINAL
ENCLOSE $75.00
CERTIFICATION FEE

DISTRIBUTION: WHITE/DIVISION CANARY/CONTRACTOR PINK/OWNER
MAIL TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
MONITORING WELL CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

Boring No. 12
PGW-41

Project Bridgeton Landfill Job No. 87848/5 Date 8-19-08

Location Bridgeton MO Crew Bill Pinson

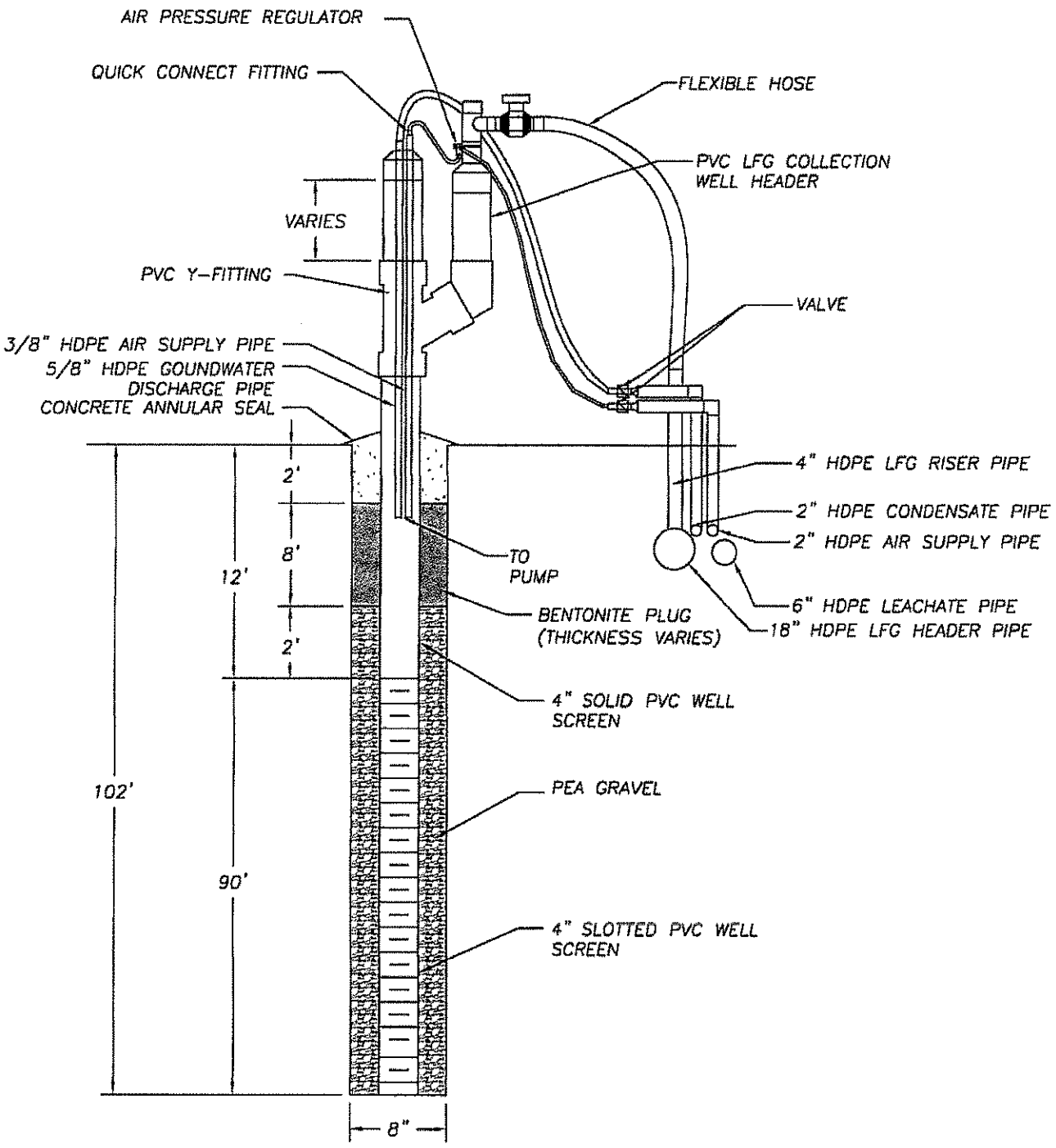
Drilling Method: ☐ HSA ☐ CFA ☐ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ Mobil Augers 8" hsm + BIT

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	10'	Overburden Brown Sandy Dirt				
10	30'	Dark Brown Clay				
30	49'	Brown wet Clay				
	49'	Rock set 8" hammer & BIT				
45	65'	Broken Gray limestone				
65	70'	Shale Blue				
2	100'	limestone no Fracturing				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' Screens				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 top cap				
	1½	Buckets Gravel				
	5	Bags Bentonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Well Bottom 100'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.

LW-784 9/00



3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-41 Detail.dwg November 6, 2008 2:10:55 pm (dr

K:\Allied Waste\

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-41
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-41 Detail.dwg	1

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

42
Boring No. ~~42~~ 11
PGW-42

Project Bridgeton Land Fill Job No. 878415 Date 8-19-08

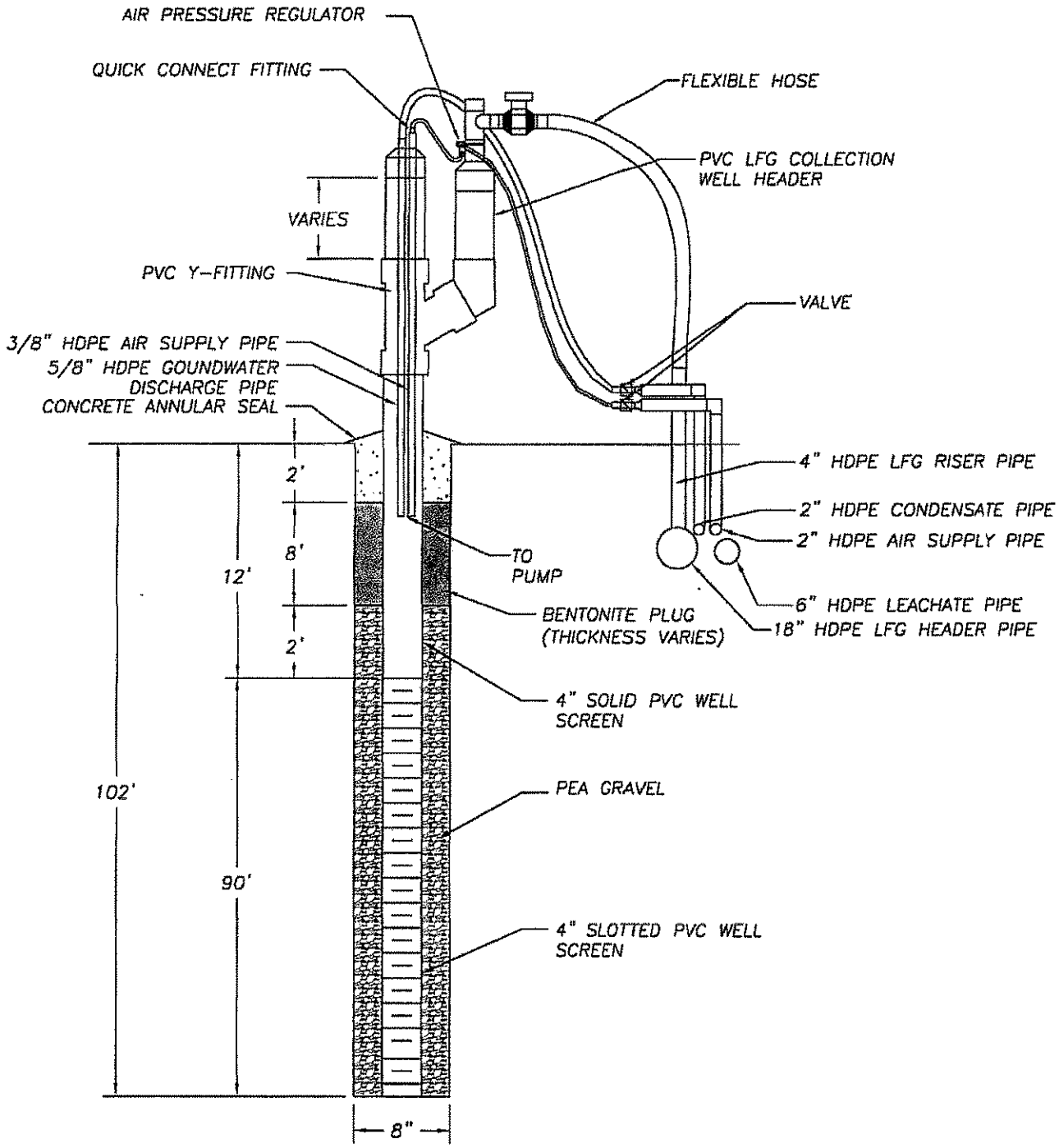
Location Bridgeton MO Crew Bill Pilson JEFF Litch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8 1/4" mobil Augers 8" HSA

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	10'	Dark Brown Sandy Dirt				
10	20'	Dark Green Sandy clay				
20	36'	Dark Green Sand — some clay				
36	48'	Blue Shale set 8" hammer	Call Bedrock	36'		
48	50'	Fractured limestone				
50	85'	Blue Shale				
85	102'	gray limestone & Some Fracturing				
	1	4" SCH 80 Bottom Cap				
	1	4" SCH 80 10' Riser				
	9	4" SCH 80 10' Screens				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 top Cap				
	1 1/2	Buckets gravel				
	5	Bags Bentonite Chips				

WATER LEVEL OBSERVATIONS	NOTES	Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.
During Drilling ____ ft.	Well Bottom 102'	
At Completion ____ ft.		
After ____ hrs. ____ ft.		
After ____ hrs. ____ ft.		
After ____ hrs. ____ ft.		

LW 784 3/00



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-42
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-42 Detail.dwg	1

K:\Allied Waste\3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-42 Detail.dwg November 6, 2008 2:12:05 pm (mt

✓

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

43
Boring No. 10
PGW-43

Project Bridgeton Landfill Job No. 878447 Date 8-18-08

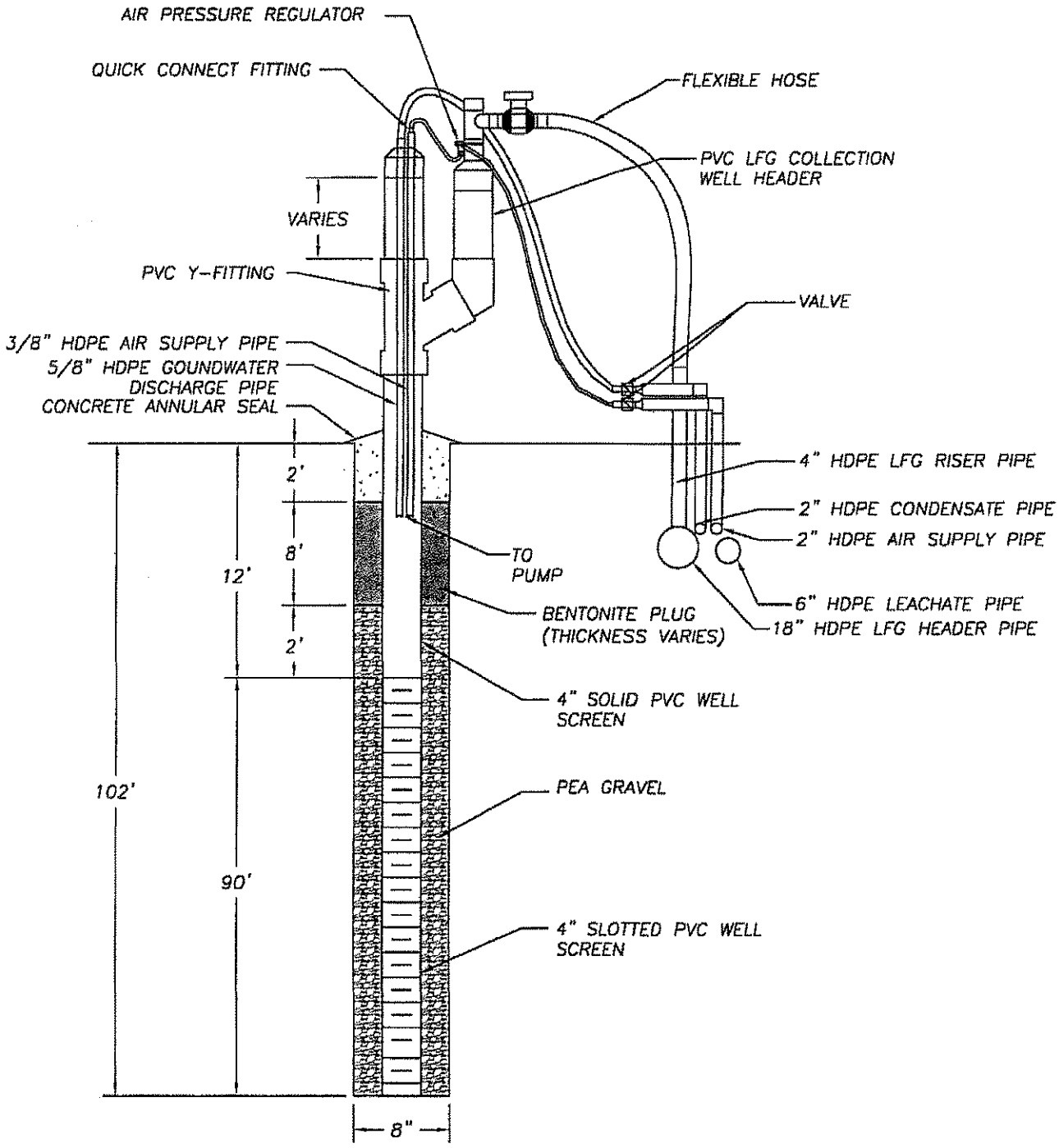
Location Bridgeton mo Crew Bill Pilsen JEFF Litch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ Auger 8" hammer

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	5'	Brown Sandy Dirt				
5	20'	Brown Sandy Clay				
20	25'	Sandy wet red Clay				
25	34'	Dark Green or Gray Clay				
34	60'	yellow light Brown weathered limestone				
60	100	Fractured Gray limestone				
		34' Bed Rock				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' screens				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 Top cap				
	1½	Buckets gravel				
	6	Bags Bentonite Chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Bottom well 100'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-43
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-43 Detail.dwg	1

K:\Allied Waste\... 3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-43 Detail.dwg November 6, 2008 2:12:25 pm (rhc

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

44 Boring No. 9
PGW-44

Project Bridgeton landFill Job No. 87 8447 Date 8-18-08

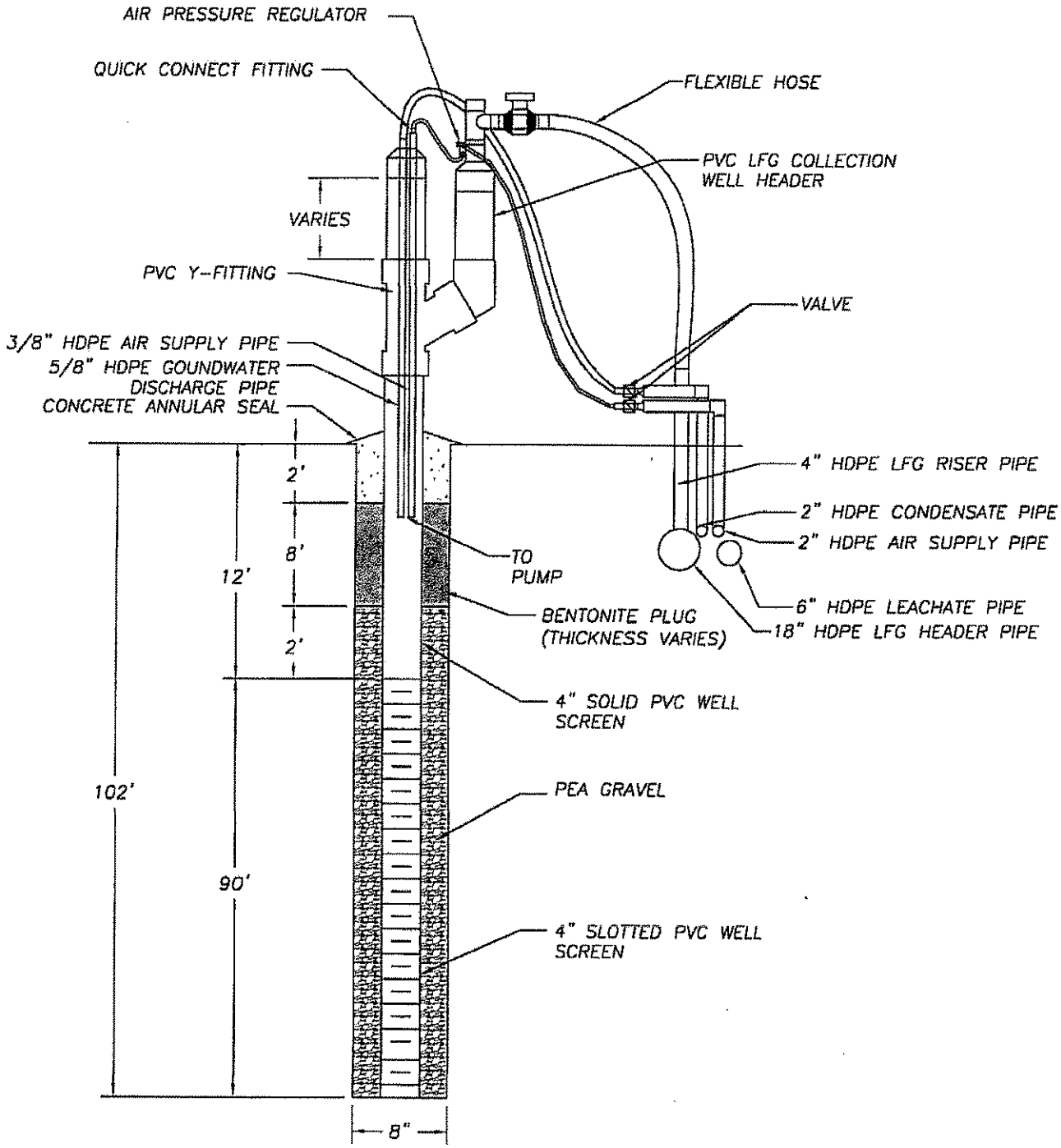
Location Bridgeton MO Crew Bill Pinson Jeff Litch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ Augers 8" hammer & [illegible]

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	5'	Brown Sandy Dirt				
5	20'	Brown Sandy Clay				
20	34'	Dark Green Gray Clay				
34	50'	yellow light Brown weather limestone				
50	60'	Fractured gray limestone & shale				
60	100'	Gray Fractured limestone				
		34' Bedrock				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' screens				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 Top Cap				
	1½	Buckets Gravel				
	5	Bags Bentonite Chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Bottom well 100'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-44
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-44 Detail.dwg	1

K:\Allied Waste\3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-44 Detail.dwg November 6, 2008 2:12:45 pm (rho)

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

Boring No. 8 (45) PGW-45

Project Bridgeton L.F Job No. 87 8145 Date 8-15-08

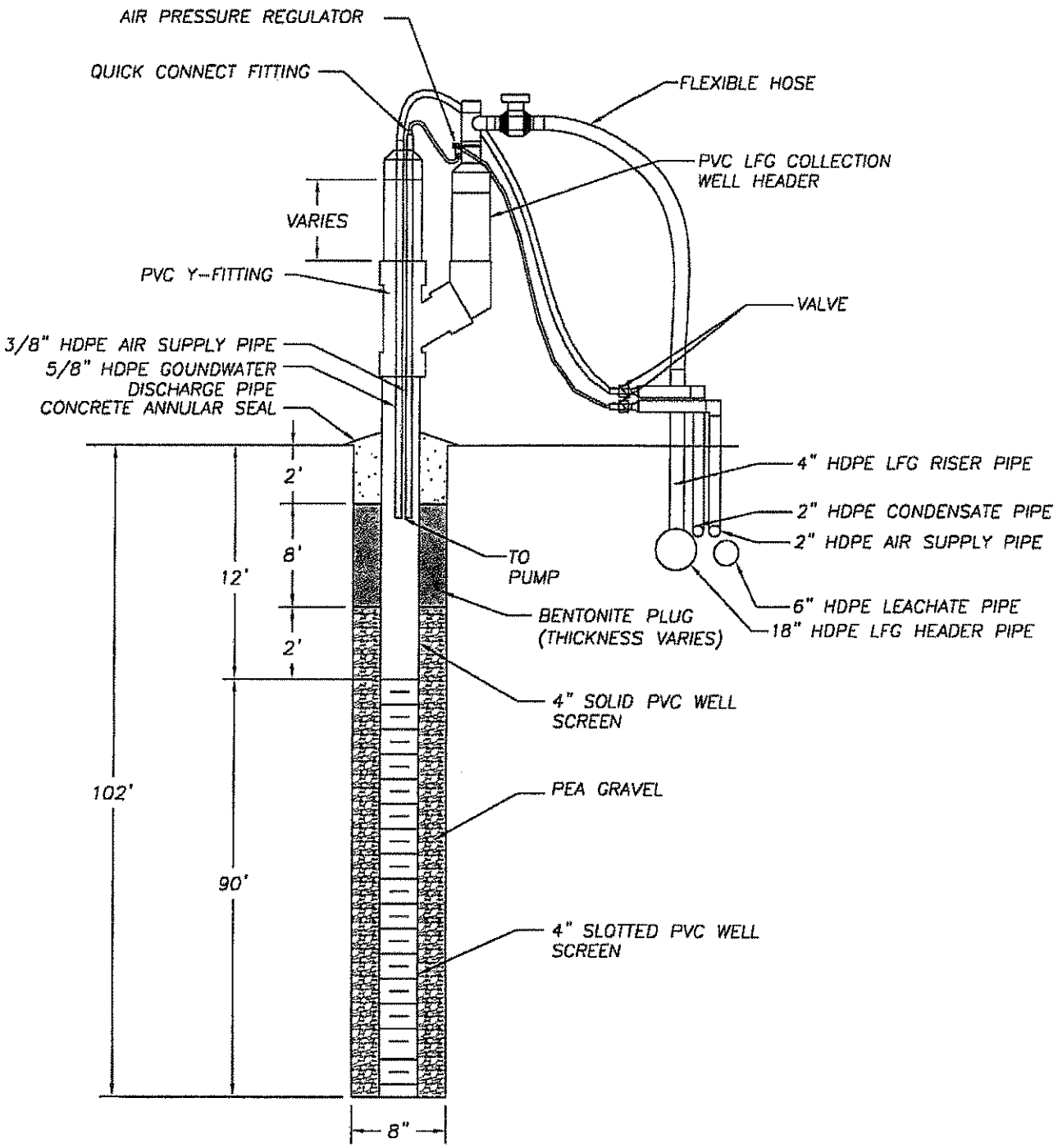
Location Bridgeton MO Crew Bill Pilsaw Jeff Hitch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ bugs 8" Hammer Bit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	24'	Brown Clay Sand Mix				
24	30'	Brown Sand Dry				
30	33'	Brown Clay Sand mix wet				
33		Bedrock				
33	47'	Blue Gray Clay Compacted & Stable				
47	60'	Gray limestone some Fracturing				
3	102'	Gray limestone				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' Screens				
	1	4" SCH 80 10' Risers				
	1	4" SCH 80 5' Risers				
	1	4" SCH 80 top Cap				
	1½	Buckets Gravel				
	5	Bags Bentonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Well Bottom 162'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-45
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-45 Detail.dwg	1

3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-45 Detail.dwg November 6, 2008 2:13:08 pm (mt
K:\Allied Waste\

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

PGW-46 Boring No. 7 P

Project Bridgeton L.F. Job No. 87 8445 Date 8-14-08

Location Bridgeton MO Crew Bill Pinson Jeff Tech

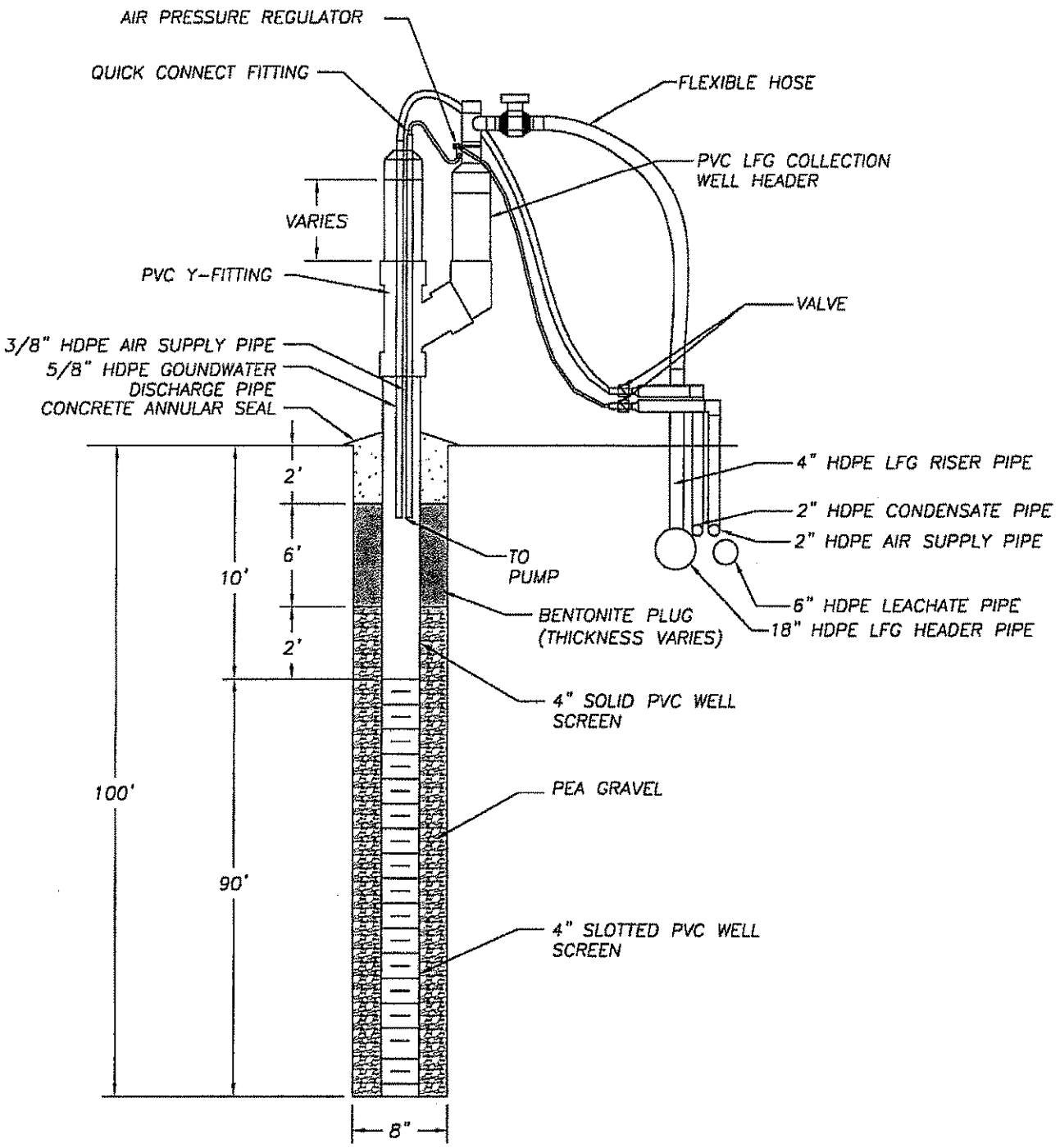
Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ mobil Augers 8" mud

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	20'	Red clay				
20	25'	wet Red clay mix with sand				
25'	33'	Brown sand				
33	32'	Rock maybe Fill				
32	35'	Silt & 2" to 3" Broken up Rock				
35'	50'	Fractured gray limestone				
2	51'	Shale layering				
51	100'	Limestone. Bottom				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 top cap				
	1½	Buckets gravel				
	5	Bags Bintonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Well Bottom at 100'
At Completion ____ ft.	
ter ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes Depth ____ ft.

LW 294 3/80



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-46
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	Date	File Name	Drawing No.
No Scale	10/24/08	3038.10 PGW-46 Detail.dwg	1

K:\Allied Waste\... 3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-46 Detail.dwg November 6, 2008 2:16:39 pm (ma

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

PLW-47
Boring No. 6

Project Bridgeton LF Job No. 878445 Date 8-14-08

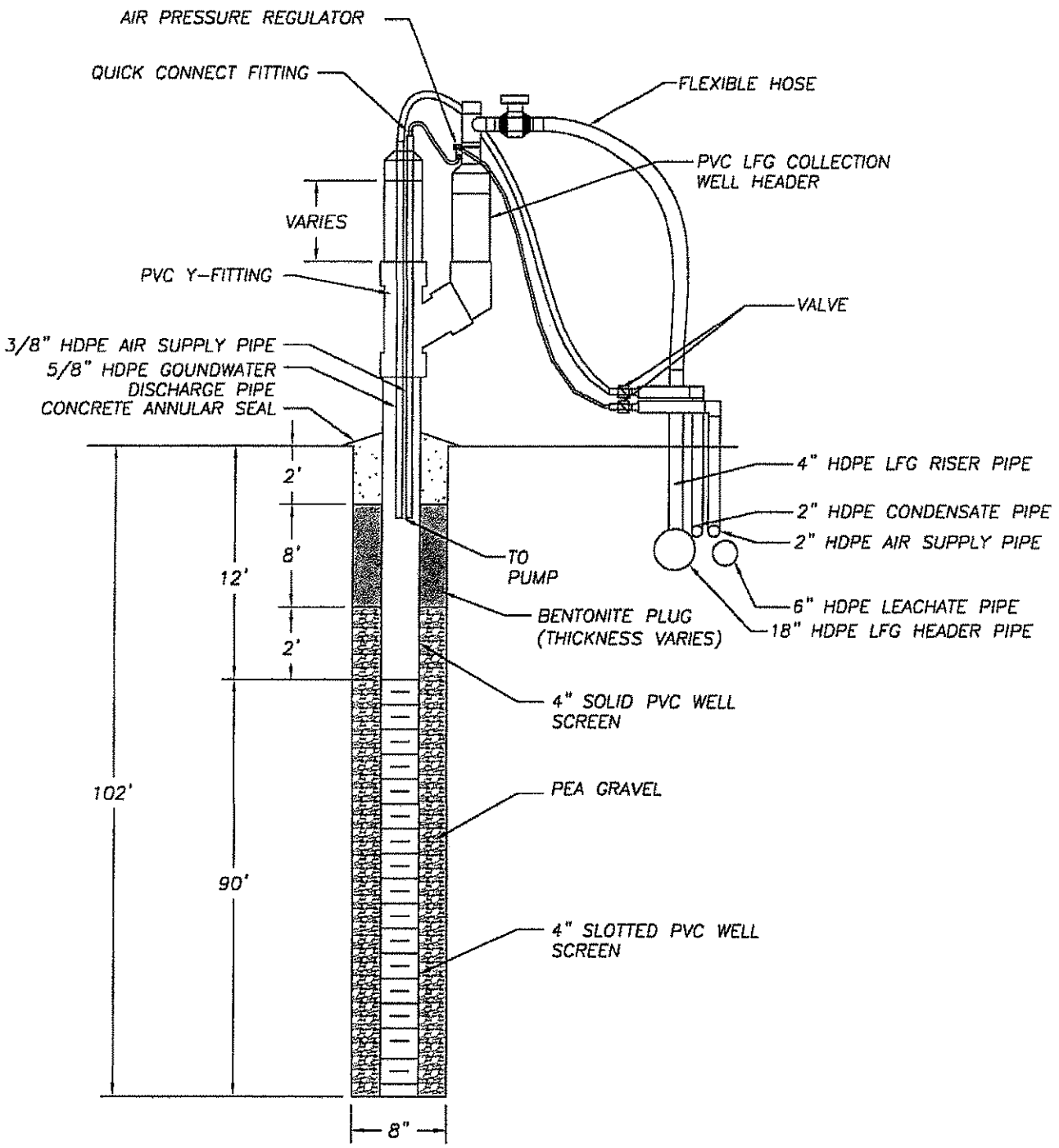
Location Bridgeton MO Crew Bill Russell Jeff Hitch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ Mobil Hyers 8" Hammer Bit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	24'	Red clay sand mix				
24	28'	Brown sand				
	28'	Bedrock				
28	47'	Broken limestone Fracturing				
47	50'	Small shale seam				
50	102'	gray limestone some Fracturing				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' Screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 top cap				
	1½	Bucket gravel				
	5	Bags Bitonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	well Bottom 102'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-47
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-47 Detail.dwg	1

3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-47 Detail.dwg November 6, 2008 2:16:58 pm (rho)
K:\Mixed Waste\

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

RW-48 Boring No. S

Project Bridgeton L.F. Job No. 87 8145 Date 8-13-08

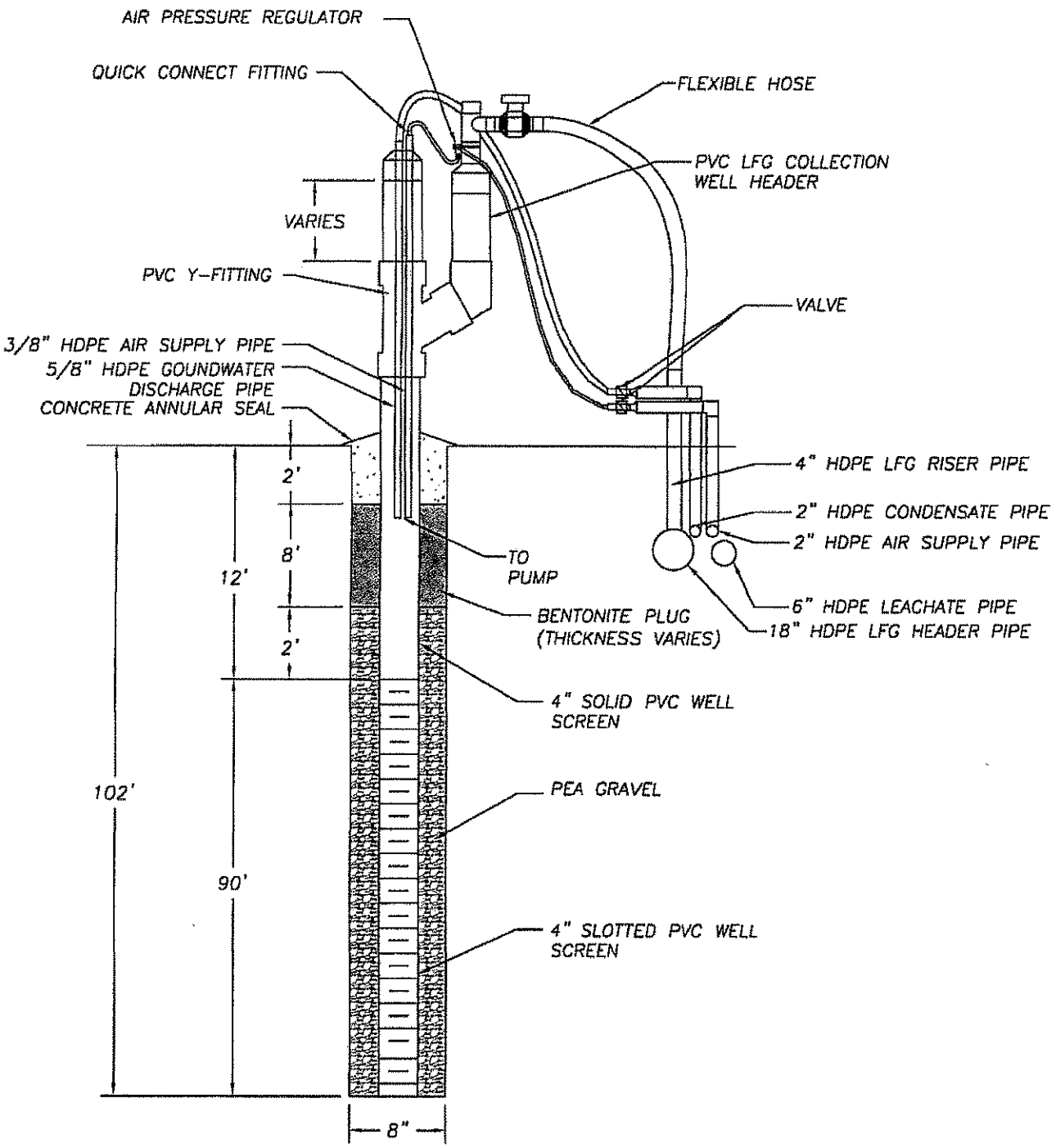
Location Bridgeton MO Crew Bill Pinson Jeff Litch

Drilling Method: ☐ HSA ☐ CFA ☐ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8 1/4 mobil Ag 8" mud Bit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	04'	Red clay Sand mix				
04	48'	Brown sand				
	48'	Rock				
48	50'	Fractured gray limestone.				
50	52'	Shale more than Previous holes				
52	102'	gray limestone limited Fractures				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' screens				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 top cap				
	1 ½	Buckets gravel				
	5	Bags Bitonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Well Bottom 102'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.



3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-48 Detail.dwg November 6, 2008 2:30:47 pm (rms)
K:\Allied Waste\

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

WELL DETAIL
PGW-48
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-48 Detail.dwg	1

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

PGW-49
Boring No. 4

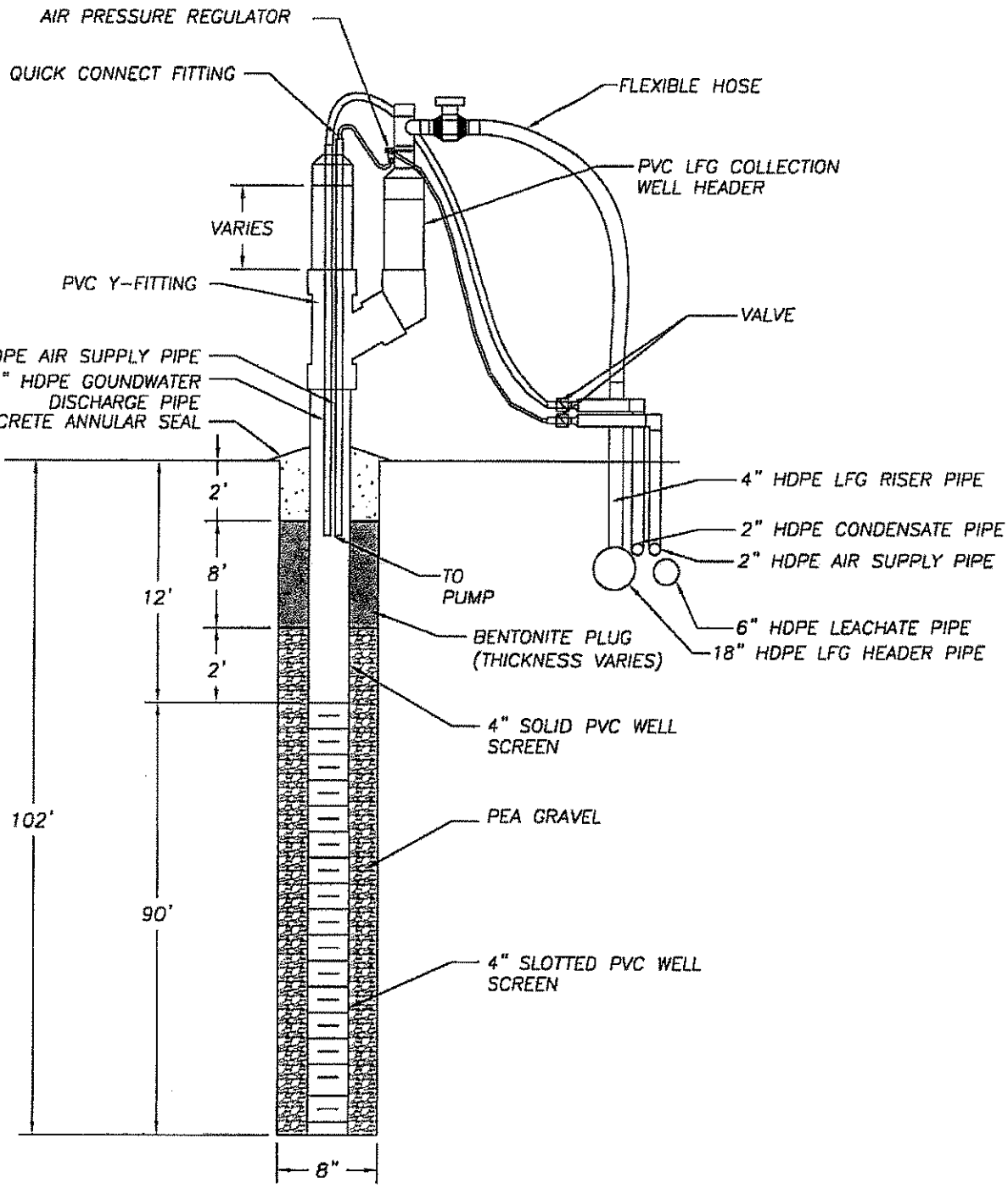
Project Bridgeton L F Job No. 87 8445 Date 8 (10-13) 08

Location Bridgeton MO Crew Bill Pinson Jeff Litch

Drilling Method: ☐ HSA ☐ CFA ☑ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid P4 mobil bigers 8" drum bit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	24'	Red clay Sand mix				
24	28'	Brown sand				
28'		Bed Rock				
28	50'	Fractured limestone gray				
50	60'	Brown limestone Maybe Sand mix				
60	70'	Brown limestone Drill very Fast				
2	100'	gray Fractured limestone				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 top cap				
	1½	Buckets gravel				
	5	Bags Bitonite Chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.
At Completion ____ ft.	Well Bottom 102'
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-49
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-49 Detail.dwg	1

K:\Allied Waste\Bri... 3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-49 Detail.dwg November 6, 2008 2:31:29 pm (rho)

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

PGW-50 Boring No. 3

Project Bridgeton Land Fill Job No. 87 8448 Date 8 (11-12) 08

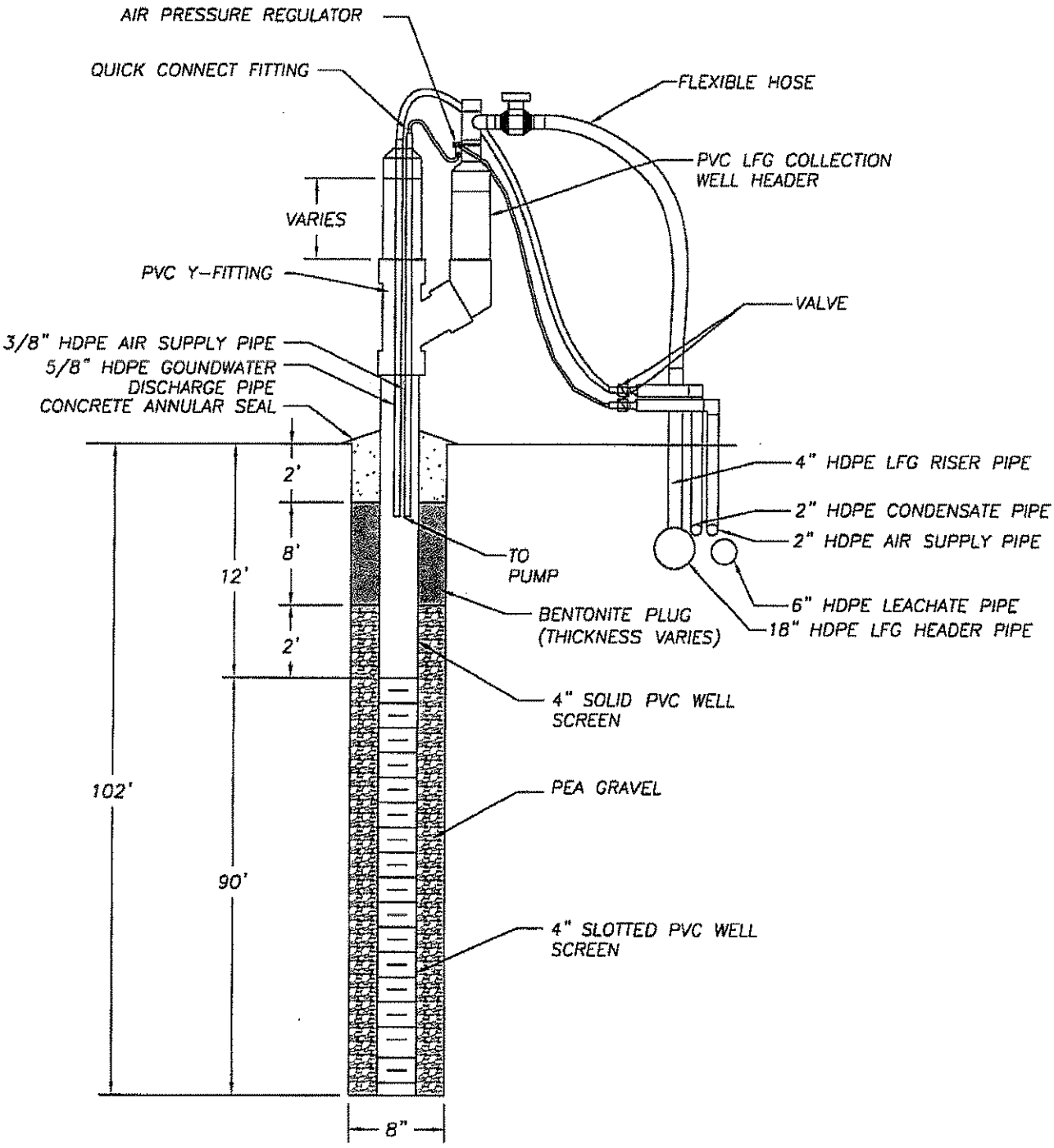
Location Bridgeton MO Crew Bill Finsch Jeff Litch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼" Mobil Rigus 8" hammBit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	20'	Red clay				
20	31'	Brown sand				
31'		Bed Rock				
31	47'	Fractured gray limestone				
47	50'	Small Shale Fracturing				
50	60'	Fractured gray limestone				
2	62'	Shale layer				
62	95'	Fractured gray limestone				
95	102'	Mix of the same maybe with Sand layering				
	1	4" SCH80 Bottom Cap				
	9	4" SCH 80 10' screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 Top cap				
	1½	Buckets gravel				
	5	Bags Bitowite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Well Bottom 102'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-50
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	Date	File Name	Drawing No.
No Scale	10/24/08	3038.10 PGW-50 Detail.dwg	1

3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-50 Detail.dwg November 6, 2008 2:31:52 pm (rho)
K:\Allied Waste\

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

PGW-51
Boring No. 2

Project Bridgeton L.F. Job No. 87 8445 Date 8(5-11)08

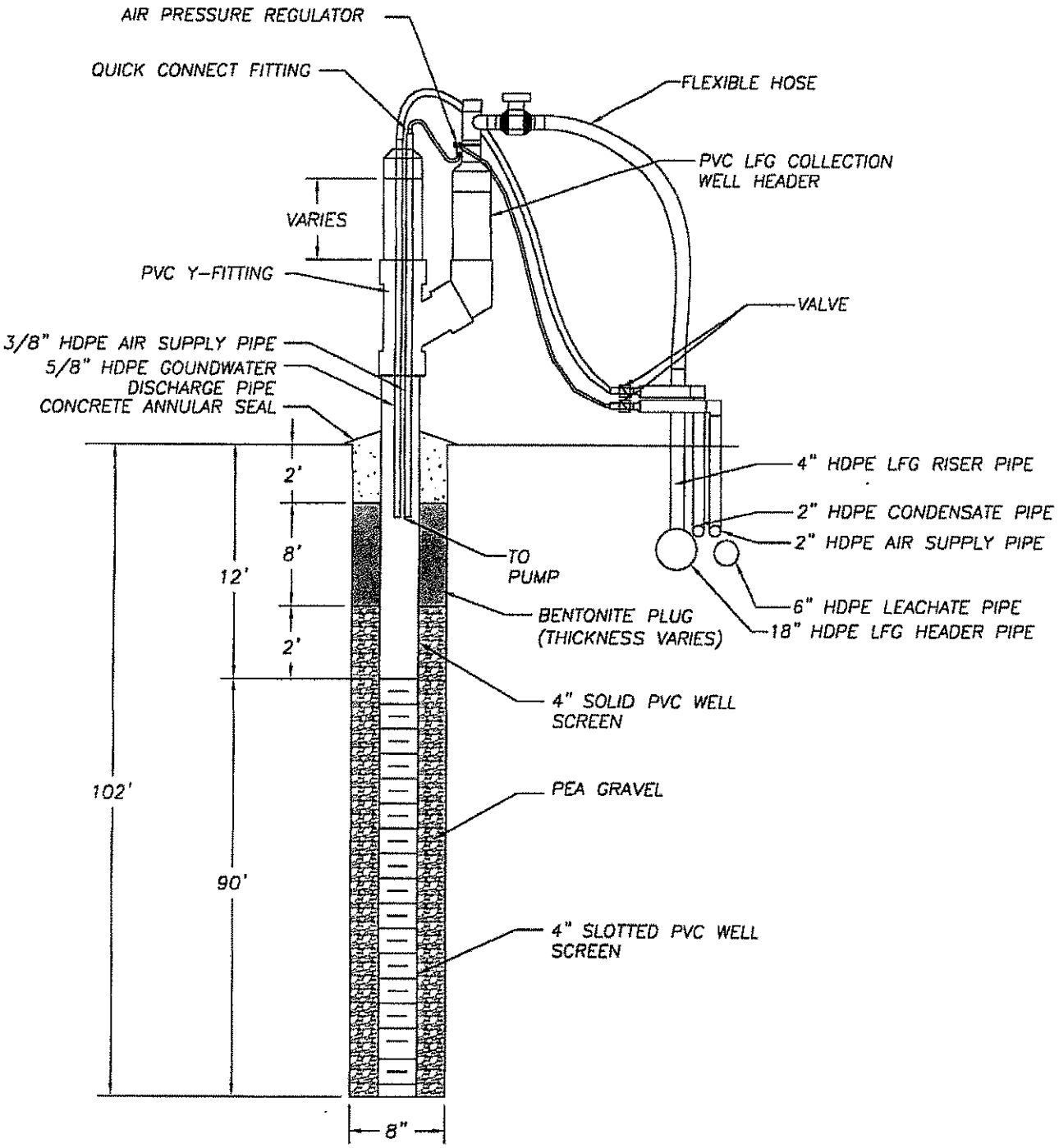
Location Bridgeton MO Crew Bill Pinson Jeff Fitch

Drilling Method: ☐ HSA ☐ CFA ☐ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid _____

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	28'	Clays & sands overburden				
28'		Bed Rock				
28	58'	Fractured gray limestone				
58	61'	Shale layerings				
61'	70'	Fractured limestone				
70	102'	Fractured gray limestone Bottom of Drill Fast				
	1	4" SCH Bottom cap				
	9	4" SCH 10' Screen				
	1	4" SCH 10' Riser				
	1	4" SCH 5' Riser				
	1	4" SCH top cap				
	1½	Buckets gravel				
	5	Bags Bentonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling _____ ft.	Well Bottom 102'
At Completion _____ ft.	
After _____ hrs. _____ ft.	
After _____ hrs. _____ ft.	
After _____ hrs. _____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth _____ ft.



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-51
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-51 Detail.dwg	1

K:\Allied Waste\3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-51 Detail.dwg November 6, 2008 2:33:51 pm (rha

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

52 #1
Boring No. PGW-52

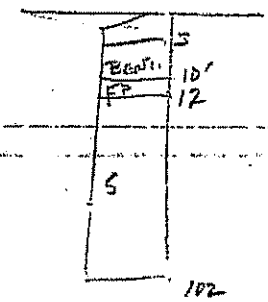
Project Bridgeton L.F. Job No. 87 8445 Date 8-7-08

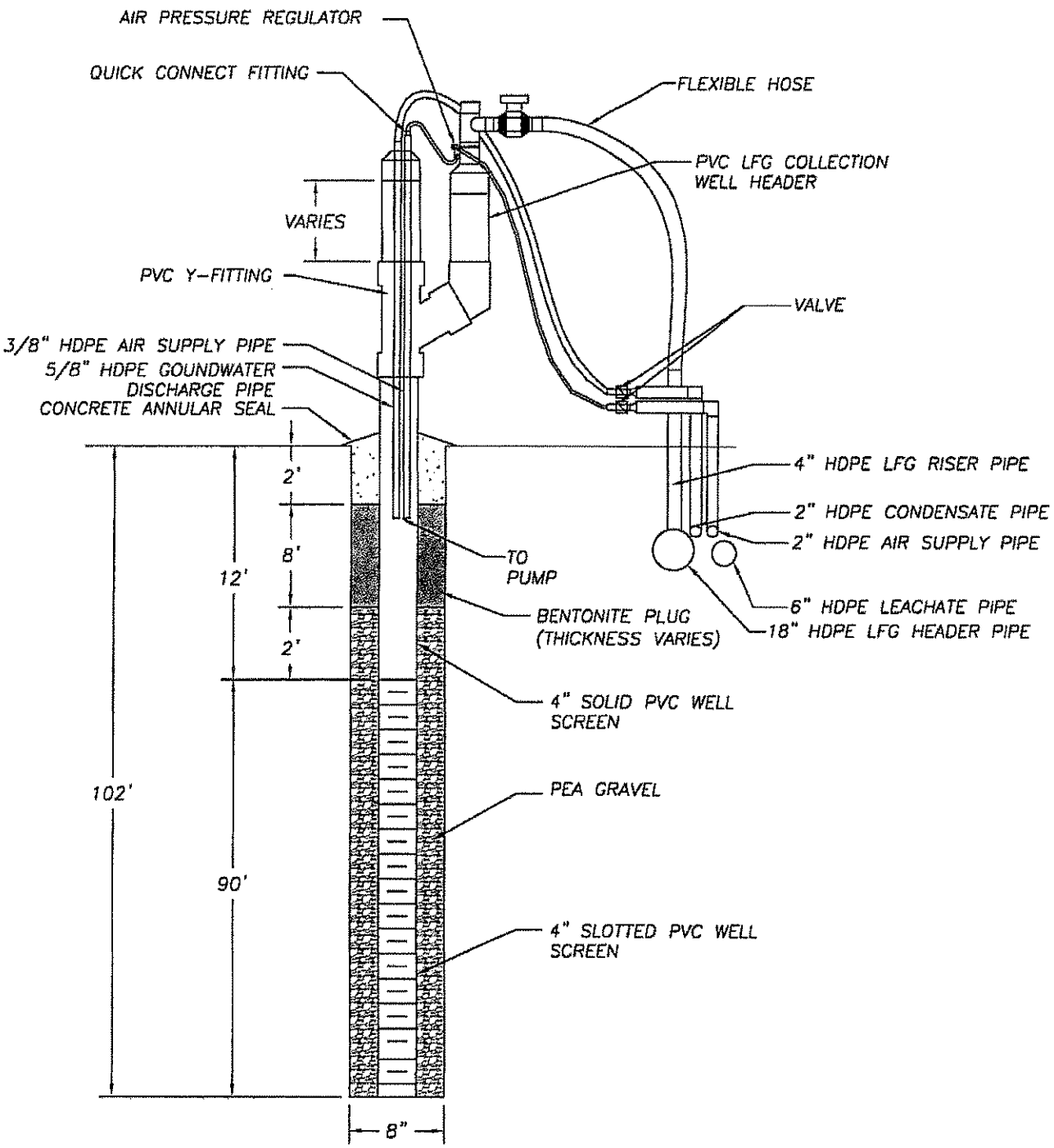
Location Bridgeton MO. Crew Bill Pinson JEFF Litch.

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ Augers 8" hammer to 8'

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	32'	overburden Red green clay				
32	60'	weathered gray limestone				
60	62'	Broken green Shale				
62	70'	Back to Broke limestone				
70	90'	gray limestone				
90	102'	SOFT limestone Sandstone MIX				
	102	Bottom From elevation				
		SET 90' SCH 80 4" Screen				
		SET 15' SCH 80 4" Riser 3' exposed				
		gravel to 10'				
		& chip to 3'				
		1 Bottom Cap				
		1 top cap				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.
Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	





AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-52
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	Date	File Name	Drawing No.
No Scale	10/24/08	3038.10 PGW-52 Detail.dwg	1

K:\Allied Waste\Br... 038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-52 Detail.dwg November 6, 2008 2:34:11 pm (rta.

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

Boring No. 13
PGW-53

Project Bridgeton Landfill Job No. 8 8445 Date 8-20-08

Location Bridgeton MO Crew Bill Pinson Jeff Litton

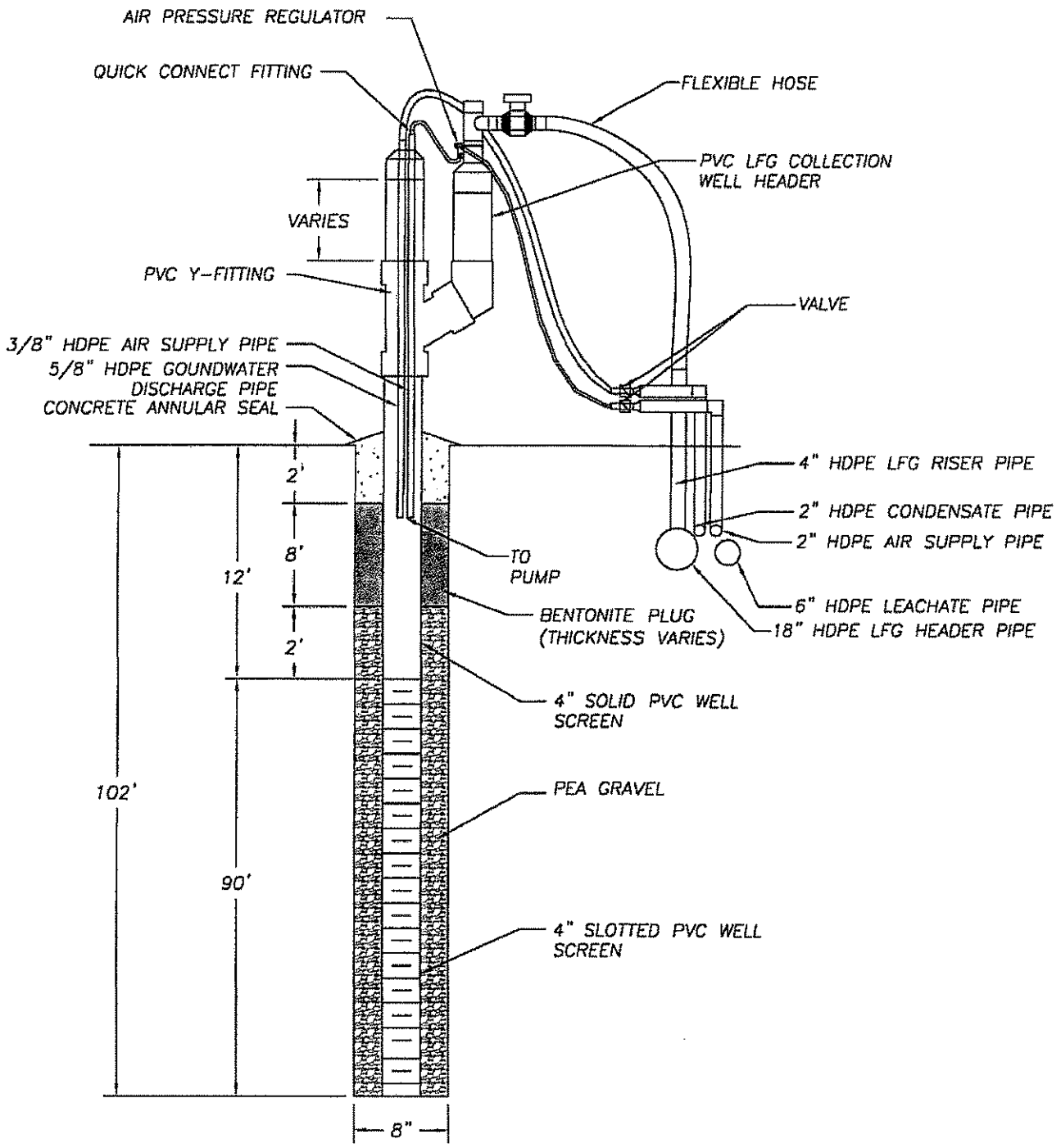
Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ mobil Agers 8" hsa & BIT

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	22'	overburden light Brown clays				
22	32'	Dark green wet clay some trash	Strong odor			
	32'	Bedrock				
32	60'	weathered green limestone				
60	60'	Shale				
60	70'	Broken limestone				
3	90'	light gray limestone				
90	100'	SOFT limestone Bottom				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' screens				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 Top Cap				
	1 ½	Buckets Gravel				
	5	Bags Bentonite Chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Well Bottom 100'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.

LW 704 3/00



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-53
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-53 Detail.dwg	1

K:\Vified Waste\Bridgeton\3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-53 Detail.dwg November 6, 2008 2:34:29 pm (rho)

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

Boring No. 14
PGW-54

Project Bridgeton Landfill Job No. 87 8445 Date 8-20-08

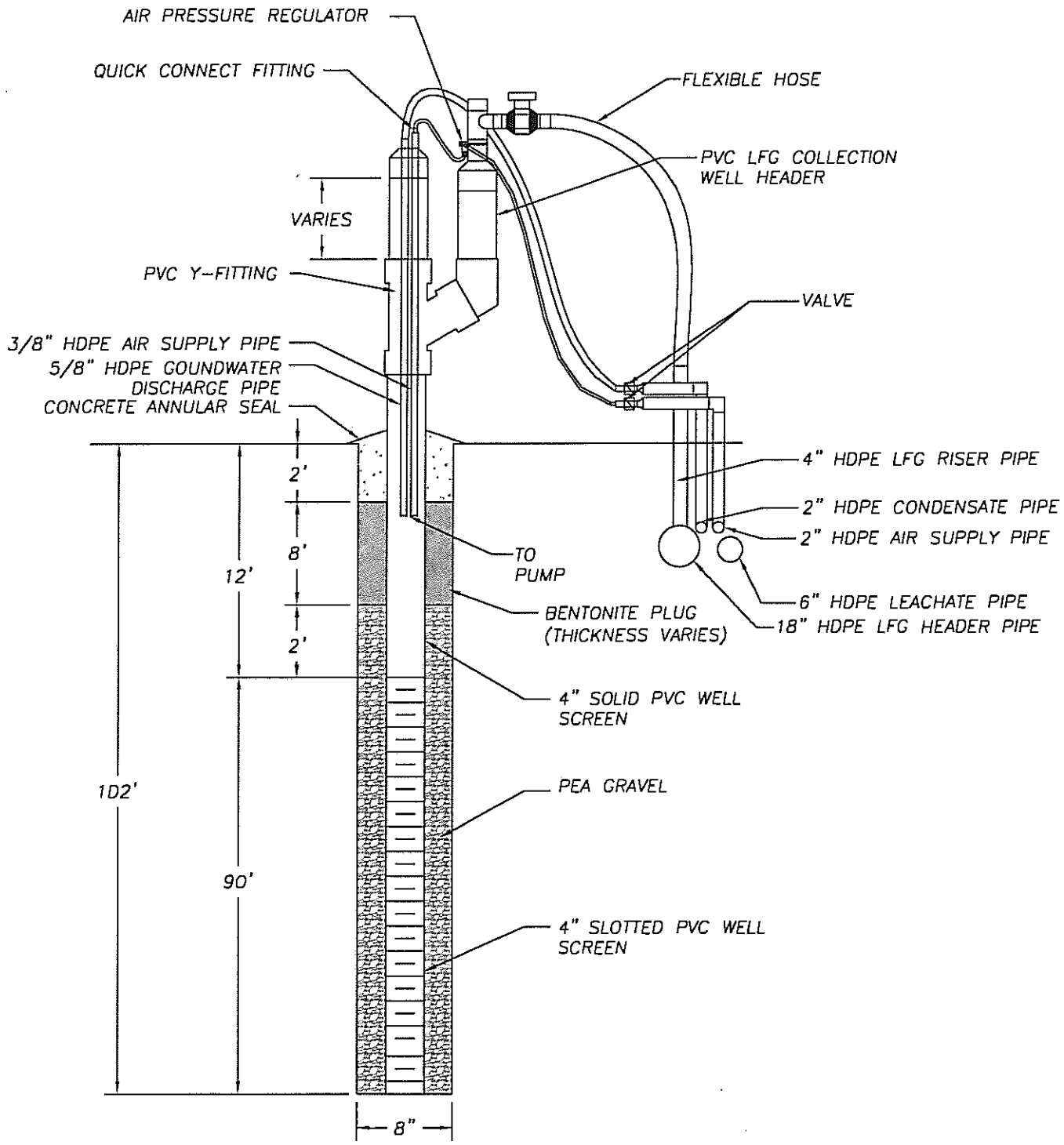
Location Bridgeton MO Crew Bill Pinson Jeff Litch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼" Mobil Auger 8" Mandrill

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	10'	Brown Clay				
10	28'	Dark green clay mix with Trash	Strong odor			
	28'	Bed Rock				
28	100'	gray limestone No Fracturing or limited				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' Screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 top Cap				
	1½	Buckets gravel				
	5	Bags Bentonite Chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.
At Completion ____ ft.	Well Bottom 102'
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

LW-794 9/99



AQUATERRA

ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-54
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-54 Detail.dwg	1

K:\Allied Waste\Bridg 3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-54 Detail.dwg November 6, 2008 2:34:47 pm (rho)

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

Boring No. 15 (58)
PGW - 55

Project Bridgeton Landfill Job No. 87 8145 Date 8-02-08

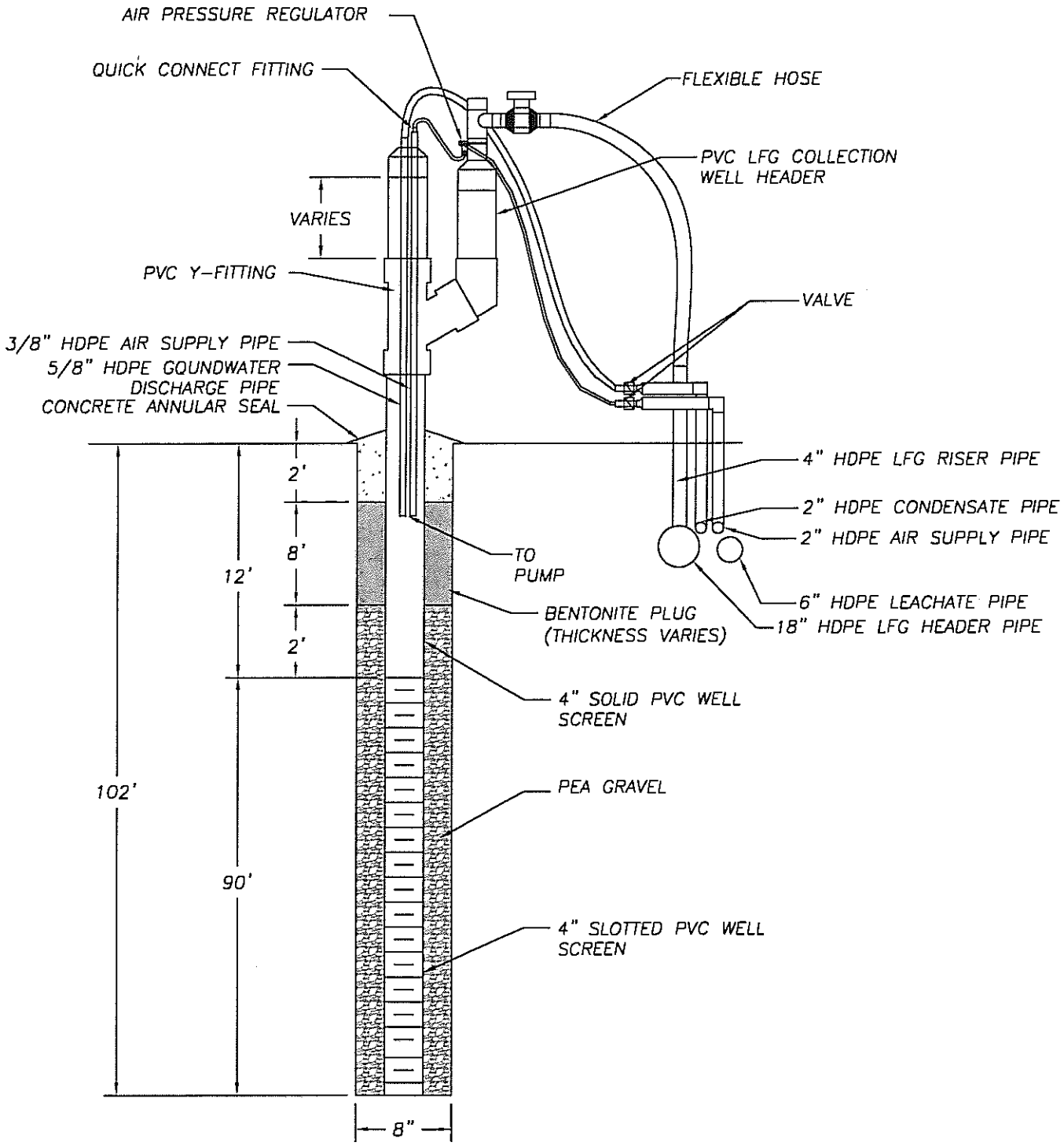
Location Bridgeton MO Crew Bill Pinson Jeff Hitch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼" mobil Augers 8" hamrBIT

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	10'	Brown clay Overburden.				
10	28'	Green clay heavy trash Deposits	Strong odor			
28'	60'	Gray limestone limited Fracturing				
60	100'	Gray limestone				
	1	4" SCH 80 Bottom cap				
	9	4" SCH 80 10' screens				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 Top cap				
	1½	Bucket gravel				
	5	Bags Bentonite Chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling _____ ft.	Plezometer Installed: ☐ No ☐ Yes - Depth _____ ft.
At Completion _____ ft.	Bottom well 102'
After _____ hrs. _____ ft.	
After _____ hrs. _____ ft.	
After _____ hrs. _____ ft.	

LW-784 9/00



AQUATERRA

ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-55
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-55 Detail.dwg	1

K:\Allied Waste\Bridgeton\3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-55 Detail.dwg November 6, 2008 2:35:09 pm (mo)

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

Boring No. 34 # 16
PAW-56

at Bridgeton L.F. Job No. 87 8415 Date 8-25-08

tion Bridgeton MO Crew Bill Pinson Jeff Litch

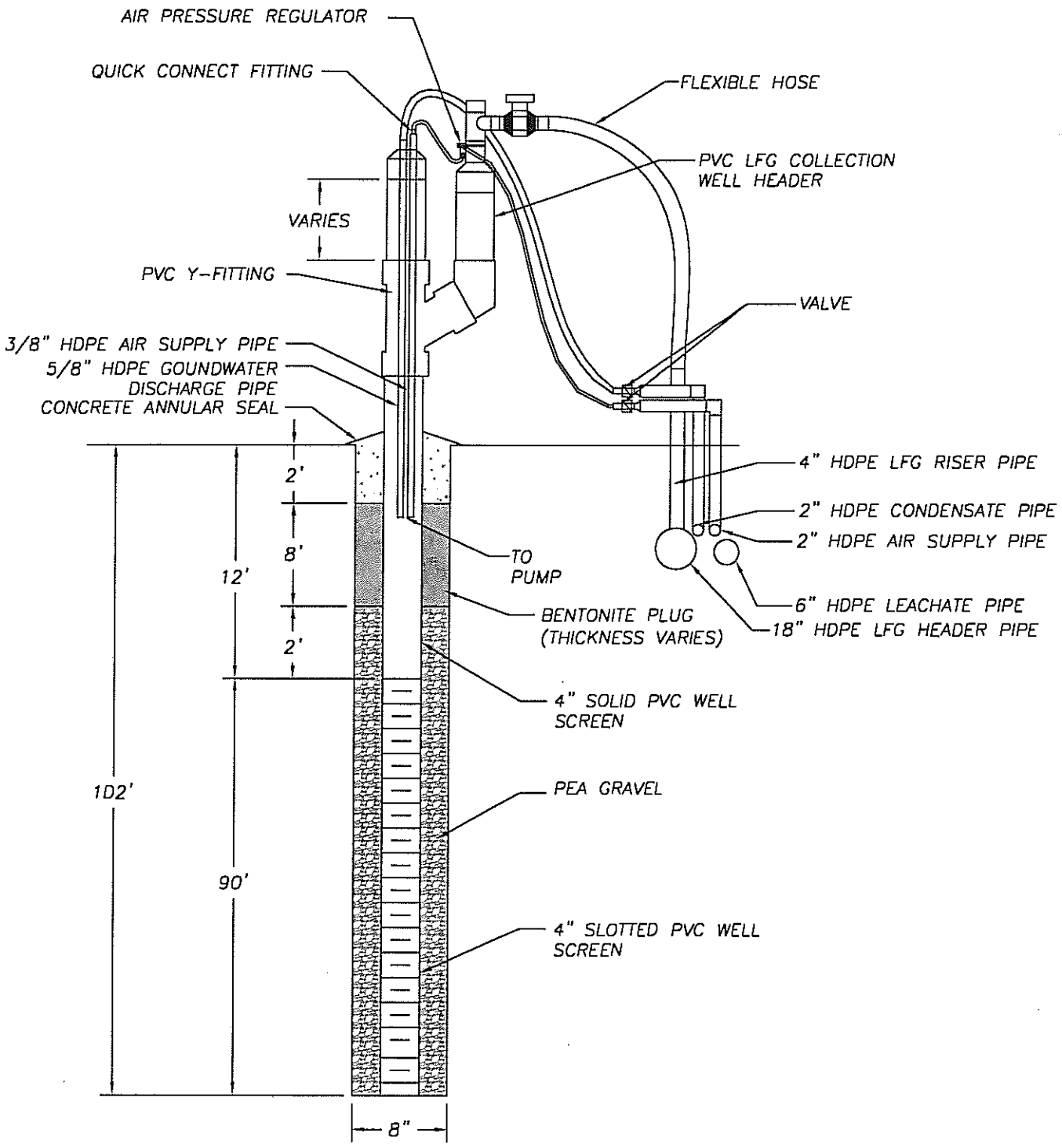
ing Method: ☐ HSA ☐ CFA ☐ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ Mobil Augers 8" Hamm Bit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	30'	Overburden Trash				
30	60'	Weathered gray limestone				
60	63'	green shale				
33	70'	Broken Gray limestone Trash Smell				
70	90'	gray limestone Stable Trash Smell				
90	102'	very easy Drill. limestone Trash Smell				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' Screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 Top Cap				
	1½	Buckets gravel				
	8	Bags Bentonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Well Bottom 102'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.

LW 704 3/99



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-56
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-56 Detail.dwg	1

K:\Allied Waste\Brid, 1038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-56 Detail.dwg November 6, 2008 2:36:58 pm (rho,

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

Boring No. 36 # 17
PGW-57

Project Bridgeton L.F. Job No. 878445 Date 8-25-08

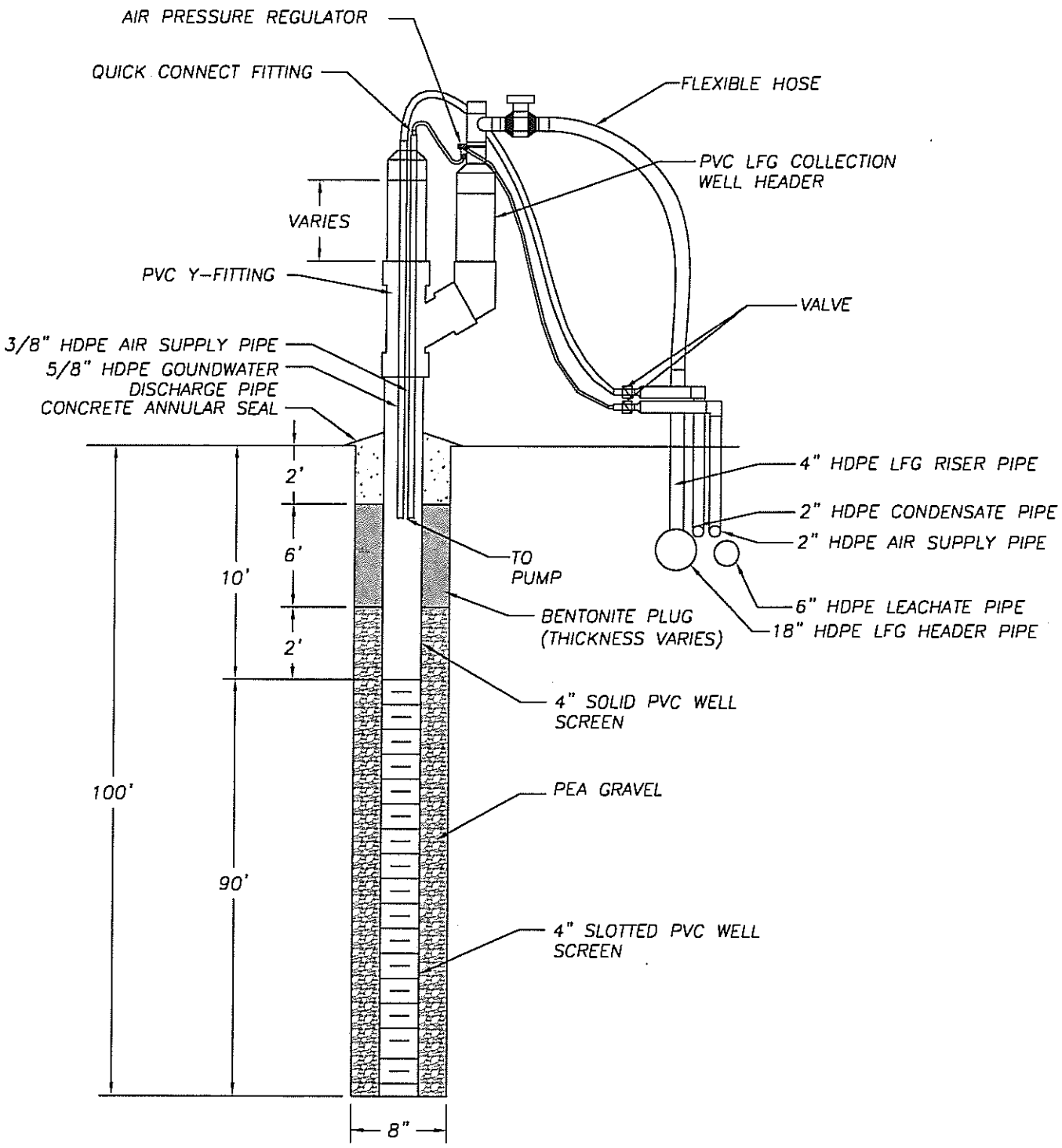
Location Bridgeton MO Crew Bill Pinson Jeff Hitch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ metal Augers 8" main 8" Bit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	30'	trash				
30	61'	weathered gray limestone				
61	62'	Shale				
62	70'	Broken gray limestone	trash smell			
70	80'	Broken gray limestone with Shale	trash Smell			
80	90'	gray limestone	trash Smell			
73	100	Broken very easily Drilled limestone				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' Screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 topcap				
	1½	Buckets Gravel				
	9	Bags Bentonite Chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling _____ ft.	Piezometer Installed: ☐ No ☐ Yes - Depth _____ ft.
At Completion _____ ft.	
After _____ hrs. _____ ft.	
After _____ hrs. _____ ft.	
After _____ hrs. _____ ft.	

LW-704 2/00



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-57
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-57 Detail.dwg	1

K:\Allied Waste\Brid... 3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-57 Detail.dwg November 6, 2008 2:37:19 pm (rho.

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

35 # Boring No. 18
PGW-58

Project Bridgeton L.F. Job No. 87-8445 Date 9-2-08

Location Bridgeton MO Crew Bill Pinson Jeff Litch

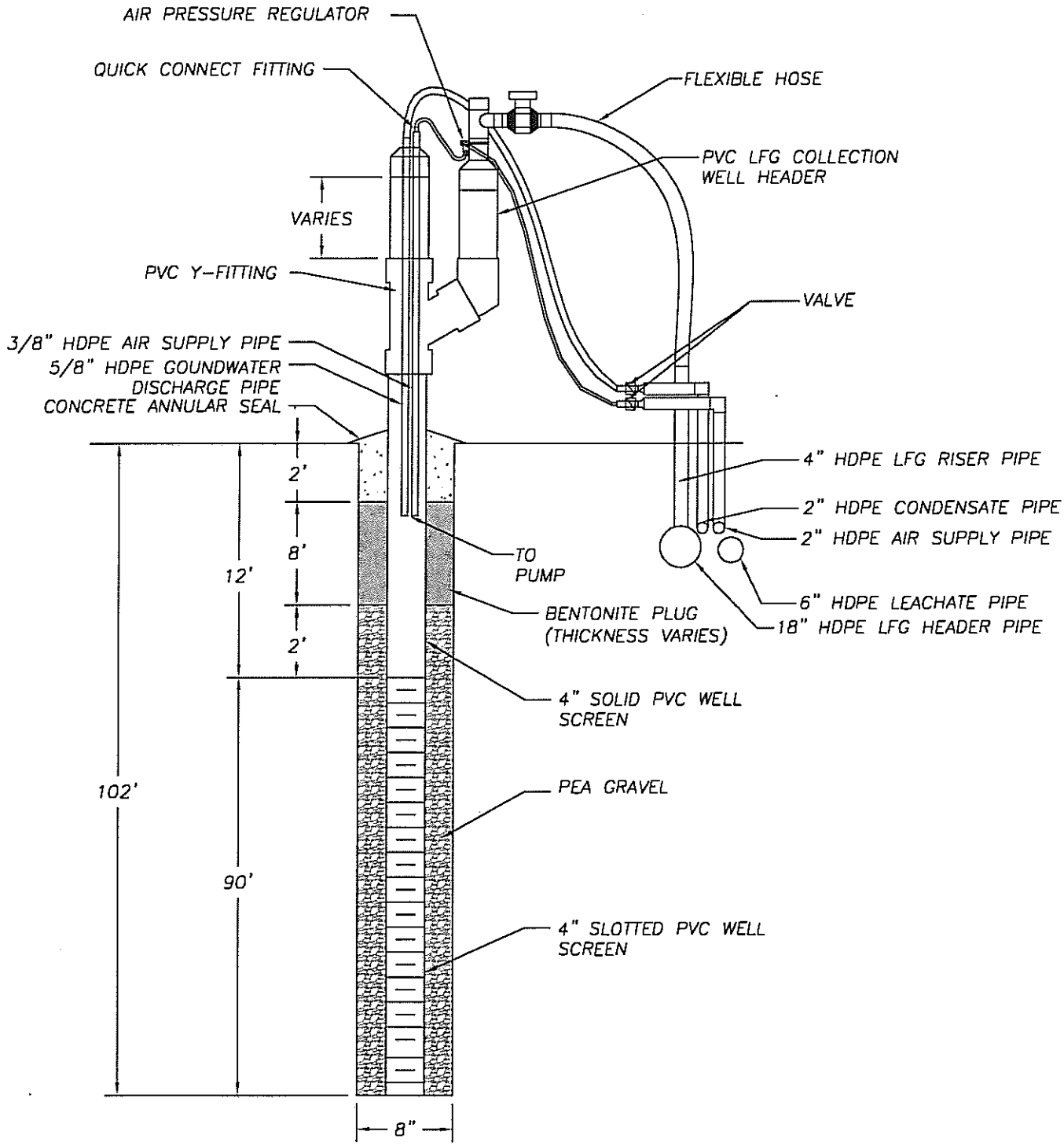
Drilling Method: ☐ HSA ☐ CFA ☐ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼ mobil Augers 8" Ream & 7" Bit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	33½'	trash Heavy odor				
33	61'	weathered gray limestone				
61	67'	oil shale to limestone trash smell				
67	80'	Broken gray limestone				
80	90'	limestone				
90	102'	Broken easy Drilled limestone				
	i	4" SCH 80 top Cap				
	9	4" SCH 80 10' Screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 Bottom Cap				
	1½	Buckets gravel				
	9	Bags Bentonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Bottom PVC 102'
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.

LW-784 3/90



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-58
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-58 Detail.dwg	1

K:\Allied Waste\Bridg 3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-58 Detail.dwg November 6, 2008 2:37:35 pm (rho)

✓

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

34 Boring No. # 19
PAW-59

Project Bridgeton L.F. Job No. 87-8415 Date 8-29-08

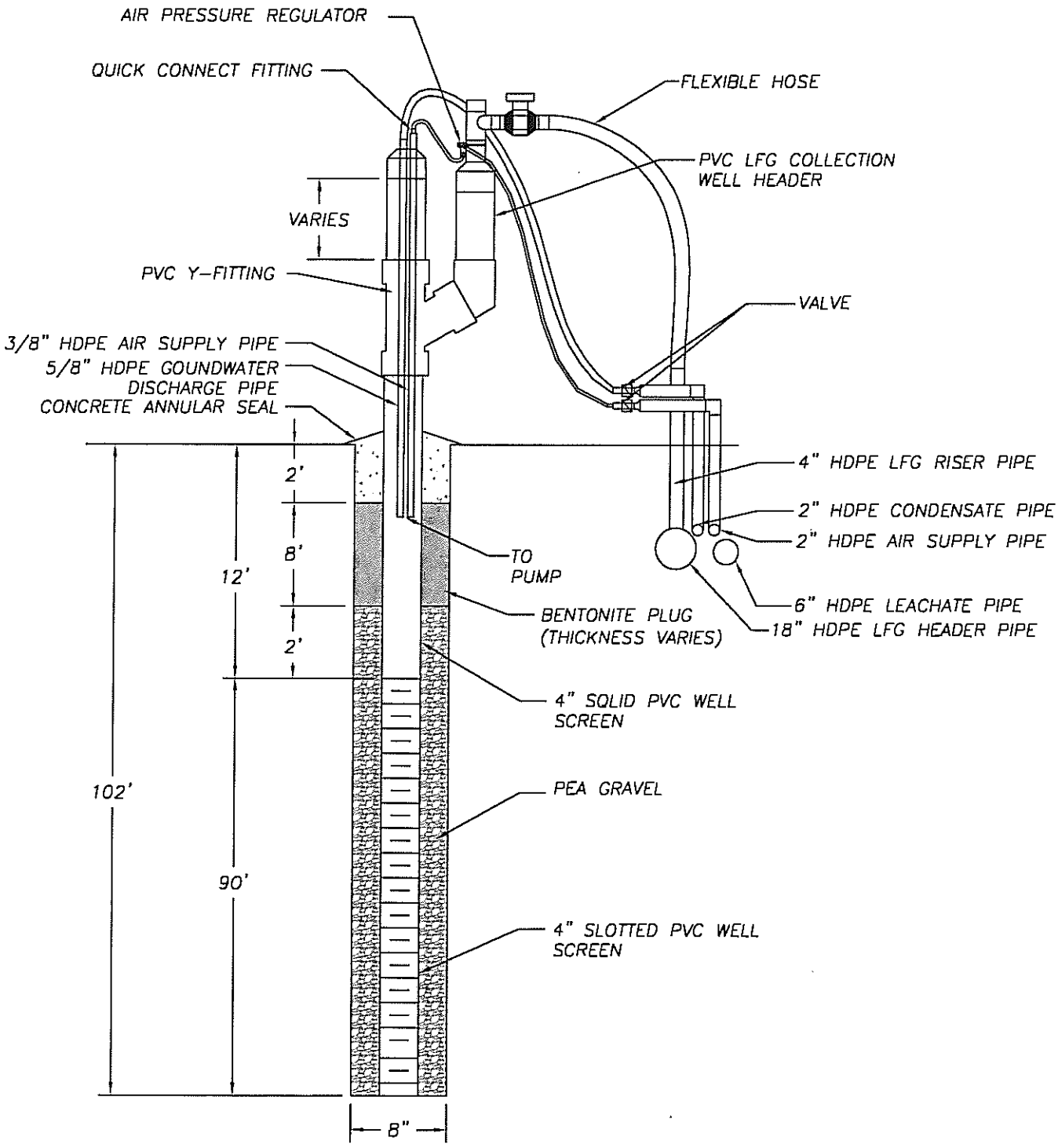
Location Bridgeton MO Crew Bill Pinson Jeff Litch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼" mud Augers 8¼ hammer Bit

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	31'	Trash				
31	60'	Broken limestone trash smell				
		very close to Quarry wall trash smell				
60	70'	Broken gray limestone. trash smell				
70	80'	Broken shale limestone mix trash smell				
80	90'	Broken limestone. trash smell				
90	100	Broken limestone, Sandstone mix trash smell				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' Screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 Top Cap				
	1½	Buckets Gravel				
	9	Bags Bentonite chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.
At Completion ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	

LW-794 9/90



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-59
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	Date	File Name	Drawing No.
No Scale	10/24/08	3038.10 PGW-59 Detail.dwg	1

K:\Allied Waste\Bridgeton\3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-59 Detail.dwg November 6, 2008 2:37:55 pm (rho

Layne-Western Company

A Layne Company
2399 Cassens Drive • Fenton, Missouri 63026

FIELD BORING LOG

33
Boring No. MW-60
PGW-60

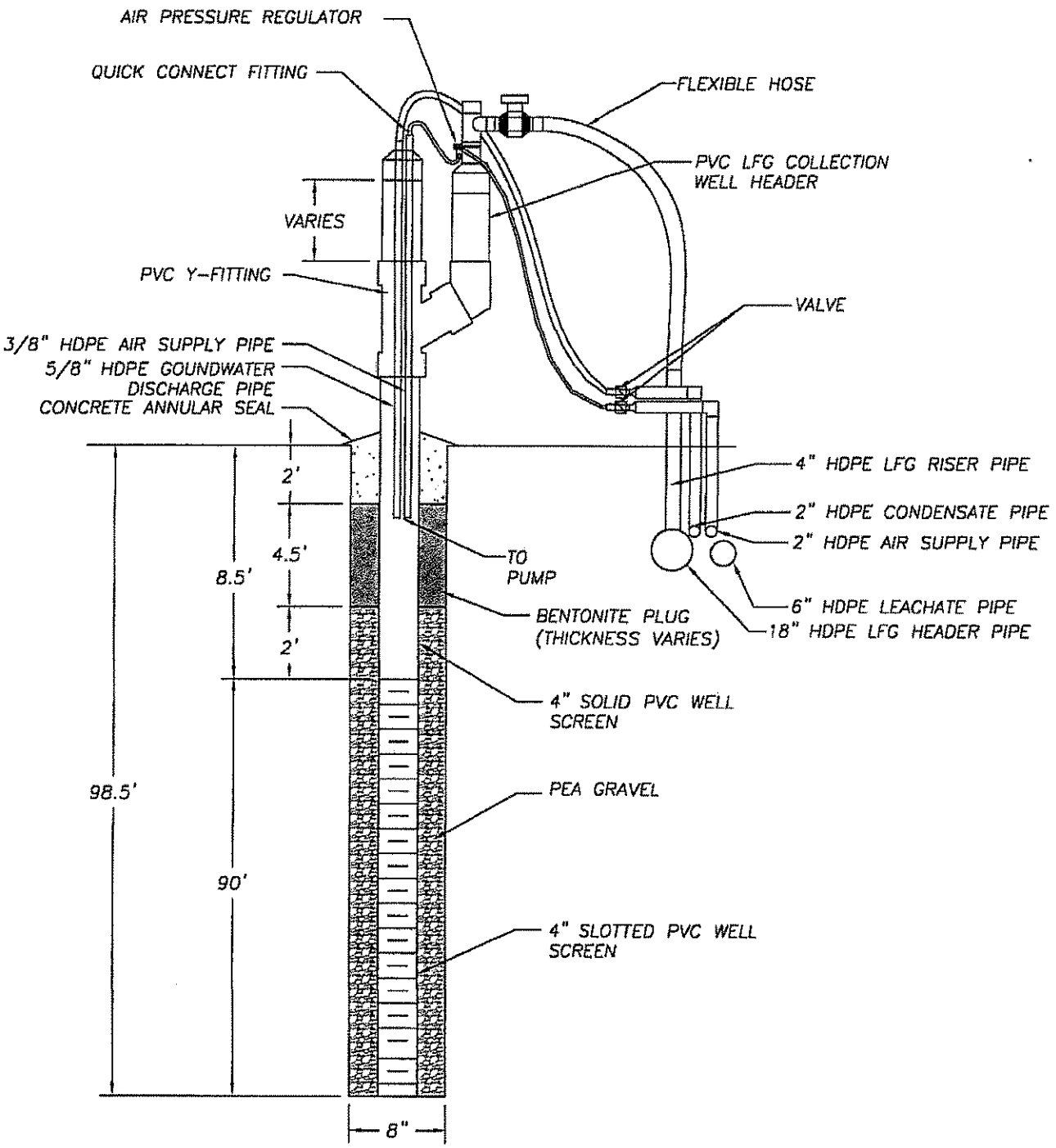
Project Bridgeton L.F. Job No. 87 8445 Date 8-26-08

Location Bridgeton MO Crew Bill Pinson Jeff Litch

Drilling Method: ☐ HSA ☐ CFA ☒ Rotary Wash ☐ Rock Coring ☐ Drilling Fluid 8¼" mobil Augers 8" pan 8" Bi

DEPTH, ft. From	DEPTH, ft. To	DESCRIPTION	Sample Type	Sample Depth, ft.	Sample Recovery	SPT Blows N/6"
0	102'	Trash				
0	12'	NO Fluid				
12	102'	leach aid				
		well set at 98½'				
	1	4" SCH 80 Bottom Cap				
	9	4" SCH 80 10' Screen				
	1	4" SCH 80 10' Riser				
	1	4" SCH 80 5' Riser				
	1	4" SCH 80 top Cap				
	1½	Buckets Gravel				
	9	Bags Bentonite Chips				

WATER LEVEL OBSERVATIONS	NOTES
During Drilling ____ ft.	Piezometer Installed: ☐ No ☐ Yes - Depth ____ ft.
At Completion ____ ft.	well Bottom 98½'
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	
After ____ hrs. ____ ft.	



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Hieghts, Illinois 62208

WELL DETAIL
PGW-60
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr.	Drawn By	Designed By	Project No.
TKJ	RLH	RLH	3038.10
Scale	**Date**	**File Name**	**Drawing No.**
No Scale	10/24/08	3038.10 PGW-60 Detail.dwg	1

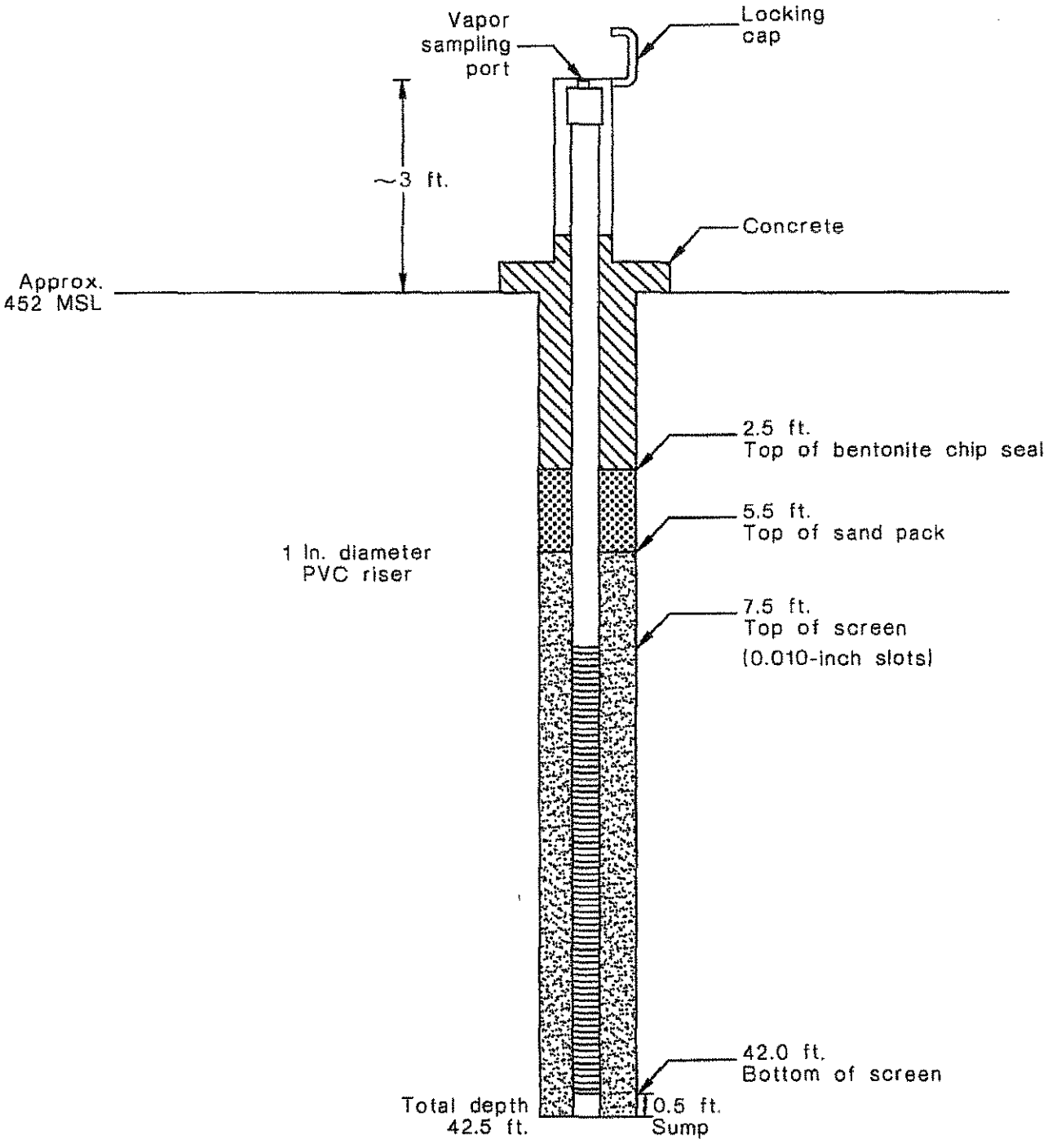
K:\Allied Waste\a... 3038.10 - 2008 PGW Installation\PGW Details\3038.10 PGW-60 Detail.dwg November 6, 2008 2:38:12 pm (ma...

TABLE 1
PERIMETER LANDFILL GAS WELL COORDINATES
CONSTRUCTION QUALITY ASSURANCE REPORT
BRIDGETON LANDFILL
BRIDGETON, MISSOURI

Point Number	Northing	Easting	Elevation	Description
2001	1067873.283	516609.979	479.78	4" Riser
2002	1067869.400	516614.860	483.39	PGW-41 ground
2003	1067869.440	516614.920	486.03	Top of Cap
2004	1067916.862	516664.221	477.06	4" Riser
2005	1067916.937	516664.202		7.75' offset perpendicular to header
2006	1067911.471	516667.284	481.80	PGW-42 ground
2007	1067911.471	516667.284	485.04	Top of Cap
2008	1067964.660	516727.150	475.90	4" Riser
2009	1067959.247	516730.698	480.96	PGW-43 ground
2010	1067959.247	516730.898	483.21	Top of Cap
2011	1068012.640	516784.270	476.24	4" Riser
2012	1068006.541	516787.758	480.64	PGW-44 ground
2013	1068006.541	516787.758	483.23	Top of Cap
2014	1068057.500	516841.960	477.66	4" Riser
2015	1068051.040	516844.760	481.23	PGW-45 ground
2016	1068051.040	516844.760	483.89	Top of Cap
2017	1068068.525	516856.192	482.49	Existing clean-out
2018	1068070.300	516858.270	484.39	Existing 6" leachate clean-out
2019	1068078.414	516866.545	482.92	PGW cut-off valve for PGW-41 through 53
2020	1068132.510	516872.100	479.63	4" Riser
2021	1068137.182	516878.377	482.75	PGW-46 ground
2022	1068137.182	516878.377	485.71	Top of Cap
2023	1068190.250	516823.900	480.44	4" Riser
2024	1068193.900	516829.065	483.93	PGW-47 ground
2025	1068193.900	516829.065	486.43	Top of Cap
2026	1068249.550	516776.110	482.19	4" Riser
2027	1068253.376	516781.769	484.73	PGW-48 ground
2028	1068253.376	516781.769	487.64	Top of Cap
2029	1068307.900	516729.760	482.34	4" Riser
2030	1068312.136	516736.260	486.52	PGW-49 ground
2031	1068312.136	516736.260	489.24	Top of Cap
2032	1068371.023	516691.288	487.01	4" Riser
2033	1068376.758	516694.420	486.29	PGW-50 ground
2034	1068376.758	516694.420	488.66	Top of Cap
2035	1068436.443	516648.621	488.79	4" Riser
2036	1068440.487	516653.168	488.72	PGW-51 ground
2037	1068440.487	516653.168	491.70	Top of Cap
2038	1068500.061	516613.940	490.55	4" Riser
2039	1068501.722	516620.725	489.42	PGW-52
2040	1068501.722	516620.725	491.81	Top of Cap
2041	1068540.381	516628.727	489.70	4" Riser
2042	1068536.980	516635.413	489.55	PGW-53
2043	1068536.980	516635.413	491.60	Top of Cap
2044	1068592.806	516643.611	492.32	4" Riser
2045	1068583.415	516649.371	490.22	PGW-54
2046	1068583.415	516649.371	493.43	Top of Cap
2047	1068638.901	516707.113	492.91	4" Riser
2048	1068632.244	516711.275	490.70	PGW-55
2049	1068632.244	516711.275	494.32	Top of Cap
2050	1068686.584	516765.300	492.07	4" Riser
2051	1068679.836	516768.837	490.69	PGW-56
2052	1068679.836	516768.837	494.66	Top of Cap
2053	1068729.600	516824.520	488.13	4" Riser
2054	1068724.754	516827.415	486.46	PGW-57
2055	1068724.754	516827.415	491.83	Top of Cap
2056	1068784.620	516872.310	484.36	4" Riser
2057	1068781.425	516877.148	487.10	PGW-58
2058	1068781.425	516877.148	490.12	Top of Cap
2059	1068796.116	516880.812	486.78	PGW cut-off valve for PGW-54 through 60
2060	1068829.160	516897.230	478.75	4" Riser
2061	1068828.149	516903.758	482.58	PGW-59
2062	1068828.149	516903.758	486.46	Top of Cap
2063	1068898.570	516881.250	473.94	4" Riser
2064	1068906.348	516883.049	474.82	PGW-60
2065	1068906.348	516883.049	478.33	Top of Cap
2066	1068887.797	516876.313	477.12	Top of Condensate Trap
2067	1068367.811	516684.154	489.07	Top of Condensate Trap

LANDFILL GAS MONITORING PROBES

GMP-1
As Built Diagram



(Not to Scale)

All depths relative to ground surface

2206S-BL
GMP
GMP-1

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 146363	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: Bridgeton Landfill Authority | WELL NUMBER: GMP-1

SITE ADDRESS: 13570 St. Charles Rk Rd | CITY: Bridgeton | STATE: Mo | ZIP CODE: 63042

OWNER NAME: Same | TELEPHONE: 314 739 1929

OWNER ADDRESS: | CITY: | STATE: | ZIP CODE:

VARIANCE ISSUED: ☑ YES ☐ NO | DATE ISSUED: 10-23-97 | VARIANCE NUMBER: V 833

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT: South Side of Landfill Old St. Charles Rk Rd - Rock Gate

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT | COUNTY: St. Louis | SURFACE ELEVATION: +478

SMALLEST ¼ | LARGEST ¼

SEC. ____ TWN. ____ N.RNG. ____ E OR W

LAT. 92° 26' 34" LONG. 38° 46' 12"

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: Layne-Western | PERMIT NUMBER: 00126/ SAMPM

DRILLING CONTRACTOR'S NAME: Layne-Western | PERMIT NUMBER: 00126/ SAMPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☐ PIEZOMETER ☑ OTHER GAS Probe

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☑ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☑ OTHER GAS ONLY

PROTECTIVE CASING DETAILS (IF USED)

LENGTH	DIAMETER OF CASING	WEIGHT OR SDR #	DIAMETER AND DEPTH OF DRILL HOLE	JOINTS	MATERIAL	LOCKING CAP?
5 FT.	6 IN.	40	9.5 x 2 FT. IN.	☐ MECHANICAL ☐ THREADED ☑ WELDED ☐ OTHER	☑ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER TYPE	☑ YES ☐ NO

CAP VENTED: ☐ YES ☑ NO | WEEP HOLE? ☑ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☑ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3' FT.

TYPE OF SURFACE COMPLETION: ☑ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: N/A

CENTRALIZER USED ON RISER: ☑ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS

LENGTH	DIAMETER OF RISER PIPE	WEIGHT OR SDR #	DIAMETER OF DRILL HOLE	JOINTS	MATERIAL
13 FT.	1 IN.	SDR	6 IN.	☐ MECHANICAL ☑ THREADED ☐ WELDED ☐ OTHER ____	☑ THERMO PLASTIC ☐ FLUORO POLYMER ☐ STEEL ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☑ BENTONITE SLURRY ☐ NON SLURRY BENTONITE ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL. TYPE: ____

BENTONITE SEAL: MATERIAL BENTONITE ☐ SLURRY ☑ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL: 3 | BENTONITE SEAL INSTALLED IN ☑ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☑ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE: 20/40 | LENGTH OF FILTER PACK: 37 FT. | METHOD OF INSTALLATION: Tremie

SECONDARY FILTER PACK: TYPE ☐ SAND ☐ MANUFACTURED ☑ NONE | GRAIN SIZE: — | LENGTH OF FILTER PACK: — FT. | METHOD OF INSTALLATION: —

WELL SCREEN: LENGTH OF SCREEN: 35 FT. | DIAMETER: 1 IN. | SLOT SIZE: 10 | WEIGHT OR SDR #: SCH 80 | MATERIAL ☑ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP: N/A | DIAMETER OF SUMP: — | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☑ NO | MATERIAL USED: — | LENGTH OF BACK FILLED BORE HOLE

Information in this column to be supplied in the Feet from Surface column

	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	2.5	0-25 Clay
Depth to Base of Annular Seal:	2.5	25-42 Shale
Depth to Base of Bentonite Seal:	2.5	
Depth to Top of Primary Filter Pack:	5.5	
Depth to Top of the Screen:	7.5	
Depth to Bottom of the Screen:	42.5	
Total Depth:	42.5	
DATE WELL DRILLING WAS COMPLETED	11-4-97	

STATIC WATER LEVEL: 24 FEET FROM MEASURING POINT | DATE OF STATIC WATER LEVEL: 11-4-97

MEASURING POINT FOR STATIC WATER LEVEL IS: ☐ TOP OF RISER PIPE ☐ OTHER Ground

ELEVATION OF MEASURING POINT: +478

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☑ AIR ROTARY ☐ AUGER TYPE ____ ☐ REVERSE ROTARY ☐ OTHER ____

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
[signature] 00274PM	1/25/98	[signature] 00126/ SAMPM	1-22-98

MO 780-1415 (7-95)

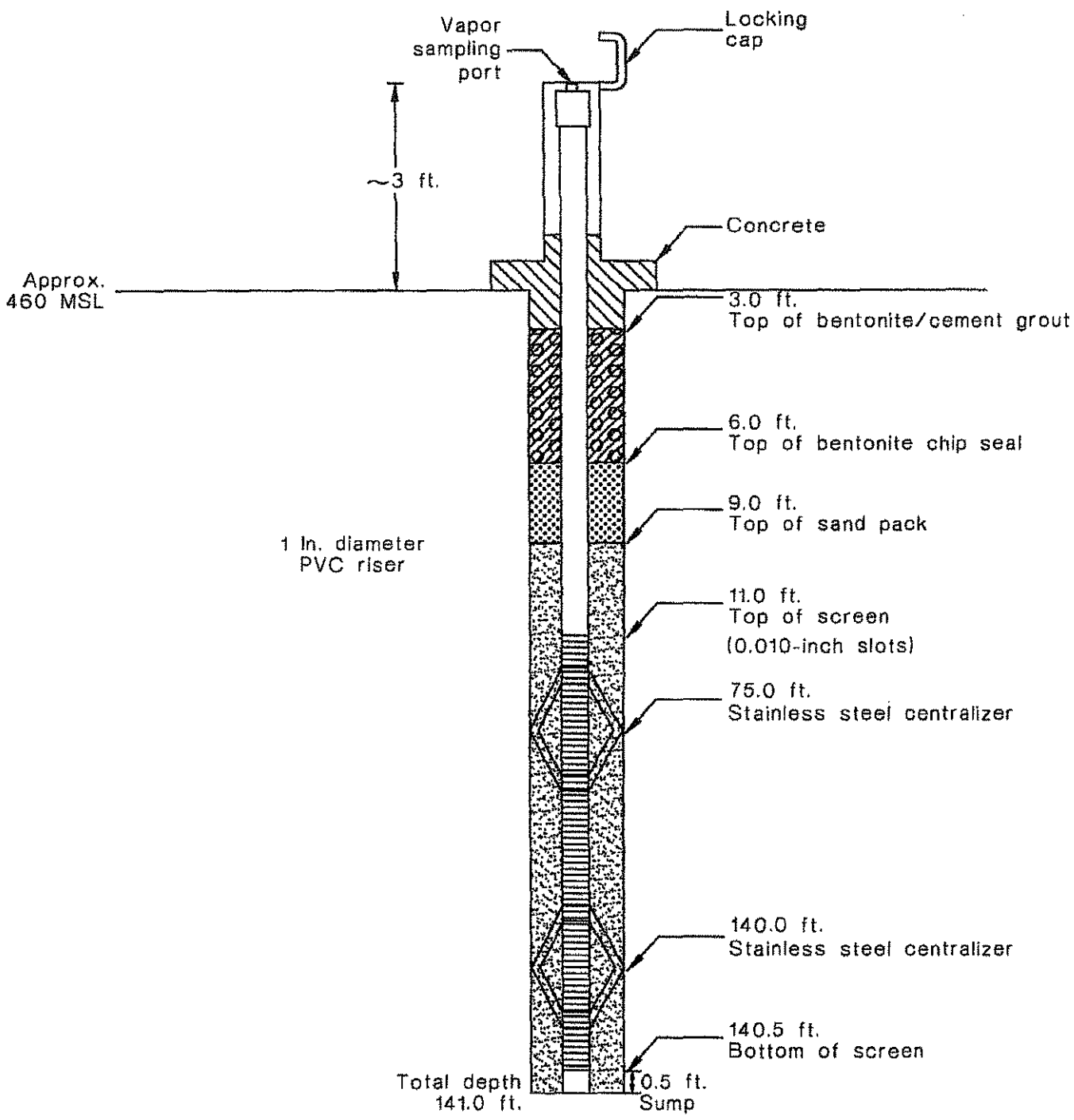
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402

ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

GMP-2
As Built Diagram



(Not to Scale)

All depths relative to ground surface

2206S-BL
GMP
GMP-2

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 162335	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Pg 1 Pg 2 Pg 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: Bridgeton Landfill Authority — WELL NUMBER: EMP-2

SITE ADDRESS: 13570 St Charles Rock Rd — CITY: Bridgeton — STATE: MO — ZIP CODE: 63042

OWNER NAME: Same — TELEPHONE: 314 739-1919

OWNER ADDRESS: — CITY: — STATE: — ZIP CODE:

VARIANCE ISSUED ☐ YES ☐ NO — DATE ISSUED: 10-23-97 — VARIANCE NUMBER: V833

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT: Old St Charles Rock Road at South end of Landfill through Road gate And 200' East

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT — COUNTY: St Louis — SURFACE ELEVATION: E478

SMALLEST ¼ — LARGEST ¼ — SEC. — TWN. — N.RNG. — E C

LAT. 92 ° 26 ' 34 " — LONG. 38 ° 46 ' 12 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: Layne-Western — PERMIT NUMBER: 00126 / WPM

DRILLING CONTRACTOR'S NAME: Layne-Western — PERMIT NUMBER: 00126 / WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☐ PIEZOMETER ☐ OTHER Gas Probe

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☑ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ONLY ☐ OTHER GAS

PROTECTIVE CASING DETAILS (IF USED)

LENGTH	DIAMETER OF CASING	WEIGHT OR SDR #	DIAMETER AND DEPTH OF DRILL HOLE	JOINTS	MATERIAL	LOCKING CAP?
5 FT.	6 IN.	40	15x2 IN. FT.	☐ MECHANICAL ☐ THREADED ☐ WELDED ☐ OTHER	☐ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER TYPE	☐ YES ☐ NO

CAP VENTED ☐ YES ☐ NO — WEEP HOLE? ☐ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☐ CONCRETE ☐ OTHER — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3 FT.

TYPE OF SURFACE COMPLETION: ☐ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: N/A

CENTRALIZER USED ON RISER ☐ NO ☐ YES LOCATED AT 75' : 140' — MATERIAL ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS

LENGTH	DIAMETER OF RISER PIPE	WEIGHT OR SDR #	DIAMETER OF DRILL HOLE	JOINTS	MATERIAL
12 FT.	1 IN.	80	6 IN.	☐ MECHANICAL ☐ THREADED ☐ WELDED ☐ OTHER	☐ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☑ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED % BENTONITE USED WATER USED/BAG GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☐ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL: 3 — BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☑ SAND ☐ MANUFACTURED ☐ NATURAL — GRAIN SIZE 20/40 — LENGTH OF FILTER PACK 132 FT. — METHOD OF INSTALLATION Tremie

SECONDARY FILTER PACK: TYPE ☐ SAND ☐ MANUFACTURED ☑ NONE — GRAIN SIZE — — LENGTH OF FILTER PACK — FT. — METHOD OF INSTALLATION —

WELL SCREEN: LENGTH OF SCREEN 130 FT. — DIAMETER 1 IN. — SLOT SIZE 10 — WEIGHT OR SDR # 80 — MATERIAL ☐ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP N/A — DIAMETER OF SUMP — — MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☑ NO — MATERIAL USED — — LENGTH OF BACK FILLED BORE HOLE —

STATIC WATER LEVEL 60 FEET FROM MEASURING POINT — DATE OF STATIC WATER LEVEL 11-5-97

MEASURING POINT FOR STATIC WATER LEVEL IS: ☐ TOP OF RISER PIPE ☑ OTHER Ground — ELEVATION OF MEASURING POINT ± 478

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☑ AIR ROTARY ☐ AUGER TYPE ☐ REVERSE ROTARY ☐ OTHER

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3	0-13 Clay
Depth to Base of Annular Seal:	6	13-141 LS/Shale
Depth to Base of Bentonite Seal:	9	with Chert
Depth to Top of Primary Filter Pack:	9	
Depth to Top of the Screen:	11	
Depth to Bottom of the Screen:	141	
Total Depth:	141	
DATE WELL DRILLING WAS COMPLETED	11-5-97	

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

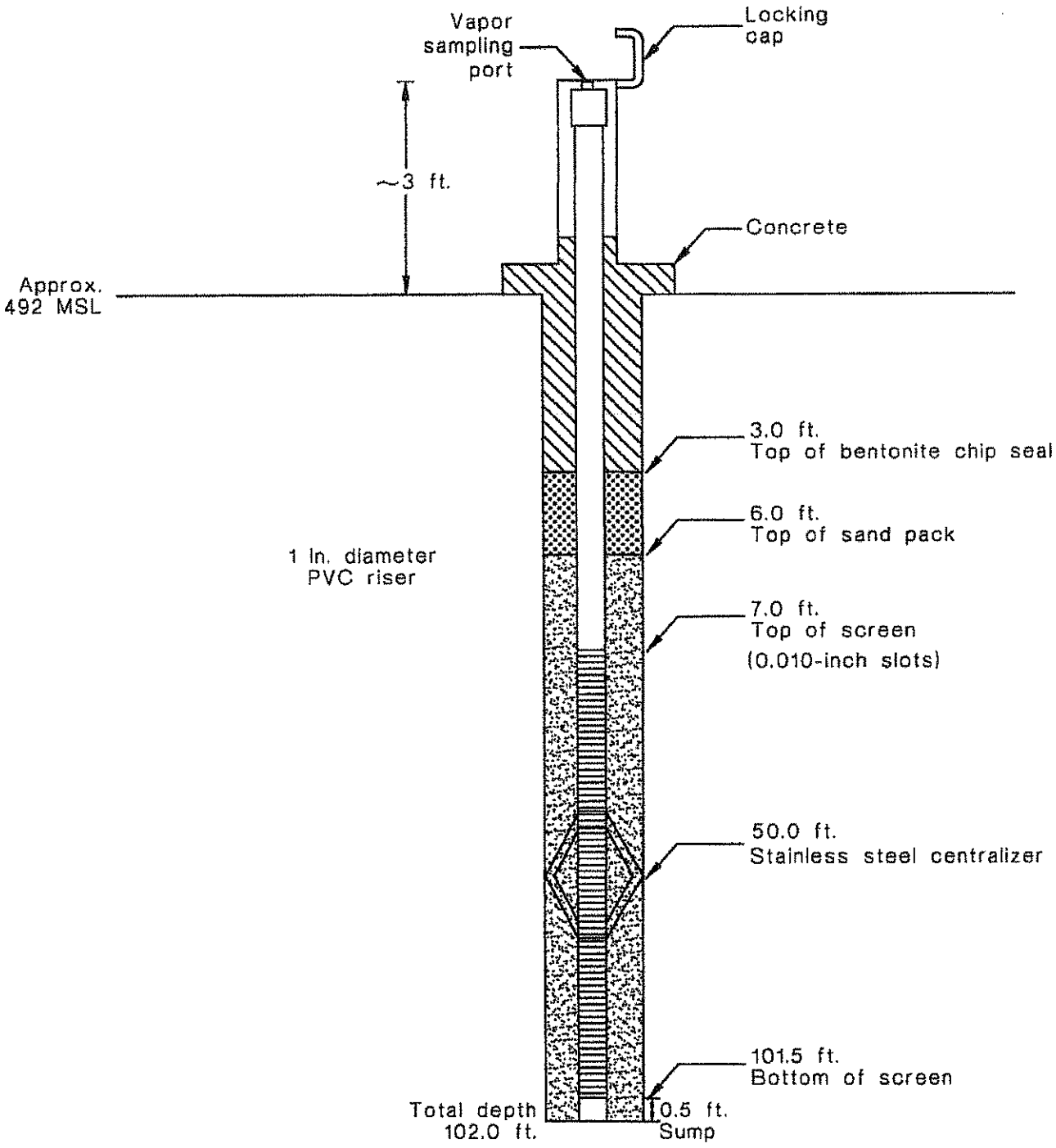
SIGNATURE PRIMARY CONTRACTOR/PERMIT # [signature] 00271 PM — DATE 1/23/98 — SIGNATURE DRILLER/PERMIT # [signature] 00126 / WPM — DATE 1-12-98

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED P

GMP-3
As Built Diagram



(Not to Scale)

All depths relative to ground surface

2206S-BL
GMP
GMP-3

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145157	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: Bridgeton Landfill Authority — WELL NUMBER: GMP-3

SITE ADDRESS: 13570 St. Charles Rock Rd. — CITY: Bridgeton — STATE: MO — ZIP CODE: 63042

OWNER NAME: SAME — TELEPHONE: 314 739 1919

OWNER ADDRESS: — CITY: — STATE: — ZIP CODE:

VARIANCE ISSUED: ☑ YES ☐ NO — DATE ISSUED: 10-23-97 — VARIANCE NUMBER: V 8833

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT: Southeast Corner of the Landfill at Old St. Charles Rock Road

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT — COUNTY: St. Louis — SURFACE ELEVATION: ± 478

SMALLEST ¼ — LARGEST ¼

SEC. ____ TWN. ____ N,RNG. ____ E OR W

LAT. 92° 26' 34" LONG. 38° 46' 12"

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: Layne-Western — PERMIT NUMBER: 001261 WPW

DRILLING CONTRACTOR'S NAME: Layne-Western — PERMIT NUMBER: 001261 WPW

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☐ PIEZOMETER ☑ OTHER GAS Probe

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☑ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☑ OTHER GAS ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH: 5 FT. — DIAMETER OF CASING: 6 IN. — WEIGHT OR SDR #: 40 — DIAMETER AND DEPTH OF DRILL HOLE: 2.5 x 2 IN. FT. — JOINTS: ☐ MECHANICAL ☐ THREADED ☐ WELDED ☐ OTHER — MATERIAL: ☑ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER ☐ OTHER TYPE — LOCKING CAP? ☑ YES ☐ NO

CASING GROUT DETAILS: CAP VENTED ☐ YES ☑ NO — WEEP HOLE? ☑ YES ☐ NO — MATERIAL: ☐ CEMENT ☑ CONCRETE ☐ OTHER — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3 FT.

TYPE OF SURFACE COMPLETION: ☑ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: N/A

CENTRALIZER USED ON RISER: ☐ NO ☑ YES LOCATED AT ± 50' — MATERIAL: ☑ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS: LENGTH: 12 FT. — DIAMETER OF RISER PIPE: 1 IN. — WEIGHT OR SDR #: 80 — DIAMETER OF DRILL HOLE: 6 IN. — JOINTS: ☑ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER — MATERIAL: ☐ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☑ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED % BENTONITE USED WATER USED/BAG GAL

BENTONITE SEAL: MATERIAL: BENTONITE ☐ SLURRY ☑ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL: 3 — BENTONITE SEAL INSTALLED IN: ☑ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☑ SAND ☐ MANUFACTURED ☐ NATURAL	7/40	96 FT.	Tremie			
SECONDARY FILTER PACK	☐ SAND ☐ MANUFACTURED ☑ NONE	—	— FT.	—	Depth to bottom of Protective Casing Seal:	3	0-35 Clay w/Stone
WELL SCREEN	LENGTH OF SCREEN: 95 FT. — DIAMETER: 1 IN. — SLOT SIZE: 10 — WEIGHT OR SDR #: 80 — MATERIAL: ☑ PLASTIC ☐ STEEL ☐ FLUORO POLYMER				Depth to Base of Annular Seal:	3	35-102 LS/Shale
SUMP DETAILS	LENGTH OF SUMP: N/A — DIAMETER OF SUMP: — MATERIAL: ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER				Depth to Base of Bentonite Seal:	6	Water Cl
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☑ NO	MATERIAL USED: —	LENGTH OF BACK FILLED BORE HOLE: —		Depth to Top of Primary Filter Pack:	6	
					Depth to Top of the Screen:	7	
					Depth to Bottom of the Screen:	102	
					Total Depth:	102	

STATIC WATER LEVEL: 55 FEET FROM MEASURING POINT — DATE OF STATIC WATER LEVEL: 11/10/97

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MEASURING POINT FOR STATIC WATER LEVEL IS: ☐ TOP OF RISER PIPE ☑ OTHER Ground Level — ELEVATION OF MEASURING POINT: ± 478

DRILLING EQUIPMENT: ☑ AIR ROTARY ☐ AUGER TYPE ☐ REVERSE ROTARY ☐ OTHER

DATE WELL DRILLING WAS COMPLETED: 11/10/97

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
[signature] 002714 PM	1/23/98	[signature] 001261 WPW	1-22-98

MO 780-1416 (7-95)

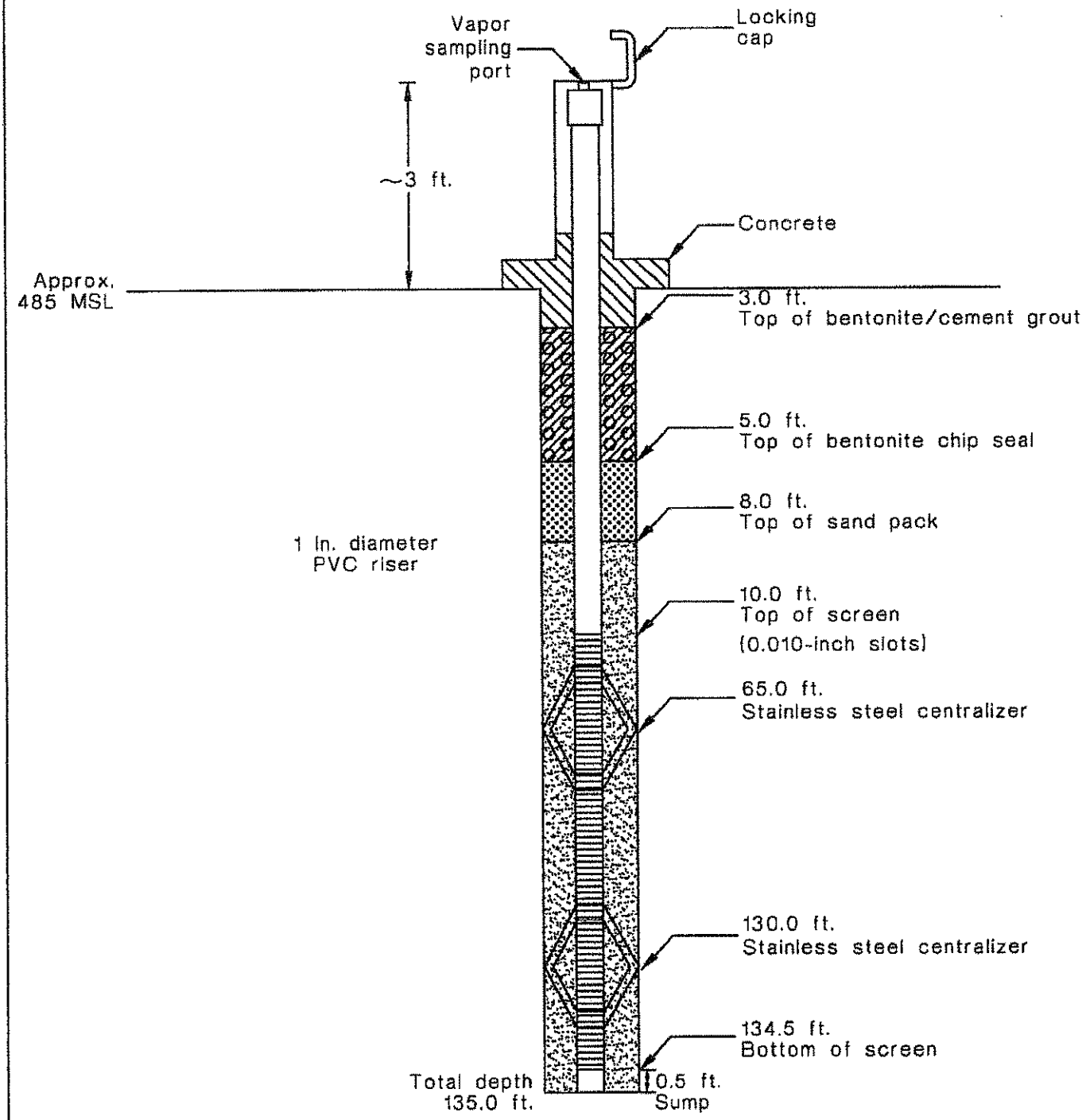
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402

ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

GMP-4
As Built Diagram



(Not to Scale)

All depths relative to ground surface

2206S-BL
GMP
GMP-4

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 162334	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: Bridgeton Landfill Auxiliary | WELL NUMBER: GMP-4

SITE ADDRESS: 13570 St. Charles Rock Rd | CITY: Bridgeton | STATE: MO | ZIP CODE: 63042

OWNER NAME: [illegible] | TELEPHONE: 314 739 1919

OWNER ADDRESS: [illegible] | CITY | STATE | ZIP CODE

VARIANCE ISSUED: ☒ YES ☐ NO | DATE ISSUED: 10-23-97 | VARIANCE NUMBER: V 833

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
East Side of Landfill
in Farmed Land Approximately
two tenths North of Old St Charles
Rock Road

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

COUNTY: St Louis | SURFACE ELEVATION: ± 478

SMALLEST ¼ | LARGEST ¼

SEC. ____ TWN. ____ N,RNG. ____ E OR

LAT. 92° 26' 34" LONG. 38° 46' 12"

MONITORING WELL INSTALLATION CONTRACTOR'S NAME	Layne Western	PERMIT NUMBER	001261 WPM
DRILLING CONTRACTOR'S NAME	Layne - Western	PERMIT NUMBER	001261 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☐ PIEZOMETER ☒ OTHER Gas Probe

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☒ OTHER GAS ONLY

PROTECTIVE CASING DETAILS (IF USED)
LENGTH: 5 FT. | DIAMETER OF CASING: 6 IN. | WEIGHT OR SDR #: 40 | DIAMETER AND DEPTH OF DRILL HOLE: 2.5 IN. x 2 FT. | JOINTS: ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL: ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE | LOCKING CAP? ☒ YES ☐ NO

CASING GROUT DETAILS
CAP VENTED: ☐ YES ☒ NO | WEEP HOLE? ☒ YES ☐ NO | MATERIAL: ☐ CEMENT ☒ CONCRETE ☐ OTHER | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3 FT.

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: N/A

CENTRALIZER USED ON RISER: ☐ NO ☒ YES LOCATED AT ± 130' & 65' | MATERIAL: ☒ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS
LENGTH: 10 FT. | DIAMETER OF RISER PIPE: 1 IN. | WEIGHT OR SDR #: 80 | DIAMETER OF DRILL HOLE: 6 IN. | JOINTS: ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL: ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL
☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED % BENTONITE USED WATER USED/BAG GAL.

BENTONITE SEAL
MATERIAL: BENTONITE ☐ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL: 3 | BENTONITE SEAL INSTALLED IN: ☒ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK
TYPE: ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE: 20/40 | LENGTH OF FILTER PACK: 127 FT. | METHOD OF INSTALLATION: Tremie

SECONDARY FILTER PACK
TYPE: ☐ SAND ☐ MANUFACTURED ☒ NONE | GRAIN SIZE: — | LENGTH OF FILTER PACK: — FT. | METHOD OF INSTALLATION: —

WELL SCREEN
LENGTH OF SCREEN: 125 FT. | DIAMETER: 1 IN. | SLOT SIZE: 10 | WEIGHT OR SDR #: 80 | MATERIAL: ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS
LENGTH OF SUMP: N/A | DIAMETER OF SUMP: — | MATERIAL: ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

BACK FILL
WAS THE WELL BACK FILLED? ☐ YES ☒ NO | MATERIAL USED: — | LENGTH OF BACK FILLED BORE HOLE: —

Information in this column to be supplied in feet from surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3	0-40 Clay
Depth to Base of Annular Seal:	5	40-135 Gs/Sh
Depth to Base of Bentonite Seal:	8	40/24 Chert
Depth to Top of Primary Filter Pack:	8	
Depth to Top of the Screen:	10	
Depth to Bottom of the Screen:	135	
Total Depth:	135	
DATE WELL DRILLING WAS COMPLETED	11-12-97	

STATIC WATER LEVEL: 70 FEET FROM MEASURING POINT | DATE OF STATIC WATER LEVEL: 11-17-97

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MEASURING POINT FOR STATIC WATER LEVEL IS: ☐ TOP OF RISER PIPE ☒ OTHER Ground | ELEVATION OF MEASURING POINT: ± 478

DRILLING EQUIPMENT: ☒ AIR ROTARY ☐ AUGER TYPE ☐ REVERSE ROTARY ☐ OTHER

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
[illegible] 003714PM	1/23/98	Craig Stanley 001261 WPM	1-22-98

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO: **GMP-4**

SHEET NUMBER: 1 of 2

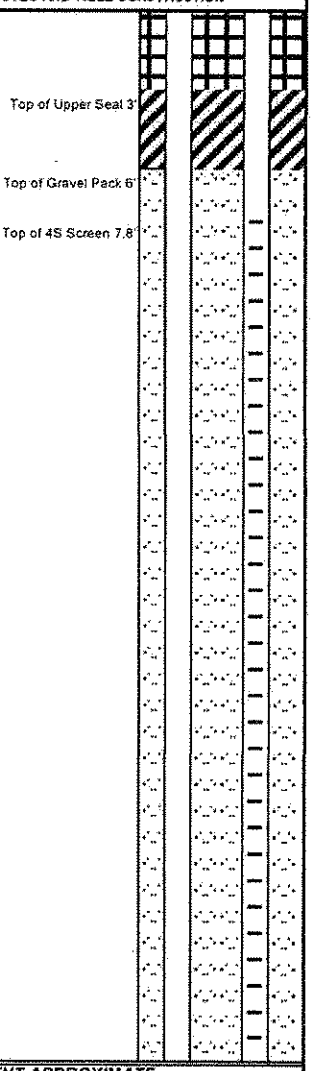
CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
ROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1066895 E: 515160
AES PROJECT NO:	4788.10
AES GEOLOGIST:	T.Pool, C. Joyce
START DATE:	08/31/12 FINISH DATE 09/04/12
START TIME:	FINISH TIME

DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	8" ID HSA, 6" Air Rorary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	10"/6"
WELL DIAMETER:	2x2"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	484.2
TOC ELEVATION:	S-487.2', D-487.21'
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS		
MATERIAL:	PVC	PVC
CASING DIAMETER:	2"	2"
WELL TOTAL DEPTH:	70'	43'
SCREEN LENGTH:	20'	35'
RISER LENGTH:	53'	11'
TOP OF SCREEN:	49'	7.8'
BOTTOM OF SCREEN:	69'	42.8'
SCREEN SLOT:	0.010 IN	0.010 IN
TOP OF FILTER PACK:	45'	5'
TOP OF SEAL:	43'	3'
TYPE OF SEAL:	3/8" Bentonite Chips	→
TYPE OF FILTER PACK:	12/20 Silica GMP-4D	GMP-4S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2	SC	Top 2" roots and vegetation Medium brown (5yr4/4), fine SAND with lean CLAY, moist
SS-1	SS		2.0	4		
HSA-2	CU			6		
SS-2	SS		2.0	8		Moderate brown (2yr3/4) very fine clayey SAND, moist
HSA-3	CU			10		
SS-3	SS		2.0	12	CL	Moderate brown (5yr4/4) fine sandy CLAY, moist
HSA-4	CU			14		
SS-4	SS		2.0	16		Color grades to dark yellow brown, slightly coarser (10yr5/4)
HSA-5	CU			18		
SS-5	SS		2.0	20		Moderate yellow bronw (10yr5/4) fine sandy lean CLAY, moist
HSA-6	CU			22		
SS-6	SS		2.0	24		Color grades to pale Brown (5yr5/2)
HSA-7	CU			26	SC	Grayish red (10yr4/2) clayey fine SAND, wet
HSA-8	CU			28		
				30		Light olive gray (5y5/2)
				32		
				34		
				36		Saturated so no samples taken
				38		
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon
CU -Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO. **GMP-4** SHEET NUMBER 2 of 2

GEOLOGIST T.Pool, C. Joyce

CLIENT: Republic Services, Inc.

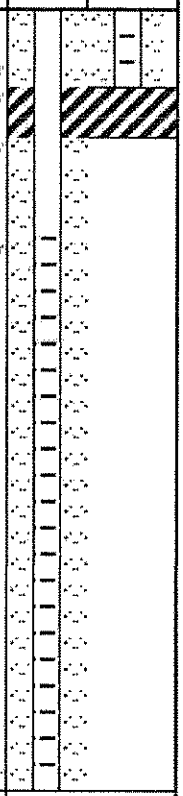
DATE: 08/31/12

PROJECT NAME: Bridgeton Landfill

PROJECT NUMBER: 4788.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
HSA-9	CU			42	SC		Bottom of 4S Screen 42.8'
				44			Top of Lower Seal 43'
				46		Bedrock @45 Very dark red (SR2.5) clayey SHALE, dry Light black in gray mottles (5b7/1)	Top of Gravel Pack 45'
				48			
				50			Top of 4D Screen 49'
				52			
				54		Red brown SHALE, wet	
				56			
AR	CU			58	SH		
				60			
				62			
				64		Band of gray shale, wet	
				66			
				68		Red brown SHALE, wet	
				70			Bottom of 4D Screen 69'
				72		Boring Terminated @ 70.0'	
				74			
				76			
				78			
				80			
				82			
				84			
				86			
				88			
				90			

GMP-4D GMP-4S

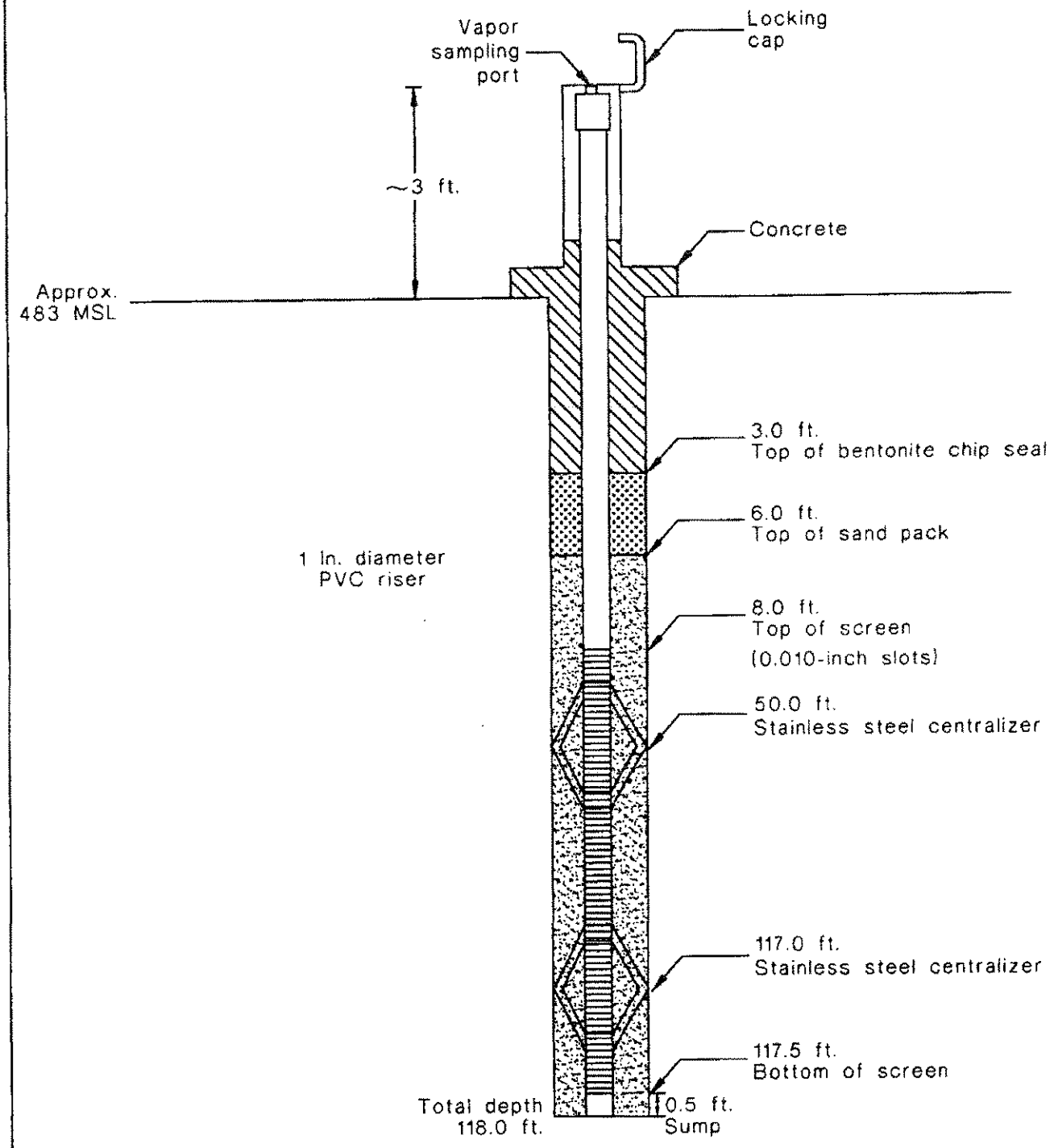


LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

GMP-5
As Built Diagram



(Not to Scale)

All depths relative to ground surface

2206S-BL
GMP
GMP-5

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 161715	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: Bridgeton Landfill Authority — WELL NUMBER: EMP-5

SITE ADDRESS: 13570 St Charles Rock Rd — CITY: Bridgeton — STATE: Mo — ZIP CODE: 63042

OWNER NAME: Same — TELEPHONE: 314 739 1719

OWNER ADDRESS: — CITY: — STATE: — ZIP CODE:

VARIANCE ISSUED: ☑ YES ☐ NO — DATE ISSUED: 10-23-97 — VARIANCE NUMBER: V 833

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
Along East side of Landfill in Farm field between Old St Charles Rock Rd & St Charles Rock Road

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT — COUNTY: St Louis — SURFACE ELEVATION: ± 478

SMALLEST ¼ — LARGEST ¼

SEC. ____ TWN. ____ N,RNG. ____ E OR W

LAT. 38° 46' 12" LONG. 90° 26' 34"

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: Layne-Western — PERMIT NUMBER: 001261 WPM

DRILLING CONTRACTOR'S NAME: Layne-Western — PERMIT NUMBER: 001261 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☐ PIEZOMETER ☑ OTHER Gas Probe

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☑ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☑ OTHER Gas ONLY

PROTECTIVE CASING DETAILS (IF USED)
LENGTH: 5 FT. — DIAMETER OF CASING: 6 IN. — WEIGHT OR SDR #: 40 — DIAMETER AND DEPTH OF DRILL HOLE: 2.5 x 2 IN. FT. — JOINTS: ☐ THREADED ☐ WELDED ☐ MECHANICAL ☐ OTHER — MATERIAL: ☑ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER TYPE — LOCKING CAP? ☑ YES ☐ NO

CASING GROUT DETAILS
CAP VENTED: ☐ YES ☑ NO — WEEP HOLE? ☑ YES ☐ NO — MATERIAL: ☐ CEMENT ☑ CONCRETE ☐ OTHER — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3 FT. — TYPE OF SURFACE COMPLETION: ☑ ABOVE GROUND ☐ FLUSH MOUNT — DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: N/A

CENTRALIZER USED ON RISER: ☐ NO ☑ YES LOCATED AT 110' 50' — MATERIAL: ☑ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS
LENGTH: 10 FT. — DIAMETER OF RISER PIPE: 1 IN. — WEIGHT OR SDR #: 80 — DIAMETER OF DRILL HOLE: 6 IN. — JOINTS: ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER — MATERIAL: ☑ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL
☐ CEMENT SLURRY ☑ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED % BENTONITE USED WATER USED/BAG GAL.

BENTONITE SEAL
MATERIAL: BENTONITE ☐ SLURRY ☑ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL: 3 — BENTONITE SEAL INSTALLED IN: ☑ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK
TYPE: ☑ SAND ☐ MANUFACTURED ☐ NATURAL — GRAIN SIZE: 20/40 — LENGTH OF FILTER PACK: 112 FT. — METHOD OF INSTALLATION: Tremie

SECONDARY FILTER PACK
TYPE: ☐ SAND ☐ MANUFACTURED ☑ NONE — GRAIN SIZE: — — LENGTH OF FILTER PACK: — FT. — METHOD OF INSTALLATION: —

WELL SCREEN
LENGTH OF SCREEN: 110 FT. — DIAMETER: 1 IN. — SLOT SIZE: 10 — WEIGHT OR SDR #: 80 — MATERIAL: ☑ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS
LENGTH OF SUMP: N/A — DIAMETER OF SUMP: — — MATERIAL: ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

BACK FILL
WAS THE WELL BACK FILLED? ☐ YES ☑ NO — MATERIAL USED: — — LENGTH OF BACK FILLED BORE HOLE: —

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3	0-40 Clay w/ Sand
Depth to Base of Annular Seal:	3	60-118 Shale/C
Depth to Base of Bentonite Seal:	6	
Depth to Top of Primary Filter Pack:	6	
Depth to Top of the Screen:	8	
Depth to Bottom of the Screen:	118	
Total Depth:	118	
DATE WELL DRILLING WAS COMPLETED	11-13-97	

STATIC WATER LEVEL: 100' FEET FROM MEASURING POINT — DATE OF STATIC WATER LEVEL: 11-13-97

MEASURING POINT FOR STATIC WATER LEVEL IS: ☐ TOP OF RISER PIPE ☐ OTHER Ground

ELEVATION OF MEASURING POINT: 1096

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☑ AIR ROTARY ☐ AUGER TYPE ☐ REVERSE ROTARY ☐ OTHER

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
[signature] 0027 PM	1/23/98	[signature] 001261 WPM	1/22/98

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **GMP-5**

SHEET NUMBER 1 of 2

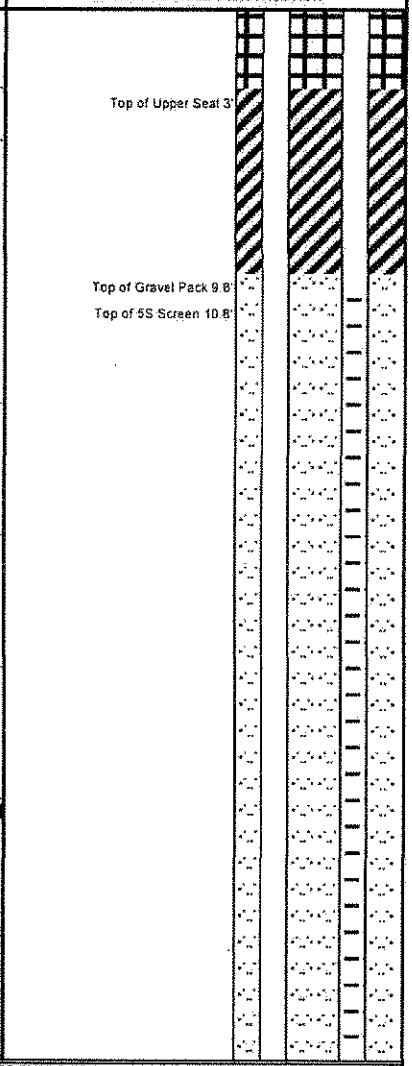
CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
PROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1067135 E: 517115
AES PROJECT NO:	4788.10
AES GEOLOGIST:	T.Pool
START DATE:	09/05/12 FINISH DATE: 09/06/12
START TIME:	FINISH TIME:

DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	8" ID HSA, 6" Air Rotary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	10"/6"
WELL DIAMETER:	2x2"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	486.2
TOC ELEVATION:	S-489; D-489.01
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS		
MATERIAL:	PVC	PVC
CASING DIAMETER:	2"	2"
WELL TOTAL DEPTH:	62'	45'
SCREEN LENGTH:	30'	35'
RISER LENGTH:	54.6'	13.8'
TOP OF SCREEN:	51.6'	10.8'
BOTTOM OF SCREEN:	71.8'	45.6'
SCREEN SLOT:	0.010 IN	0.010 IN
TOP OF FILTER PACK:	48'	9.8'
TOP OF SEAL:	46'	3'
TYPE OF SEAL:	3/8" Bentonite Chips	→
TYPE OF FILTER PACK:	12/20 Silica	GMP-5D / GMP-5S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2	CL	Gravel and brown silty CLAY, dry
				4	ML	Brown clayey SILT, dry
SS-1	SS		2.0	6	CL	Brown silty CLAY, dry
HSA-2	CU			8		
SS-2	SS		2.0	10		Brown silty CLAY, dry
HSA-3	CU			12		
SS-3	SS		0.0	14		Tan to light gray silty CLAY, moist
HSA-4	CU			16		
SS-4	SS		2.0	18		Tan to light gray silty CLAY, wet
HSA-5	CU			20		
SS-5	SS		2.0	22		Dark grey silty CLAY, wet
HSA-6	CU			24		
SS-6	SS		2.0	26	SM	Gray silty fine SAND with clay horizons, saturated
HSA-7	CU			28		
HSA-8	CU			30	ML	Gray, sandy, clayey SILT, wet
				32		
				34		
				36		
				38		
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon
CU -Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO **GMP-5** SHEET NUMBER 2 of 2

GEOLOGIST: T.Pool

CLIENT: Republic Services, Inc.

DATE: 09/05/12

PROJECT NAME: Bridgeton Landfill

PROJECT NUMBER: 4786.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
HSA-9	CU			42	SP	Gray fine-medium SAND trace gravel, saturated	
				44			
				46		Gray fine-medium SAND with clay, saturated	Bottom of 5S Screen 45.8'
					CL	Orange red silty CLAY with shale fragments, wet	Top of Lower Seal 46'
				48	SH	Bit Refusal/ Bedrock @ 48'	Top of Gravel Pack 48'
				50		Orange brown SHALE, wet	
				52	LMS	Gray weathered LMS interbedded with orange brown shale, wet	Top of 5D Screen 51.8'
				54			
				56			
AR	CU			58		Competent LIMESTONE begins from cuttings	
				60		Gray LIMESTONE, dry	
				62			
				64			
				66			
				68			
				70			
				72			
				74			
				76			
				78			
				80		Gray LIMESTONE, wet	Bottom of 5D Screen 81.8'
				82		Boring Terminated @ 82.0'	
				84			
				86			
				88			
				90			

GMP-5D GMP-5S

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **GMP-6**

SHEET NUMBER 1 of 2

CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
PROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1067308 E: 517573
AES PROJECT NO:	4788.10
AES GEOLOGIST:	T.Pool
START DATE:	09/06/12 FINISH DATE: 09/07/12
START TIME:	FINISH TIME:

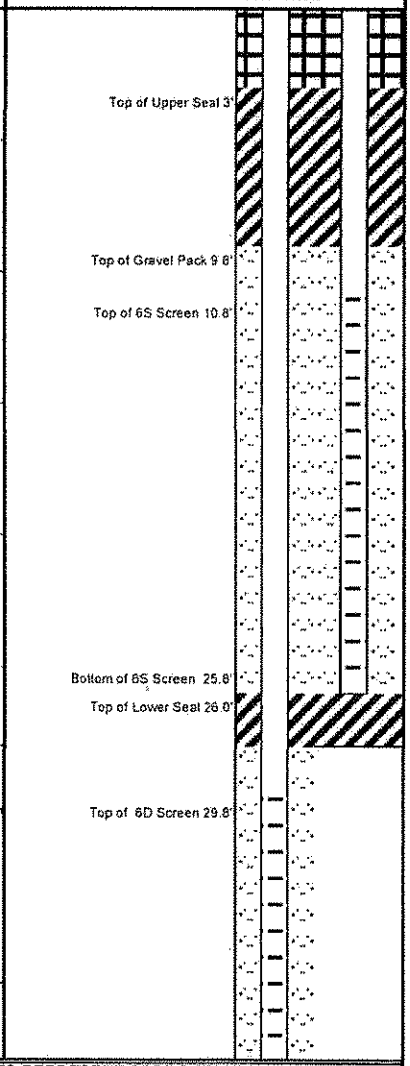
DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	8" ID HSA, 6" Air Rotary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	10"/6"
WELL DIAMETER:	2x2"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	476.3
TOC ELEVATION:	S-478.867' D-478.94
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS

MATERIAL:	PVC	PVC
CASING DIAMETER:	2"	2"
WELL TOTAL DEPTH:	70'	26'
SCREEN LENGTH:	40'	15'
RISER LENGTH:	32.7	13.6
TOP OF SCREEN:	29.8'	10.8'
BOTTOM OF SCREEN:	69.8'	25.8'
SCREEN SLOT:	0.010 IN	0.010 IN
TOP OF FILTER PACK:	28'	9'
TOP OF SEAL:	26'	3'
TYPE OF SEAL:	3/8" Bentonite Chips	→
TYPE OF FILTER PACK:	12/20 Silica	GMP-6D / GMP-6S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
						Grass on surface
HSA-1				2	ML	Brown clayey SILT, dry
				4		
SS-1	SS		2.0	6	CL	Brown silty CLAY, dry
HSA-2	CU			8		
				10		
SS-2	SS		2.0			Gray mottled brown clayey SILT, moist
HSA-3	CU			12		
				14	ML	
SS-3	SS		0.0	16		Brown sandy clayey SILT, wet
HSA-4	CU			18		
				20		
SS-4	SS		2.0			Brown silty fine SAND, saturated
HSA-5	CU			22	SM	
				24		
SS-5	SS		2.0	26	SP	Brown fine-medium SAND, saturated Gray CLAY, wet
HSA-6	CU			28		Bit refusal @ 28.0'
				30		
				32	LMS	Gray weathered Limestone with sand in cuttings,
AR	CU			34		
				36		
				38	CL	Gray CLAY, wet (Possible CLAY filled void)
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon
CU -Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

CLIENT: Republic Services, Inc.

PROJECT NAME: Bridgeton Landfill

LOG OF BORING NO: **GMP-6** SHEET NUMBER 2 of 2

GEOLOGIST: T.Pool

DATE: 09/06/12

PROJECT NUMBER: 4788.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
AR	CU			42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76	LMS	Gray weathered LIMESTONE, sand in cuttings, Gray	Bottom of 6D Screen 69.8' Boring fell in 6.0' before casing was installed
				78 80 82 84 86 88 90		Boring Terminated @ 76.0'	

GMP-6D GMP-6S

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO: **GMP-7**

SHEET NUMBER: 1 of 2

CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
PROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1068503 E: 517249
AES PROJECT NO:	4788.10
AES GEOLOGIST:	T.Pool
START DATE:	09/12/12 FINISH DATE: 09/12/12
START TIME:	FINISH TIME:

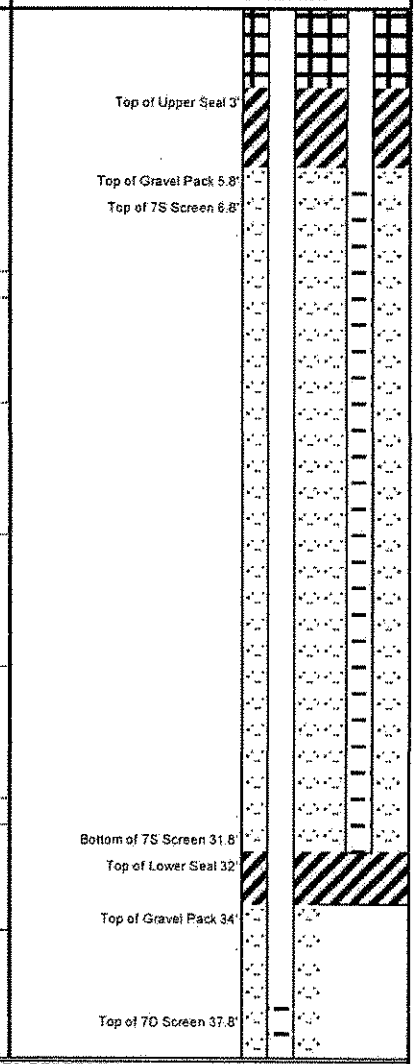
DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	8" ID HSA, 6" Air Rotary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	10"/6"
WELL DIAMETER:	2x2"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	480.7
TOC ELEVATION:	S-483.5; D-483.56
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS

MATERIAL:	PVC	PVC
CASING DIAMETER:	2"	2"
WELL TOTAL DEPTH:	118'	32'
SCREEN LENGTH:	80'	25'
RISER LENGTH:	32.9'	9.8'
TOP OF SCREEN:	37.8'	6.8'
BOTTOM OF SCREEN:	117.8'	31.8'
SCREEN SLOT:	0.010 IN	0.010 IN
TOP OF FILTER PACK:	34'	5.8'
TOP OF SEAL:	32'	3'
TYPE OF SEAL:	3/8" Bentonite Chips	→
TYPE OF FILTER PACK:	12/20 Silica	GMP-7D / GMP-7S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				0		Grass on surface
SS-1	SS		2.0	2	CL	Brown silty CLAY, dry
HSA-2	CU			4		
SS-2	SS		2.0	6		
HSA-3	CU			8		
SS-3	SS		2.0	10	SP	Brown fine SAND, dry
HSA-4	CU			12	ML	Brown clayey SILT, moist
SS-4	SS		2.0	14		
HSA-5	CU			16	CL	Brown silty CLAY, moist
SS-5	SS		2.0	18		
HSA-6	CU			20		
SS-6	SS		2.0	22	ML	Light brown mottled gray clayey SILT, moist
HSA-7	CU			24		
AR	CU			26		Gray clayey sandy SILT, moist
				28		
				30	SM	Gray clayey silty SAND, wet
				32	SP	Gray fine-medium SAND, saturated
				34		ROUGH DRILLING 33.0'-35.0'
				36		Bit refusal/Bedrock at 34.5'
				38	LMS	Gray Weathered LIMESTONE with shale and sand, dry
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon
CU - Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

CLIENT: Republic Services, Inc.

PROJECT NAME: Bridgeton Landfill

LOG OF BORING NO.: **GMP-7** SHEET NUMBER: 2 of 2

GEOLOGIST: T.Pool

DATE: 09/12/12

PROJECT NUMBER: 4786.1

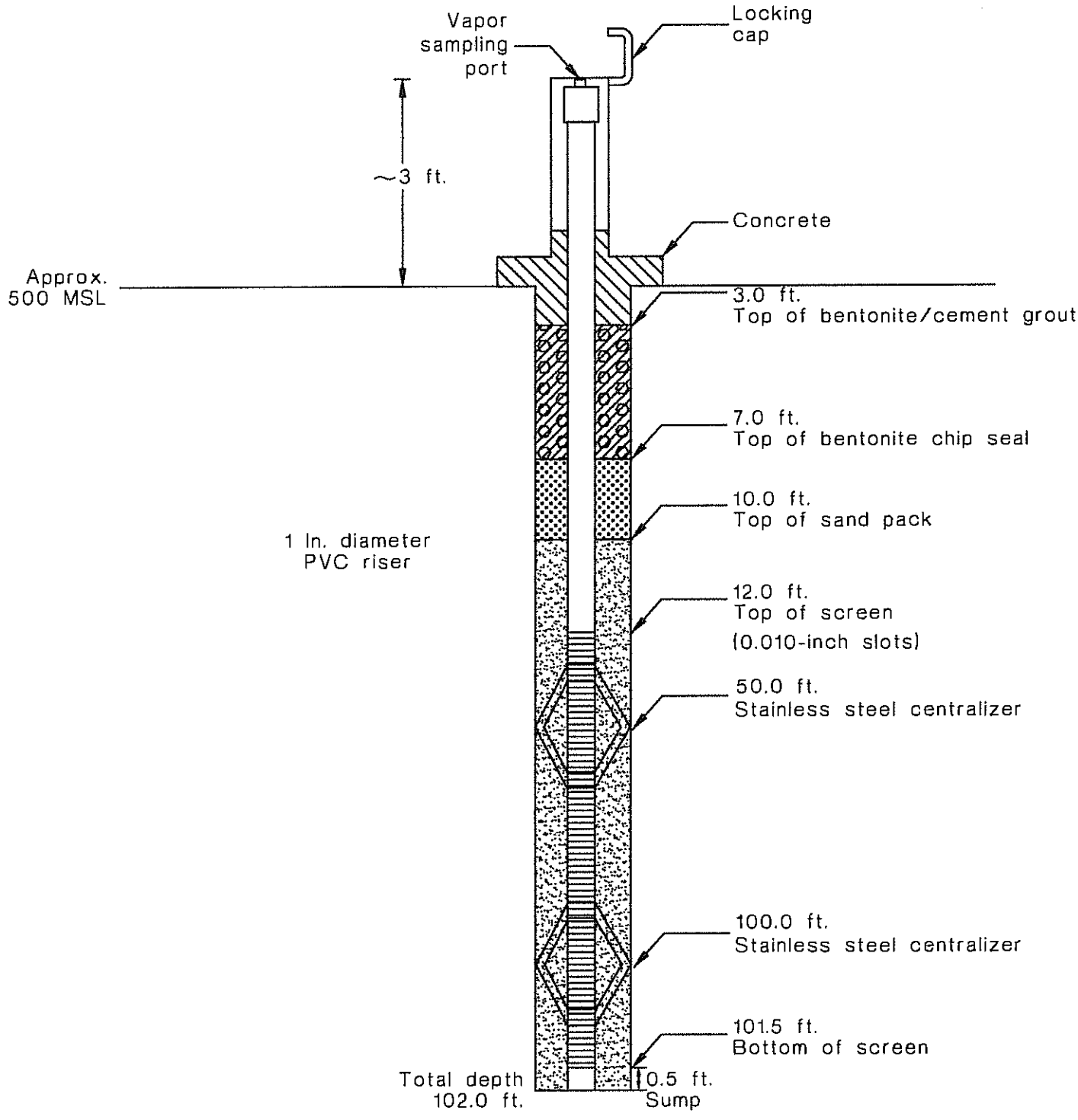
SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:	GMP-7D	GMP-7S
				42		Gray Weathered LIMESTONE with shale and sand, dry			
				44		Limestone becomes saturated			
				46					
				48					
				50					
				52					
				54					
				56					
				58	LMS				
				60					
				62					
				64		Weathered Limestone ends, dry			
AR	CU			66					
				68					
				70		Gray LIMESTONE, dry			
				72					
				74					
				76					
				78					
				80					
				82					
				84					
				90		Gray LIMESTONE, wet till end of boring at 118'			
				100					
				118		Boring Terminated @ 118'	Bottom of 7D Screen 117.8'		

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

GMP-8
As Built Diagram



(Not to Scale)

All depths relative to ground surface

2206S-BL
GMP
GMP-8

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 161716	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: Bridgeton Landfill Authority | WELL NUMBER: GMW-8

SITE ADDRESS: 13570 St Charles Rock Rd | CITY: Bridgeton | STATE: MO | ZIP CODE: 63042

OWNER NAME: Same | TELEPHONE: 314 739 1919

OWNER ADDRESS: Same | CITY | STATE | ZIP CODE

VARIANCE ISSUED ☑ YES ☐ NO | DATE ISSUED 10-29-97 | VARIANCE NUMBER: V 833

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT: The Northeast corner of the Landfill Located on St Charles Rock Rd & Taussig Rd

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT | COUNTY St Louis | SURFACE ELEVATION 473

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ | LARGEST ¼

SEC. ____ TWN. ____ N.RNG. ____ E OR W

LAT. 38° 45' 34" LONG. 90° 46' 12"

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: Layne Western | PERMIT NUMBER: 001201 WPM

DRILLING CONTRACTOR'S NAME: Layne Western | PERMIT NUMBER: 001201 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☐ PIEZOMETER ☑ OTHER Groundwater

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☑ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☐ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER Gas ONLY

PROTECTIVE CASING DETAILS (IF USED)

LENGTH	DIAMETER OF CASING	WEIGHT OR SDR #	DIAMETER AND DEPTH OF DRILL HOLE	JOINTS	MATERIAL	LOCKING CAP?
5 FT.	6 IN.	40	8.5" IN. 3 FT.	☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER	☑ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER ☐ OTHER TYPE	☑ YES ☐ NO

CAP VENTED ☐ YES ☐ NO | WEEP HOLE? ☐ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☑ CONCRETE ☐ OTHER

DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3 FT.

TYPE OF SURFACE COMPLETION: ☐ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: N/A

CENTRALIZER USED ON RISER ☐ NO ☑ YES LOCATED AT 100' 50' | MATERIAL ☑ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS

LENGTH	DIAMETER OF RISER PIPE	WEIGHT OR SDR #	DIAMETER OF DRILL HOLE	JOINTS	MATERIAL
14 FT.	1 IN.	80	6 IN.	☑ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER	☑ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☑ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☐ SLURRY ☑ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 3' | BENTONITE SEAL INSTALLED IN ☑ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☑ SAND ☐ MANUFACTURED ☐ NATURAL	20/40	92 FT.	Tremie			
SECONDARY FILTER PACK	☐ SAND ☐ MANUFACTURED ☑ NONE		FT.		Depth to bottom of Protective Casing Seal:	3	0-10 Clay w/ sand
WELL SCREEN	LENGTH OF SCREEN 90 FT.	DIAMETER 1 IN.	SLOT SIZE 10	WEIGHT OR SDR # 80	MATERIAL ☑ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	7	10-102 Limestone
SUMP DETAILS	LENGTH OF SUMP N/A	DIAMETER OF SUMP —	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER		Depth to Base of Bentonite Seal:	10	w/ Chert
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☑ NO	MATERIAL USED —	LENGTH OF BACK FILLED BORE HOLE —		Depth to Top of Primary Filter Pack:	10	
					Depth to Top of the Screen:	12	
					Depth to Bottom of the Screen:	102	
					Total Depth:	102	

STATIC WATER LEVEL 60 FEET FROM MEASURING POINT | DATE OF STATIC WATER LEVEL 11-19-97

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MEASURING POINT FOR STATIC WATER LEVEL IS ☐ TOP OF RISER PIPE ☑ OTHER Ground

ELEVATION OF MEASURING POINT +473

DRILLING EQUIPMENT ☑ AIR ROTARY ☐ AUGER TYPE ____ ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED 11-12-97

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
[signature] 001201 WPM	11/23/98	[signature]	11/24/98

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402

ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO 00206789	DATE RECEIVED 10/15/1999	PUBLIC SAFETY PROBE GMP-09	
CR NO			
STATE CERT NO APPROVED DATE A082738 01/05/2000	CHECK NO. 8706629		
DATE ENTERED PHASE 1 PHASE 2 PHASE 3 10/18/1999 01/01/1000 02/17/2006	ROUTE PCD	REVENUE NO. 102799	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL AUTHORITY
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 833 (Applicable only if variance was obtained from DNR)
OWNER ADDRESS: 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63042
SITE NAME: GMP-9,
CONTACT NAME:
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[X] MONITORING [ ] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[X] ABOVE GROUND [ ] FLUSH CASE LENGTH 60.0 IN. CASE HOLE DEPTH 576.0 IN.

PROTECTIVE CASE MATERIAL [X] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 6.0 IN. CASE HOLE DIAMETER 2.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 1.0 IN. RISER PIPE LENGTH 12.0 FT. RISER HOLE DIAMETER 6.0 IN.

RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD

[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER 1.0 IN. SCREEN LENGTH 30.0 FT. BENTONITE SEAL LENGTH 3.0 FT.

SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]

[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 6.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 32.0 FT. PRIMARY FILTER MATERIAL [ ] SAND

SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 1.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT

ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER

[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS

ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

COPY

LOCATION OF WELL

(OPTIONAL) LEGAL LOCATION (OPTIONAL)

LAT. 0° 0' 0.0" COUNTY

LONG. 0° 0' 0.0" ST LOUIS COUNTY

ELEVATION 475 FT. ____ 1/4 ____ 1/4 ____ 1/4

SEC. 0 TWN. 0 RNG. 0 E

Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	15	SILTY CLAY
15	20	CLAY
20	40	LS WITH CHERT

TOTAL DEPTH 40.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT PUMP SET DEPTH FT

STATIC WATER LEVEL (swl) 0.0 FT WELL YIELD 0.0 GPM

WELL COMPLETION DATE 07/22/1999 PUMP INSTALLATION DATE

OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

PRIMARY CONTRACTOR SIGNATURE x WARD HERST	PERMIT NUMBER 002702	DATE
WELL DRILLER SIGNATURE x JOHN PHILLIPS	PERMIT NUMBER 002893	DATE
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x	PERMIT NUMBER	DATE
APPRENTICE WELL DRILLER SIGNATURE x	PERMIT NUMBER	DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY
206789

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

Bridgeton Landfill Authority — GMP 9
13570 St Charles Rk Rd Bridgeton MO 63042
Same
12-23-97
Old St. Charles Road
Landfill
St Charles Rk Rd
92 26 34
38 46 12
St Louis
From 270 & St Charles Rk Rd travel East to Old Rock Rd. Left to the site

5 6 2
12 1 40 6 3
32 8
1
30 1 6 10

Depth From	To	Formation
0	15	Silty clay
15	20	Clay
20	40	LS with Chert

TOTAL DEPTH 40

7-22-97 7-22-97

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00206790
CR NO:
DATE RECEIVED: 10/15/1999
PUBLIC SAFETY PROBE GMP-10
STATE CERT NO APPROVED DATE: A082774 03/22/2000
CHECK NO.: 8706629
DATE ENTERED: PHASE 1 10/18/1999 PHASE 2 01/01/1000 PHASE 3 02/17/2006
ROUTE: PCD
REVENUE NO.: 102799

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL AUTHORITY
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER: _____ Applicable only if variance was obtained from DNR
OWNER ADDRESS: 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63042
SITE NAME: GMP-10,
CONTACT NAME:
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[X] MONITORING [ ] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[X] ABOVE GROUND [ ] FLUSH CASE LENGTH 60.0 IN. CASE HOLE DEPTH 576.0 IN.
PROTECTIVE CASE MATERIAL [X] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 6.0 IN. CASE HOLE DIAMETER 2.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 1.0 IN. RISER PIPE LENGTH 12.0 FT. RISER HOLE DIAMETER 6.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 4/316 OTHER [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER 1.0 IN. SCREEN LENGTH 30.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 6.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 32.0 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 1.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

COPY

LOCATION OF WELL

LAT. 0° 0' 0.0" COUNTY
LONG. 0° 0' 0.0" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.
LEGAL LOCATION (OPTIONAL)
_____ 1/4 _____ 1/4 _____ 1/4
SEC. 0 TWN. 0 RNG. 0 E

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	15	SILTY CLAY
15	40	LS WITH CHERT

TOTAL DEPTH 40.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 07/22/1999
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

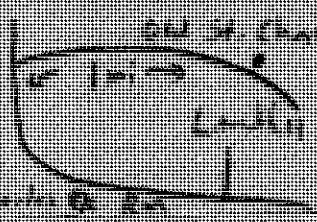
	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x WARD HERST	002702	
WELL DRILLER SIGNATURE x JOHN PHILLIPS	002683	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

OFFICE USE ONLY

206791

MONITORING WELL CERTIFICATION RECORD

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR



TOTAL DEPTH 60

7-26-97 | 7-26-97

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00206791
CR NO:
DATE RECEIVED: 10/15/1999
PUBLIC SAFETY PROBE GMP-11
STATE CERT NO APPROVED DATE: A082773 03/22/2000
CHECK NO.: 8706629
DATE ENTERED: PHASE 1 PHASE 2 PHASE 3 10/18/1999 01/01/1000 02/17/2006
ROUTE: PCD
REVENUE NO.: 102799

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL AUTHORITY
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 833 — Applicable only if variance was obtained from DNR
OWNER ADDRESS: 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63042
SITE NAME: GMP-11,
CONTACT NAME:
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[X] MONITORING [ ] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[X] ABOVE GROUND [ ] FLUSH CASE LENGTH 60.0 IN. CASE HOLE DEPTH 570.0 IN.
PROTECTIVE CASE MATERIAL [X] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 8.0 IN. CASE HOLE DIAMETER 2.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 1.0 IN. RISER PIPE LENGTH 12.0 FT. RISER HOLE DIAMETER 6.0 IN.
RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD
[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 304/316 [ ] OTHER [ ] AUGER [ ] PUSH [ ] OTHER

SCREEN DIAMETER 1.0 IN. SCREEN LENGTH 60.0 FT. BENTONITE SEAL LENGTH 3.0 FT.
SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]
[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 6.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 52.0 FT. PRIMARY FILTER MATERIAL [ ] SAND
SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 1.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT
ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER
[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS
ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

COPY

LOCATION OF WELL

LAT. 0° 0' 0.0" COUNTY
LONG. 0° 0' 0.0" ST LOUIS COUNTY
Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)
ELEVATION 0 FT.

LEGAL LOCATION (OPTIONAL)
1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0 E

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	15	SILTY CLAY
15	60	LS WITH CHERT

TOTAL DEPTH 60.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 07/26/1999
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE
OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x WARD HERST	002702	
WELL DRILLER SIGNATURE x JOHN PHILLIPS	002883	
PUMP INSTALLER SIGNATURE pump info required for extraction/recovery wells x		
APPRENTICE WELL DRILLER SIGNATURE x		

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY
(573) 368-2165

MONITORING WELL AND ENVIRONMENTAL INJECTION WELL RECORD

REF NO: 00206788	DATE RECEIVED: 10/15/1999	PUBLIC SAFETY PROBE GMP-12	
CR NO:			
STATE CERT NO APPROVED DATE: A082772 03/22/2000	CHECK NO.: 8706629		
DATE ENTERED: PHASE 1 10/18/1999 PHASE 2 01/01/1000 PHASE 3 02/17/2006	ROUTE: PCD	REVENUE NO.: 102799	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME: BRIDGETON LANDFILL AUTH
TELEPHONE (OPTIONAL):
DNR VARIANCE NUMBER 833 (Applicable only if variance was obtained from DNR)
OWNER ADDRESS: 13570 ST CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP: 63042
SITE NAME: GMP-12,
CONTACT NAME:
SITE ADDRESS (IF DIFFERENT THAN ABOVE):
CITY:
STATE: MO
ZIP:

PROPOSED USE OF WELL

[X] MONITORING [ ] GAS MONITORING [ ] EXTRACTION [ ] RETURN OR INJECTION (UIC PERMIT MAY BE NEEDED) [ ] WATER LEVEL MEASUREMENT (only)

TYPE OF SURFACE COMPLETION

[X] ABOVE GROUND [ ] FLUSH CASE LENGTH 60.0 IN. CASE HOLE DEPTH 576.0 IN.

PROTECTIVE CASE MATERIAL [X] STEEL [ ] ALUMINUM [ ] PLASTIC [ ] OTHER CASE DIAMETER 6.0 IN. CASE HOLE DIAMETER 2.0 IN.

CONSTRUCTION

RISER PIPE DIAMETER 1.0 IN. RISER PIPE LENGTH 10.0 FT. RISER HOLE DIAMETER 6.0 IN.

RISER PIPE MATERIAL [X] PLASTIC RISER PIPE WEIGHT [ ] SCH40 DRILLING METHOD

[ ] STEEL [ ] PTFE [ ] OTHER [X] SCH80 [ ] 304/316 [ ] OTHER ____ [ ] AUGER [ ] PUSH [ ] OTHER

COPY

SCREEN DIAMETER 1.0 IN. SCREEN LENGTH 70.0 FT. BENTONITE SEAL LENGTH 3.0 FT.

SCREEN MATERIAL [ ] PLASTIC SCREEN HOLE DIAMETER SEAL ABOVE SWL [ ] SEAL BELOW SWL [ ]

[ ] STEEL [ ] PTFE [ ] OTHER IF DIFFERENT FROM RISER 6.0 IN. SEAL ABOVE SWL WAS HYDRATED [ ]

PRIMARY FILTER PACK LENGTH 71.0 FT. PRIMARY FILTER MATERIAL [ ] SAND

SECONDARY FILTER PACK LENGTH 0.0 FT. [ ] PREPACKED

ANNULAR SEAL LENGTH 2.0 FT. ANNULAR SEAL MATERIAL [ ] BENTONITE SLURRY [ ] NEAT CEMENT GROUT

ANNULAR SEAL PLACED BY [ ] TREMIE [ ] CEMENT BENTONITE GROUT [X] NON-SLURRY BENTONITE [ ] OTHER

[ ] GRAVITY [ ] PRESSURE GROUT THRU TREMIE IF NON-SLURRY BENTONITE [X] CHIPS [ ] GRANULAR [ ] PELLETS [ ] OTHER

[ ] MULTIPLE CASED OR NESTED WELLS

ATTACH AS-BUILT DIAGRAMS showing constructions details with type, length and diameter of material and length and diameter of bores

LOCATION OF WELL

LAT. 0° 0' 0.0" COUNTY

LONG. 0° 0' 0.0" ST LOUIS COUNTY

Please be aware that we do not guarantee the accuracy of the data. It is submitted to us by a third party and has not been field verified.

(OPTIONAL)

ELEVATION 0 FT.

LEGAL LOCATION (OPTIONAL)

1/4 1/4 1/4 SEC. 0 TWN. 0 RNG. 0 E

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION
0	4	SILTY CLAY
4	11	BROWN SAND
11	15	GRAY SAND
15	60	BROKEN LS
60	80	SHALE & LS

TOTAL DEPTH 80.0 FEET

FIRST ENCOUNTER GROUNDWATER 0.0 FT
STATIC WATER LEVEL (swl) 0.0 FT
WELL COMPLETION DATE 07/28/1999
PUMP SET DEPTH FT
WELL YIELD 0.0 GPM
PUMP INSTALLATION DATE

OTHER INFORMATION OR LOCATION DATA (OPTIONAL)

I HEREBY CERTIFY THE WELL/PUMP INFORMATION DESCRIBED HEREIN IS TRUE AND ACCURATE

	PERMIT NUMBER	DATE
PRIMARY CONTRACTOR SIGNATURE x WARD HERST	002702	
WELL DRILLER SIGNATURE x JOHN PHILLIPS	002883	
PUMP INSTALLER SIGNATURE (pump info required for extraction/recovery wells) x		
APPRENTICE WELL DRILLER SIGNATURE x		

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **GMP-13**

SHEET NUMBER 1 of 2

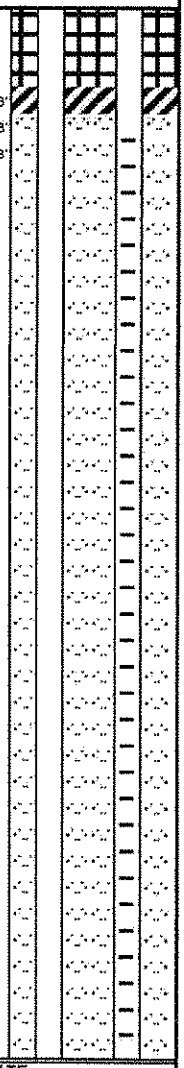
CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
PROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1066434 E: 516379
AES PROJECT NO:	4788.10
AES GEOLOGIST:	C. Joyce
START DATE:	08/30/12 FINISH DATE: 09/12/12
START TIME:	FINISH TIME:

DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	8" HAS, 6" Air Rorary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	8"/6"
WELL DIAMETER:	2x2"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	483.2
TOC ELEVATION:	S-485.981, D-486.027
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS		
MATERIAL:	PVC	PVC
DIAMETER:	2"	2"
WELL TOTAL DEPTH:	69'	45'
SCREEN LENGTH:	20'	40'
RISER LENGTH:	52.9'	7.8'
TOP OF SCREEN:	48.9'	4.8'
BOTTOM OF SCREEN:	68.9'	44.8'
SCREEN SLOT:	0.010 IN	0.010 IN
TOP OF FILTER PACK:	48'	3.8'
TOP OF SEAL:	45'	2.8'
TYPE OF SEAL:	3/8" Bentonite Chips	→
TYPE OF FILTER PACK:	12/20 Silica	GMP-13D / GMP-13S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2	SM	Top 1" Roots and Veg. Fine Clayey, SILT, Dark Reddish Brown (10yr3/4), moist
				4		
SS-1	SS		2.0	6	CL	Fine Sandy Fat CLAY, Mod Brown (5yr4/4), moist
HSA-2	CU			8		
SS-2	SS		2.0	10		Fine sandy Fat CLAY, Mod Brown (syr4/4), moist
HSA-3	CU			12		
				14		
SS-3	SS		2.0	16	SM	Silty Sand, Light Olive Gray (5y5/2) moist-wet with iron oxide Staining light brown (5yr5/6) medium mottled pattern
HSA-4	CU			18		
				20		
SS-4	SS		2.0	22	ML	Light brown mottled gray clayey SILT, moist
HSA-5	CU			24		Color grades to moderate yellow/brown (10yr5/4)
SS-5	SS		2.0	26		
HSA-6	CU			28		
				30		
SS-6	SS		2.0	32		
HSA-7	CU			34		
HSA-8	CU			36	GC	Clayey GRAVEL, Anugular to sub angular, dark yellow-orange, wet
				38	SM	Clayey Silty SAND, Fine and Medium grained, Dark Yellow Brown (10yr4/2)
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon
CU -Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO **GMP-13** SHEET NUMBER 2 of 2

GEOLOGIST:	C. Joyce
CLIENT: Republic Services, Inc.	DATE: 08/30/12
PROJECT NAME: Bridgeton Landfill	PROJECT NUMBER: 4788.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				42		Grading to Weathered Clayey SHALE, Thin slaty, Lt. Olive gray. (5y5/2)	
				44			Botton of 13S Screen 44.8'
				46		Silt to Shale with fine sandy banding, Pale Red (10r6/2), pale Brown (syr5/2) Gray, Light Red (5r4/2), light Bluish gray (5b7/1), Dry Hard	Top of Lower Seal 45'
				48			Top of Gravel Pack 48'
				50		Silty SHALE, moderate red (5rs14), Dry	Top of 13D Screen 49'
				52			
AR	CU			54	SH	Layered with pale brown (5yr5/2) and medium bluish gray (5b5/1), saturated in fractures within unit	
				56			
				58			
				60		Silty SHALE, medium dark gray (NH), Dry	
				62			
				64			
				66			
				68			Bottom of 13D Screen 69'
				70		Boring Terminated @ 69.0'	
				72			
				74			
				76			
				78			
				80			
				82			
				84			
				90			
				100			
				118			

GMP-13D GMP-13S

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO. **GMP-14**

SHEET NUMBER 1 of 2

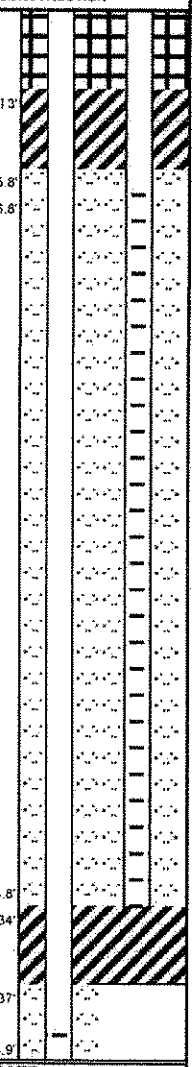
CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
PROJECT LOCATION	Maryland Heights, MO
BORING LOCATION:	N: 1068503 E: 517249
AES PROJECT NO:	4788.10
AES GEOLOGIST:	T.Pool
START DATE	09/04/12 FINISH DATE 09/05/12
START TIME	FINISH TIME

DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	8" ID HSA, 6" Air Rorary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	10"/6"
WELL DIAMETER:	2x2"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	480.7
TOC ELEVATION:	S-483.53; D-483.56
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS		
MATERIAL:	PVC	PVC
CASING DIAMETER:	2"	2"
WELL TOTAL DEPTH:	79'	34'
SCREEN LENGTH:	40'	25'
RISER LENGTH:	42'	12'
TOP OF SCREEN:	38.9'	8.8'
BOTTOM OF SCREEN:	78.9'	33.8'
SCREEN SLOT:	0.010 IN	0.010 IN
TOP OF FILTER PACK:	37'	7'
TOP OF SEAL:	34'	3'
TYPE OF SEAL:	3/8" Bentonite Chips	→
TYPE OF FILTER PACK:	12/20 Silica	GMP-14D GMP-14S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2	ML	Grass on surface with Brown clayey SILT, dry trace gravel
				4		
SS-1	SS		2.0	6		Brown silty CLAY, dry
HSA-2	CU			8		
SS-2	SS		2.0	10	CL	Tan to light Gray, silty CLAY, moist
HSA-3	CU			12		
SS-3	SS		2.0	14		Gray with Tan silty CLAY, wet
HSA-4	CU			16		
SS-4	SS		2.0	18		Dark gray clayey SILT, wet
HSA-5	CU			20	ML	
SS-5	SS		2.0	22		Gray silty fine SAND, saturated
HSA-6	CU			24	SM	
SS-6	SS		0.0	26		No Sample due to Auger backfill of sand
HSA-7	CU			28		SAND in cuttings
HSA-8	CU			30	SP	
AR	CU			32		
				34		
				36		Bit Refusal/Bedrock at 37'
				38	LMS	Gray weathered LIMESTONE with occasional shale, wet
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon
CU - Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO. **GMP-14** SHEET NUMBER 2 of 2

GEOLOGIST: T.Pool

CLIENT: Republic Services, Inc.

DATE: 09/04/12

PROJECT NAME: Bridgeton Landfill

PROJECT NUMBER: 4788.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:	GMP-14D	GMP-14S
				42					
				44					
				46					
				48					
				50					
				52					
				54					
				56					
				58					
AR	CU			60	LMS				
				62		Gray LIMESTONE, wet			
				64					
				66					
				68					
				70					
				72					
				74					
				76					
				78			Bottom of 14D Screen 78.6'		
				80		Boring Terminated @ 79'			
				82					
				84					
				86					
				88					
				90					

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO. **GMP-15**

SHEET NUMBER 1 of 2

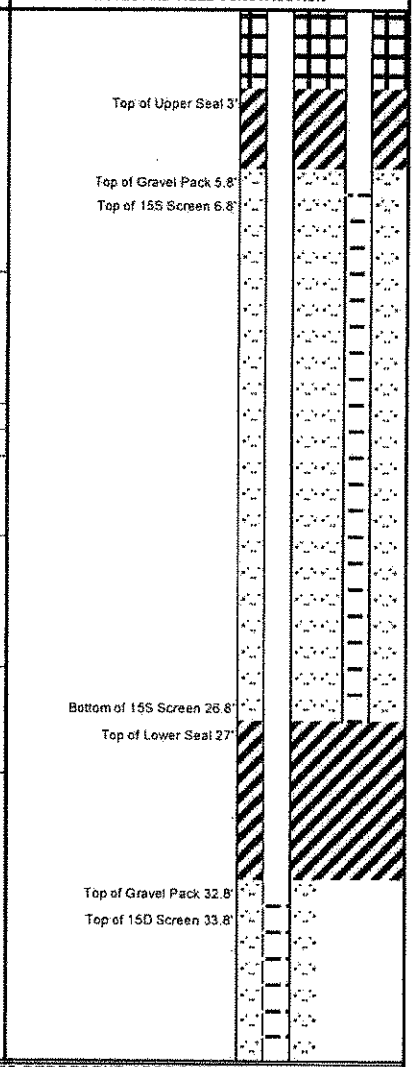
CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
ROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1067710 E: 517839
AES PROJECT NO:	4788.10
AES GEOLOGIST:	T.Pool
START DATE:	09/10/12 FINISH DATE 09/10/12
START TIME:	FINISH TIME:

DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	8" ID HSA, 6" Air Rorary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	10"/6"
WELL DIAMETER:	2x2"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	483'
TOC ELEVATION:	S-481.15; D-481.19
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS		
MATERIAL:	PVC	PVC
CASING DIAMETER:	2"	2"
WELL TOTAL DEPTH:	79'	27'
SCREEN LENGTH:	45'	20'
RISER LENGTH:	33.7'	6.8'
TOP OF SCREEN:	33.8'	6.8'
BOTTOM OF SCREEN:	78.9'	26.8'
SCREEN SLOT:	0.010 IN	0.010 IN
TOP OF FILTER PACK:	32.8'	5.8'
TOP OF SEAL:	27'	3'
TYPE OF SEAL:	3/8" Bentonite Chips	
TYPE OF FILTER PACK:	12/20 Silica	GMP-15D GMP-15S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2	ML	Grass on surface with Dark brown clayey SILT, dry
SS-1	SS		2.0	4		Brown clayey SILT, trace gravel, dry
HSA-2	CU			6		
SS-2	SS		2.0	8		
HSA-3	CU			10	CL	Tan mottled gray silty CLAY, wet
SS-3	SS		2.0	12		
HSA-4	CU			14		Brown silty CLAY, wet
SS-4	SS		2.0	16		Brown sandy CLAY, wet
HSA-5	CU			18	ML	Brown clayey SILT, wet
SS-5	SS		2.0	20		Brown sandy SILT, saturated
HSA-6	CU			22		
AR	CU			24		
				26	CL	Gray silty CLAY, wet
				28		
				30	LMS	Bit refusal/ Bedrock @ 29' (Rock in SS shoe)
				32		
				34		Gray weathered LIMESTONE, with clay in cuttings, wet
				36		
				38		
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon
CU -Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **GMP-15** SHEET NUMBER 2 of 2

CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
GEOLOGIST:	T.Pool
DATE:	09/10/12
PROJECT NUMBER:	4788.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				42		Gray weathered LIMESTONE, with clay in cuttings, wet	
				44			
				46			
				48			
				50			
				52			
				54			
				56			
				58			
AR	CU			60	LMS		
				62			
				64		Gray LIMESTONE, wet	
				66			
				68			
				70			
				72			
				74			
				76			
				78			Bottom of 15D Screen 78.6'
				80		Bottom of Boring @ 79'	
				82			
				84			
				86			
				88			
				90			

GMP-15D GMP-15S

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **GMP-16**

SHEET NUMBER 1 of 2

CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
PROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1068094 E: 517531
AES PROJECT NO:	4788.10
AES GEOLOGIST:	T.Pool
START DATE:	09/11/12 FINISH DATE: 09/11/12
START TIME:	FINISH TIME:

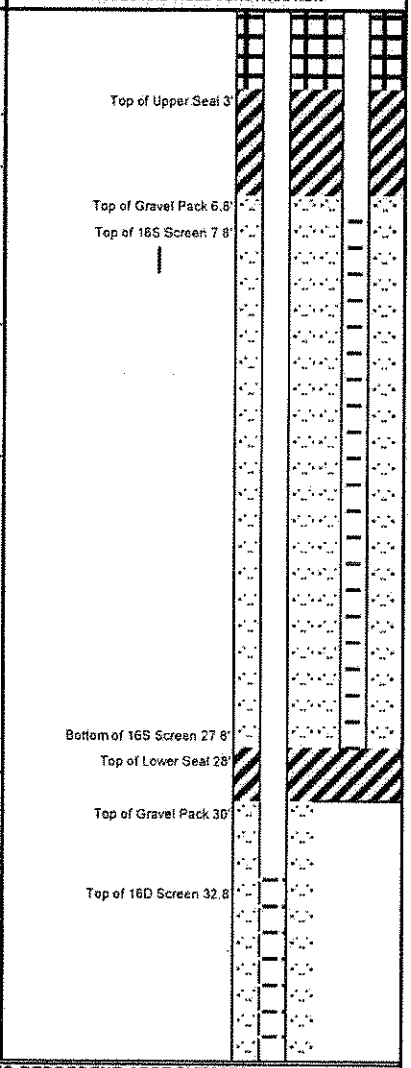
DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	8" ID HSA, 6" Air Rotary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	10"/6"
WELL DIAMETER:	2x2"
WELL COMPLETION:	Flush Mount
SURFACE ELEVATION:	477.1
TOC ELEVATION:	S-4476.77; D-476.81
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS

MATERIAL:	PVC	PVC
CASING DIAMETER:	2"	2"
WELL TOTAL DEPTH:	76'	28'
SCREEN LENGTH:	45'	20'
RISER LENGTH:	32.7'	7.6'
TOP OF SCREEN:	32.8'	7.8'
BOTTOM OF SCREEN:	77.8'	27.8'
SCREEN SLOT:	0.010 IN	0.010 IN
TOP OF FILTER PACK:	30'	6.8'
TOP OF SEAL:	28'	3'
TYPE OF SEAL:	3/8" Bentonite Chips	→
TYPE OF FILTER PACK:	12/20 Silica	GMP-16D / GMP-16S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2	GM	Brown with gray silty GRAVEL, dry
				4	SP	
SS-1	SS		2.0	6		Brown fine-medium SAND, dry
HSA-2	CU			8	ML	Light brown clayey SILT, dry
SS-2	SS		0.0	10		Rock in shoe no sample
HSA-3	CU			12	SP	
SS-3	SS		2.0	16		Brown silty fine SAND, trace medium SAND, saturated
HSA-4	CU			18		
				20		no samples do to saturated sand in cuttings
HSA-5	CU			22		
				24		
				26		
HSA-6	CU			28		Bit refusal/bedrock at 29.5' (LMS present in SS shoe)
AR	CU			30	LMS	
				32		
				34		Gray weathered LIMESTONE, with sand in cuttings, wet
				36		
				38		
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon
CU -Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **GMP-16** SHEET NUMBER 2 of 2

GEOLOGIST: T.Pool

CLIENT: Republic Services, Inc.

DATE: 09/11/12

PROJECT NAME: Bridgeton Landfill

PROJECT NUMBER: 4788.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:	GMP-16D	GMP-16S
				42		Gray weathered LIMESTONE, wet			
				44					
				46					
				48					
				50					
				52					
				54					
				56					
				58					
AR	CU			60	LMS	Gray LIMESTONE, wet			
				62					
				64					
				66					
				68					
				70					
				72					
				74					
				76					
				78					
				80		Bottom of Boring @ 78'			
				82					
				84					
				86					
				88					
				90					

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

TEMPORARY LANDFILL GAS MONITORING PROBES

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **TMP-1**

SHEET NUMBER 1 of 2

CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
PROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1066895 E: 515160
AES PROJECT NO:	4788.10
AES GEOLOGIST:	T.Pool, C. Joyce
START DATE:	08/20/12 FINISH DATE: 08/29/12
START TIME:	FINISH TIME:

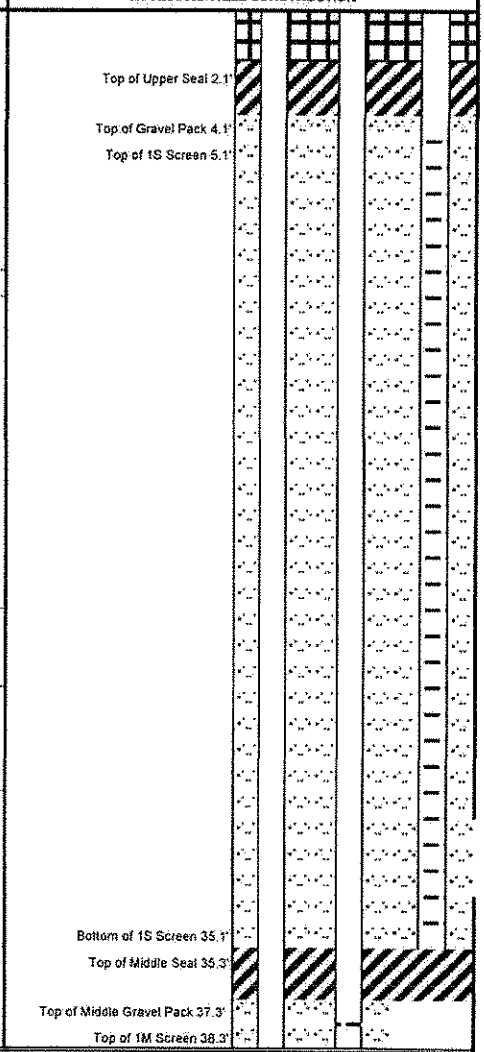
DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	10" ID HSA, 8" Air Rotary
SAMPLING METHOD	Split Spoon, Cuttings
BORING DIAMETER:	12"/8"
WELL DIAMETER:	3x 1"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	456.5
TOC ELEVATION:	S-456.47; M-456.43; C-456.41
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS

MATERIAL:	PVC	PVC	PVC
CASING DIAMETER:	1"	1"	1"
WELL TOTAL DEPTH:	66.5'	53.5'	35.3'
SCREEN LENGTH:	10'	15'	30'
RISER LENGTH:	56.5'	43.5'	9'
TOP OF SCREEN:	56.3'	38.3'	5.1'
BOTTOM OF SCREEN:	66.3'	53.3'	35.1'
SCREEN SLOT:	0.010 IN	0.010 IN	0.010 IN
TOP OF FILTER PACK:	55.5'	37.3'	4.1'
TOP OF SEAL:	53.5'	35.3'	2.1'
TYPE OF SEAL:	3/8" Bentonite Chips	→	→
TYPE OF FILTER PACK:	12/20 Silica	TMP-1D	TMP-1M	TMP-1S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2	ML	Parking lot fill,gravel
SS-1	SS		2.0	4		Brown sandy, clayey SILT, dry
HSA-2	CU			6		Trace Gravel at 8'
SS-2	SS		2.0	8	SM	Brown silty SAND, dry
HSA-3	CU			10	CL	Dark brown, silty CLAY, moist
SS-3	SS		0.0	12		No recovery spoon empty
HSA-4	CU			14		
SS-4	SS		2.0	16		Dark brown silty CLAY, moist
HSA-5	CU			18		
SS-5	SS		2.0	20		Gray silty CLAY, wet
HSA-6	CU			22	SM	Gray silty fine SAND, saturated
SS-6	SS		2.0	24	SP	Gray fine-med SAND, saturated
HSA-7	CU			26		
SS-7	SS		1.0	28		Gray fine-med SAND, saturated
AR	CU			30	LMS	BEDROCK @ 36' trace sand
				32		TP ends logging here on 8/20/12 resumed by CJ on 8/29/12
				34		
				36		
				38		
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon	*PID - Photoionization Detecto*	*HA - Hand Auger*
CU -Cuttings Sample	*PP - Pocket Penetrometer*	*WB - Wash Bore*
ST - Shelby Tube	*HSA - Hollow Stem Augers*	*RB - Rock Bit*
	AR - Air Rotary	*NX - Rock Core*

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **TMP-1** SHEET NUMBER 2 of 2

GEOLOGIST: T.Pool, C. Joyce

CLIENT: Republic Services, Inc.

DATE: 08/20/12

PROJECT NAME: Bridgeton Landfill

PROJECT NUMBER: 4788.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
AR	CU			42	LMS	Fine clayey sand infiltrated through cracks in the limestone or beneath augers at RX interface overnight. Medium Bluish Gray (SB5/1)	Bottom of 1M Screen 53.3'
				44			Top of Lower Seal 53.5'
				46			
				48			
				50			
				52			
				54		Unweathered LIMESTONE at 55.0'	Top of Gravel Pack 55.3'
				56			Top of 1D Screen 56.3'
				58			
				60			
				62			
				64			
				66			Bottom of 1D Screen 66.3'
				68		Boring Terminated @ 66.5'	
				70			
				72			
				74			
				76			
				78			
				80			
				82			
				84			
				86			
				88			
				90			

TMP-1D | TMP-1M | TMP-1S

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **TMP-2**

SHEET NUMBER 1 of 2

CLIENT:	Republic Services, Inc.
PROJECT NAME:	Bridgeton Landfill
PROJECT NUMBER:	4788.10
PROJECT LOCATION:	Maryland Heights, MO
BORING LOCATION:	N: 1066806 E: 515318
AES PROJECT NO:	4788.10
AES GEOLOGIST:	C. Joyce
START DATE:	08/28/12 FINISH DATE 08/29/12
START TIME:	FINISH TIME

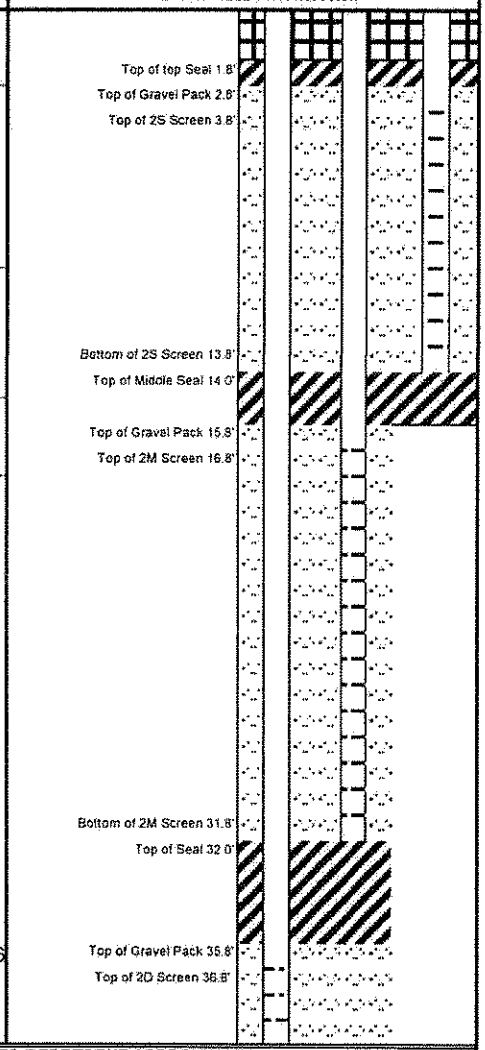
DRILLING CONTRACTOR:	Roberts Environmental Drilling
DRILLER:	Patrick
DRILLING RIG:	Track Mounted CME-75
DRILLING METHOD:	10" ID HSA, 8" Air Rorary
SAMPLING METHOD:	Split Spoon, Cuttings
BORING DIAMETER:	12"/8"
WELL DIAMETER:	3x 1"
WELL COMPLETION:	Stick-Up
SURFACE ELEVATION:	457.9
TOC ELEVATION:	S-460.90; M-460.84; D-460.78
WATER LEVEL:	-
WATER ELEVATION:	-
DATE:	-

WELL CONSTRUCTION DETAILS

MATERIAL:	PVC	PVC	PVC
CASING DIAMETER:	1"	1"	1"
WELL TOTAL DEPTH:	47'	32'	14'
SCREEN LENGTH:	10'	15'	10'
RISER LENGTH:	39.9'	20'	7.1'
TOP OF SCREEN:	36.8'	15.8'	3.8'
BOTTOM OF SCREEN:	46.8'	31.8'	13.8'
SCREEN SLOT:	0.010 IN	0.010 IN	0.010 IN
TOP OF FILTER PACK:	35.8'	15.8'	2.8'
TOP OF SEAL:	32'	14'	1.8'
TYPE OF SEAL:	3/8" Bentonite Chips	→	
TYPE OF FILTER PACK:	12/20 Silica	TMP-1D	TMP-1M	TMP-1S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2	FILL	Road Aggregate
				4	SC	Pale yellow-brown (10yr6/2) clayey SAND, moist
SS-1	SS		2.0	6		Grayish brown (5yr3/2) fine sandy lean CLAY, Moist
HSA-2	CU			8		
SS-2	SS		2.0	10	CL	Moderate brown (5yr4/4) fine sandy lean CLAY, moist
HSA-3	CU			12		
SS-3	SS		2.0	14		Moderate brown (5yr3/4) lean CLAY, moist
HSA-4				16		
				18		Bedrock @ 18.0'
AR	CU			20	LMS	Limestone more crystaline. Medium Gray N6, weathered surface, very pale orange (10yr8/2)
				22		
				24		Shaley Limestone. medium gray (N5), to light .gray (N8)
				26		Weathered LMS, pale yellow-orange to light olive gray, dry (10yr8/6 to 5y 5/8)
				28		
				30		
				32		
				34		
				36		Limestone, medium light gray to medium gray N6 Weathered surfaces reddish gray (5gy6/1)
				38		
				40		

NOTES AND WELL CONSTRUCTION



LEGEND:

SS - Split Spoon	*PID - Photoionization Detecto*	*HA - Hand Auger*
CU -Cuttings Sample	*PP - Pocket Penetrometer*	*WB - Wash Bore*
ST - Shelby Tube	*HSA - Hollow Stem Augers*	*RB - Rock Bit*
	AR - Air Rotary	*NX - Rock Core*

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

LOG OF BORING NO.: **TMP-2** SHEET NUMBER 2 of 2

GEOLOGIST: C. Joyce

CLIENT: Republic Services, Inc.

DATE: 08/28/12

PROJECT NAME: Bridgeton Landfill

PROJECT NUMBER: 4788.1

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:	TMP-1D	TMP-1M	TMP-1S
AR	CU			42 44 46	LMS	Limestone med gray N6. Weathered Surfaces dusky yellow	Bottom of 2D Screen 46.8'			
				48		Boring Terminated @ 47' BGS				
				50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90						

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA
Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

CLIENT: Republic Services, Inc.
PROJECT NAME: Bridgeton Landfill
PROJECT NUMBER: 4788.10
PROJECT LOCATION: Maryland Heights, MO
BORING LOCATION: N: 1066895 E: 515160
AES PROJECT NO: 4788.10
AES GEOLOGIST: T.Pool, C. Joyce
START DATE: 08/23/12 FINISH DATE: 08/28/12
START TIME: FINISH TIME:

LOG OF BORING NO. **TMP-3**

SHEET NUMBER 1 of 2

DRILLING CONTRACTOR: Roberts Environmental Drilling
DRILLER: Patrick
DRILLING RIG: Track Mounted CME-75
DRILLING METHOD: 8" HAS, 8" Air Rorary
SAMPLING METHOD: Split Spoon, Cuttings
BORING DIAMETER: 10"/8"
WELL DIAMETER: 3x 1"
WELL COMPLETION: Stick-Up
SURFACE ELEVATION: 456.1
TOC ELEVATION: S-458.82; M-458.777; D-458.812
WATER LEVEL: -
WATER ELEVATION: -
DATE: -

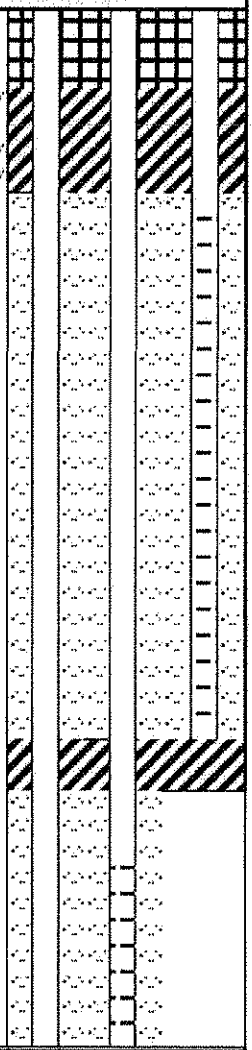
WELL CONSTRUCTION DETAILS

MATERIAL:	PVC	PVC	PVC
DIAMETER:	1"	1"	1"
WELL TOTAL DEPTH:	61'	48	28.5'
SCREEN LENGTH:	10'	15'	20'
RISER LENGTH:	53.8'	35.7'	11.3'
TOP OF SCREEN:	50.8	32.8	8.3
BOTTOM OF SCREEN:	60.8	47.8	28.3'
SCREEN SLOT:	0.010 IN	0.010 IN	0.010 IN
TOP OF FILTER PACK:	49.8	30.5	7.3
TOP OF SEAL:	45	29	5.5
TYPE OF SEAL:	3/8" Bentonite Chips	→	→
TYPE OF FILTER PACK:	12/20 Silica	TMP-3D	TMP-3M	TMP-3S

SAMPLE NUMBER	SAMPLE TYPE	BLOW COUNT	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS
HSA-1				2		Grass with Gravel
				4	ML	
SS-1	SS		2.0	6		Brown with gray clayey SILT, dry
						Brown silty CLAY, dry
HSA-2	CU			8		Trace Gravel at 8'
SS-2	SS		2.0	10		Brown silty CLAY, dry
HSA-3	CU			12	CL	
				14		
SS-3	SS		2.0	16		Dark brown silty CLAY, wet
HSA-4	CU			18		
				20		
SS-4	SS		2.0			Gray silty CLAY, moist
				22		Gray sandy, clayey SILT saturated
HSA-5	CU			24		
SS-5	SS		2.0	26	ML	Gray sandy SILT, moist
HSA-6	CU			28		
				30		
SS-6	SS		2.0			Bit Refusal
						Bedrock @ 31.0'
				32		
AR	CU			34		Gray weathered LIMESTONE, wet
				36	LMS	
				38		End of TP Log, CJ resumes on 8/28/2012
				40		

NOTES AND WELL CONSTRUCTION

Top of Upper Seal 2.5'
Top of Gravel Pack 4.3'
Top of 1S Screen 5.3'
Top of Gravbel pack 7.3'
Top of 3S Screen 8.3'
Bottom of 3S Screen 28.3
Top of Middle Seal 28.5
Top of Gravel Pack 30.5
Top of 3M Screen 32.8



LEGEND:

SS - Split Spoon
CU -Cuttings Sample
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr, Suite 1 Fairview Heights IL 62208

LOG OF BORING NO. **TMP-3** SHEET NUMBER 2 of 2

GEOLOGIST: T.Pool, C. Joyce

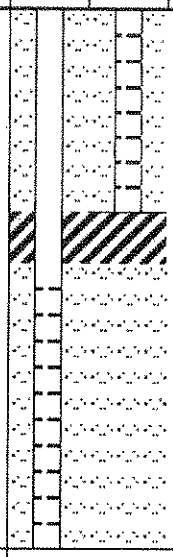
CLIENT: Republic Services, Inc.

DATE: 08/23/12

PROJECT NAME: Bridgeton Landfill

PROJECT NUMBER: 4788.1

SAMPLER TYPE	LEL %	H2S (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				42		Gray weathered LIMESTONE, wet	
				44			
				46			
				48			Bottom of 3M Screen 47.8 Top of Bottom Seal 48'
AR	CU			50	LMS	Limestone Competent, Medium Light Gray (N6) Thin shaley LMS	Top of Gravel Pack 49.8' Top of 3D Screen 50.8'
				52			
				54			
				56			
				58			
				60			Bottom of 3D Screen 60.8'
				62		Boring Terminated @ 61.0'	
				64			
				66			
				68			
				70			
				72			
				74			
				76			
				78			
				80			
				82			
				84			
				86			
				88			
				90			



LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

13 Executive Dr. Suite 1 Fairview Heights IL 62208

CLIENT: Republic Services, Inc.

PROJECT NAME: Bridgeton Landfill

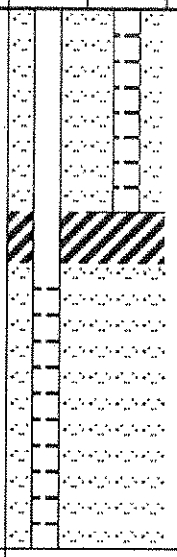
LOG OF BORING NO.: **TMP-3** SHEET NUMBER: 2 of 2

GEOLOGIST: T.Pool, C. Joyce

DATE: 08/23/12

PROJECT NUMBER: 4788.1

SAMPLER TYPE	LEL %	H2S (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				42		Gray weathered LIMESTONE, wet	
				44			
				46			
				48			Bottom of 3M Screen 47.8 Top of Bottom Seal 48'
AR	CU			50	LMS	Limestone Competent, Medium Light Gray (N6) Thin shaley LMS	Top of Gravel Pack 49.8' Top of 3D Screen 50.8'
				52			
				54			
				56			
				58			
				60			Bottom of 3D Screen 60.8'
				62		Boring Terminated @ 61.0'	
				64			
				66			
				68			
				70			
				72			
				74			
				76			
				78			
				80			
				82			
				84			
				86			
				88			
				90			



LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detecto
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
AR - Air Rotary
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

GROUNDWATER MONITORING WELLS

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-3 WL-105A	07.0803035.003.002	1 of 2

Start/Finish Date 8/8/95 / 8/9/95	**Site Name and Location** West Lake Landfill; Bridgeton, Missouri
Drilling Contractor Hart Environmental Drilling	**Boring Location:** Area 1 **Ground Surface Elevation:** 467.2
Driller Max Tinnin	**Northing:** 1069136.26 **Easting:** 515871.62

Drilling Equipment CME-55 Drill Rig, Hollow Stem Augers	**McLaren/Hart Geologist/Office** Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	109'	D-3

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	None Taken	None Taken	0.0-30.0' Landfill Debris: trashy debris consisting of cloth, wood, rope, and plastic; soil consisting of brown and gray silt, and crushed rock; dry to moist.
10	WL-105A 10'	None Taken	
15	None Taken	None Taken	
20	None Taken	None Taken	
25	None Taken	None Taken	
30	WL-105A 30'	None Taken	
35	None Taken	None Taken	30.0-60.0' Native Alluvium: dark gray clayey silt grading to fine to coarse-grained sand and gravel; wet. @ 30' wet
40	None Taken	None Taken	
45	WL-105A 47'	Background (0.04-0.06)	
50	None Taken	None Taken	
55	None Taken	None Taken	
60	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-3 WL-105A	07.0803035.003.002	2 of 2

Start/Finish Date	Site Name and Location
8/8/95 / 8/9/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 1
Hart Environmental Drilling	**Ground Surface Elevation:** 467.2
Driller	**Northing:** 1069136.26
Max Tinnin	**Easting:** 515871.62

Drilling Equipment	McLaren/Hart Geologist/Office
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	109'	D-3

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
70	None Taken	None Taken	60.0-109.0' Native Alluvium: dark gray clayey silt grading to fine to coarse-grained sand and gravel; wet.
75	None Taken	None Taken	
80	None Taken	None Taken	
85	None Taken	None Taken	
90	None Taken	None Taken	
95	None Taken	None Taken	
100	None Taken	None Taken	
105	None Taken	None Taken	
110	None Taken	Background	Auger refusal @ 109.0' (bedrock)

Notes:

Radiological samples collected at 10 and 30 feet below ground surface; downhole logging indicated elevated gamma readings from 0.5-11.0'.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

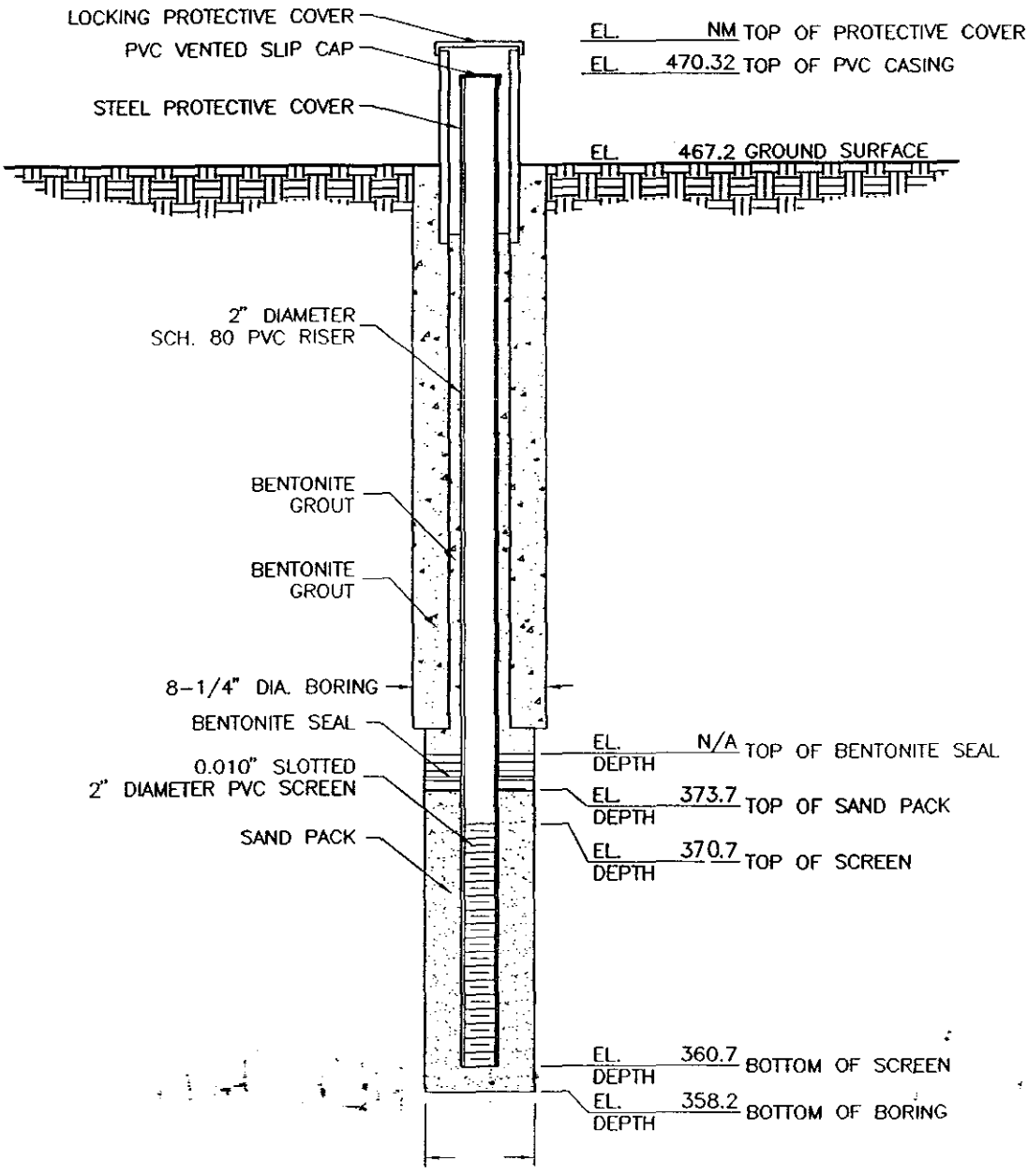
Groundwater encountered at 30 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. D-3

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 8/9/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-105A FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED
4. N/A NOT APPLICABLE, BENTONITE GROUT/CHIPS USED TO SEAL WELL UP TO SURFACE.

(W3.DWG)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-6 WL-206	07.0803035.003.002	1 of 2

Start/Finish Date	Site Name and Location
8/16/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location: Area 2
Hart Environmental Drilling	Ground Surface Elevation: 444.4
Driller	Northing: 1070194.31
Max Tinnin	Easting: 514549.50

Drilling Equipment	McLaren/Hart Geologist/Office
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	109'	D-6

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-206 5'	Background (0.02-0.04)	0.0-65.0' Native Alluvium: olive brown clayey silt grading to grayish brown, coarse-grained sand and gravel; dry to wet.
10	WL-206 10'	Background (0.02-0.04)	
15	WL-206 15'	Background (0.02-0.04)	@ 11' wet
20	None Taken	None Taken	
25	None Taken	None Taken	
30	None Taken	None Taken	
35	None Taken	None Taken	
40	None Taken	None Taken	
45	None Taken	None Taken	
50	None Taken	None Taken	
55	None Taken	None Taken	
60	None Taken	None Taken	
65	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-6 WL-206	07.0803035.003.002	2 of 2

Start/Finish Date	**Site Name and Location**
8/16/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 2
Hart Environmental Drilling	**Ground Surface Elevation:** 444.4
Driller	**Northing:** 1070194.31
Max Tinnin	**Easting:** 514549.50

Drilling Equipment	**McLaren/Hart Geologist/Office**
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	109'	D-6

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
70	None Taken	None Taken	65.0-109.0' Native Alluvium: olive brown clayey silt grading to grayish brown, coarse-grained sand and gravel; dry to wet.
75	None Taken	None Taken	
80	None Taken	None Taken	
85	None Taken	None Taken	
90	None Taken	None Taken	
95	None Taken	None Taken	
100	None Taken	None Taken	
105	None Taken	None Taken	
110	None Taken	None Taken	Auger refusal @ 109.0' (bedrock)

Notes:

Radiological samples collected at 5 and 10 feet below ground surface.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

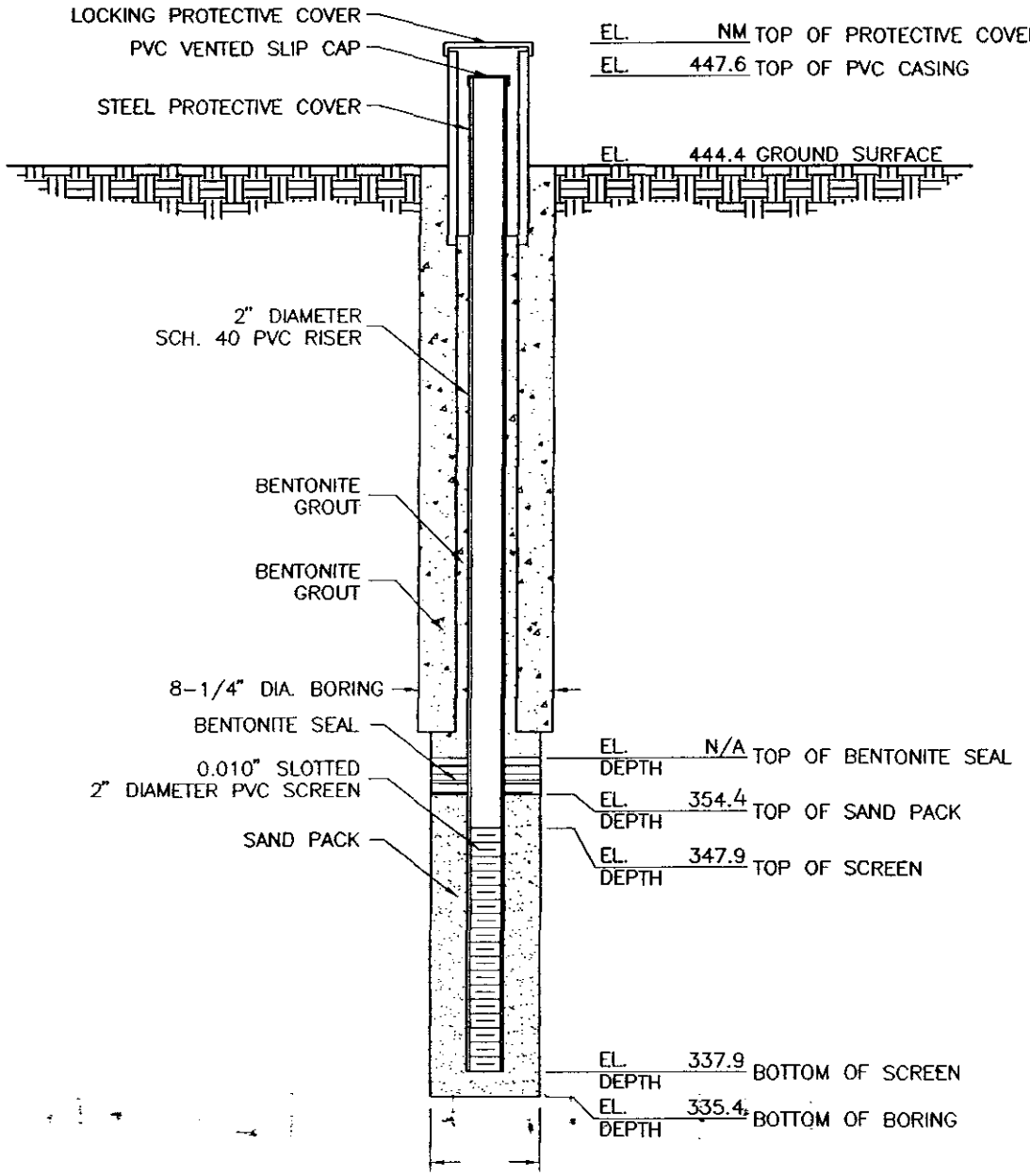
Groundwater encountered at 11 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. D-6

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 8/17/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-206 SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED
4. N/A NOT APPLICABLE; BENTONITE GROUT USED TO SEAL WELL UP TO SURFACE

(W6.DWG)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-12 WL-216A	07.0803035.003.002	1 of 3

Start/Finish Date	Site Name and Location
8/29/95 / 10/17/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location:	Area 2
Hart Environmental Drilling	Ground Surface Elevation:	477.4
Drilling Service Company	Northing:	1069836.29
Driller	Easting:	514936.08
Max Tinnin	**McLaren/Hart Geologist/Office**	
Bruce Murphy	Tim Biggs / St. Louis	

Drilling Equipment
CME-55 Drill Rig, Hollow Stem Augers
LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/8" Drag Bit (mud rotary) 4 1/4" ID; 8 1/4" Hole 24" OD Solid Auger	5' Continuous Sampler Grab from Auger	146.2	D-12

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-216 5'	Background	0.0-22.0' Landfill Debris: soil consiting of grayish brown to olive brown silty clay to gray, very fine-grained sand, and crushed rock; no trashy debris encountered; dry to moist.
10	WL-216 10'	Background	
15	WL-216 15'	Background	
20	WL-216 20'	Background	
25	WL-216 25'	Background	22.0-65.0' Native Alluvium: gray, silty, very fine-grained sand grading to coarse-grained sand, gravel, cobbles, and coal; moist to wet.
30	None Taken	None Taken	
35	None Taken	None Taken	
40	None Taken	None Taken	
45	None Taken	None Taken	
50	None Taken	None Taken	@ 48' wet
55	None Taken	None Taken	
60	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-12 WL-216A	07.0803035.003.002	2 of 3

Start/Finish Date	**Site Name and Location**
8/29/95 / 10/17/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 2
Hart Environmental Drilling	**Ground Surface Elevation:** 477.4
Drilling Service Company	**Northing:** 1069836.29
Driller	**Easting:** 514936.08
Max Tinnin	**McLaren/Hart Geologist/Office**
Bruce Murphy	Tim Biggs / St. Louis

Drilling Equipment

CME-55 Drill Rig, Hollow Stem Augers

LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/8" Drag Bit (mud rotary)	5' Continuous Sampler	146.2	D-12
4 1/4" ID; 8 1/4" Hole	Grab from Auger		
24" OD Solid Auger			

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
65	None Taken	None Taken	65.0-125.0' Native Alluvium: gray, silty, very fine-grained sand grading to coarse-grained sand, gravel, cobbles, and coal; moist to wet.
70	None Taken	None Taken	
75	None Taken	None Taken	
80	None Taken	None Taken	
85	None Taken	None Taken	
90	None Taken	None Taken	
95	None Taken	None Taken	
100	None Taken	None Taken	
105	None Taken	None Taken	
110	None Taken	None Taken	
115	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-12 WL-216A	07.0803035.003.002	3 of 3

Start/Finish Date	Site Name and Location
8/29/95 / 10/17/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location: Area 2
Hart Environmental Drilling	Ground Surface Elevation: 477.4
Drilling Service Company	Northing: 1069836.29
Driller	Easting: 514936.08
Max Timin	**McLaren/Hart Geologist/Office**
Bruce Murphy	Tim Biggs / St. Louis

Drilling Equipment
CME-55 Drill Rig, Hollow Stem Augers
LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/8" Drag Bit (mud rotary)	5' Continuous Sampler	146.2	D-12
4 1/4" ID; 8 1/4" Hole	Grab from Auger		
24" OD Solid Auger			

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
120	None Taken	None Taken	-
125	None Taken	None Taken	
130	None Taken	None Taken	125.0-146.2' Native Alluvium: gray, silty, very fine-grained sand grading to coarse-grained sand, gravel, cobbles, and coal; moist to wet.
135	None Taken	None Taken	
140	None Taken	None Taken	
145	None Taken	None Taken	
150	None Taken	None Taken	Auger refusal @ 146.2' (bedrock)

Notes:

Radiological samples collected at 5 and 25 feet below ground surface; downhole logging indicated elevated gamma readings from 2.5-5.0'.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

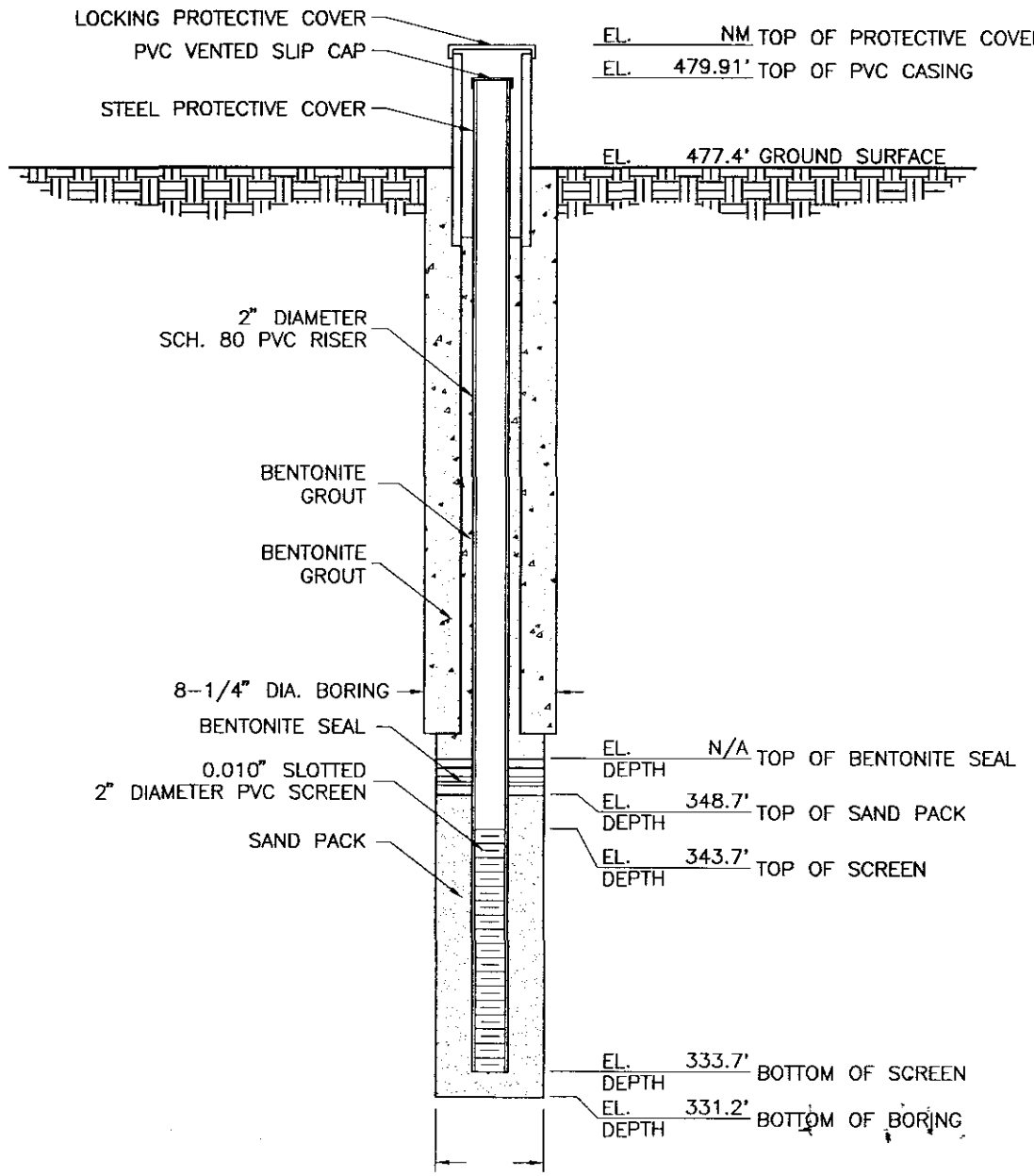
Groundwater encountered at 48 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. D-12

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 10/17/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-216A FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED.
4. N/A = NOT APPLICABLE; BENTONITE GROUT USED TO SEAL WELL UP TO SURFACE.

(W12)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
3 D-14 WL-224	07.0803035.003.002	1 of 3

Start/Finish Date	Site Name and Location
9/14/95 / 10/19/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location: Area 2
Hart Environmental Drilling	Ground Surface Elevation: 468.4
Drilling Service Company	Northing: 1070485.74
Driller	Easting: 515601.73
Max Tinnin	McLaren/Hart Geologist/Office
Bruce Murphy	Tim Biggs / St. Louis

Drilling Equipment
CME-55 Drill Rig, Hollow Stem Augers
LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/8" Drag Bit (mud rotary) 4 1/4" ID; 8 1/4" Hole 24" OD Solid Auger	5' Continuous Sampler Grab from Auger	135.5	D-13

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-224 5'	Background (0.02-0.04)	0.0-33.0' Landfill Debris: trashy debris consisting of rubber, wood, plastic, cloth, paper, glass, and metal; soil consisting of brownish yellow silt and dark gray clayey silt to silty fine-grained sand; dry to moist.
10	WL-224 10'	Background (0.02-0.04)	
15	WL-224 15'	Background (0.02-0.04)	
20	WL-224 20'	Background (0.02-0.04)	
25	WL-224 25'	Background (0.02-0.04)	
30	WL-224 30'	Background (0.02-0.04)	
35	WL-224 35'	Background (0.02-0.04)	@ 33' wet 33.0-65.0' Native Alluvium: dark gray clayey silt grading to fine to coarse grained sand, and coal; wet.
40	None Taken	Background (0.02-0.04)	
45	None Taken	Background (0.02-0.04)	
50	None Taken	Background (0.02-0.04)	
55	None Taken	None Taken	
60	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-13 WL-224	07.0803035.003.002	2 of 3

Start/Finish Date	Site Name and Location
9/14/95 / 10/19/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location: Area 2
Hart Environmental Drilling	Ground Surface Elevation: 468.4
Drilling Service Company	Northing: 1070485.74
Driller	Easting: 515601.73
Max Tinnin	McLaren/Hart Geologist/Office
Bruce Murphy	Tim Biggs / St. Louis

Drilling Equipment
CME-55 Drill Rig, Hollow Stem Augers
LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/8" Drag Bit (mud rotary)	5' Continuous Sampler	135.5	D-13
4 1/4" ID; 8 1/4" Hole	Grab from Auger		
24" OD Solid Auger			

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
65	None Taken	None Taken	65.0-125.0' Native alluvium: dark gray clayey silt grading to fine to coarse grained sand, and coal; wet.
70	None Taken	None Taken	
75	None Taken	None Taken	
80	None Taken	None Taken	
85	None Taken	None Taken	
90	None Taken	None Taken	
95	None Taken	None Taken	
100	None Taken	None Taken	
105	None Taken	None Taken	
110	None Taken	None Taken	
115	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-13 WL-224	07.0803035.003.002	3 of 3

Start/Finish Date	Site Name and Location
9/14/95 / 10/19/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location: Area 2
Hart Environmental Drilling	Ground Surface Elevation: 468.4
Drilling Service Company	Northing: 1070485.74
Driller	Easting: 515601.73
Max Tinnin	**McLaren/Hart Geologist/Office**
Bruce Murphy	Tim Biggs / St. Louis

Drilling Equipment

CME-55 Drill Rig, Hollow Stem Augers

LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/8" Drag Bit (mud rotary)	5' Continuous Sampler		
4 1/4" ID; 8 1/4" Hole	Grab from Auger	135.5	D-13
24" OD Solid Auger			

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
120	None Taken	None Taken	
125	None Taken	None Taken	
130	None Taken	None Taken	125.0-135.5' Native Alluvium: dark gray clayey silt grading to fine to coarse grained sand, and coal; wet.
135	None Taken	None Taken	
140	None Taken	None Taken	Auger refusal @ 135.5' (bedrock)

Notes:

Radiological samples collected at 5 and 35 feet below ground surface.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

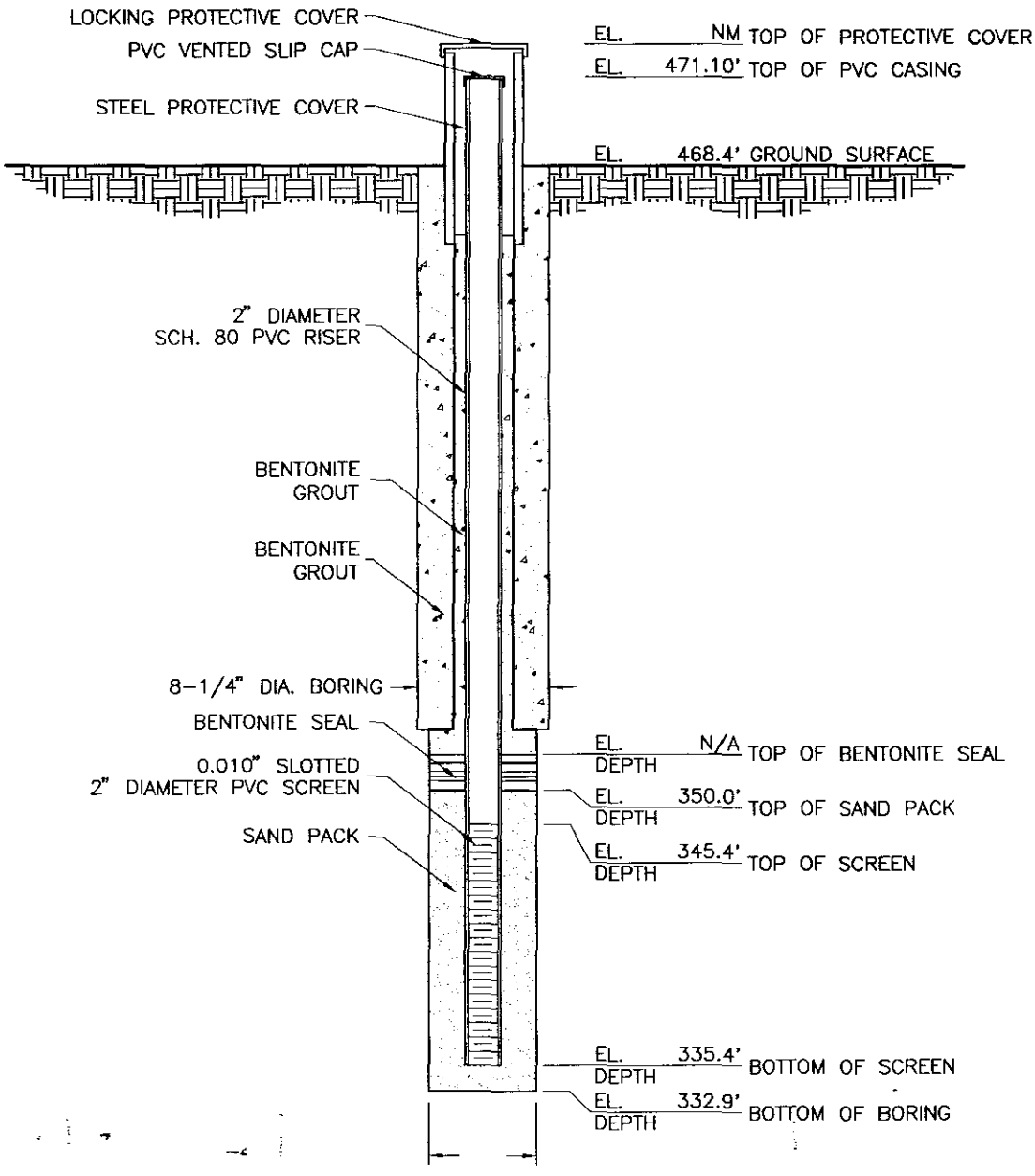
Groundwater encountered at 33 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. D-13

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 10/19/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-224 FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED.
4. N/A = NOT APPLICABLE; BENTONITE GROUT USED TO SEAL WELL UP TO SURFACE.

(W13)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-14 WL-109B	07.0803035.003.002	1 of 2

Start/Finish Date	Site Name and Location
9/7/95 / 10/24/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location:	Area 1
Hart Environmental Drilling	Ground Surface Elevation:	484.5
Drilling Service Company	Northing:	1068947.16
Driller	Easting:	516523.17
Max Tinnin	McLaren/Hart Geologist/Office	
Bruce Murphy	Tim Biggs / St. Louis	

Drilling Equipment
CME-55 Drill Rig, Hollow Stem Augers
LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID 8 1/4" Hole 24" OD Solid Auger	Continuous Sampler Grab from Auger	59'	D-14

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	None Taken	None Taken	0.0-49.0' Landfill Debris: trashy debris consisting of wood, plastic, brick, paper, wire, rubber, metal, yard waste, and carpeting; soil consisting of olive brown to dark gray silt, gray to black silty clay, and crushed rock; dry to moist; warm.
10	None Taken	None Taken	
15	None Taken	None Taken	
20	None Taken	None Taken	
25	None Taken	None Taken	
30	None Taken	None Taken	
35	None Taken	None Taken	
40	None Taken	None Taken	
45	None Taken	None Taken	@ 45.0' sample had temperature of 116° F

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
D-14 WL-109B	07.0803035.003.002	2 of 2

Start/Finish Date	Site Name and Location
10/24/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location: Area 1
Hart Environmental Drilling	Ground Surface Elevation: 484.5
Drilling Service Company	Northing: 1068947.16
Driller	Easting: 516523.17
Max Tinnin	**McLaren/Hart Geologist/Office**
Bruce Murphy	Tim Biggs / St. Louis

Drilling Equipment
CME-55 Drill Rig, Hollow Stem Augers
LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID 8 1/4" Hole 24" OD Solid Auger	Continuous Sampler Grab from Auger	59'	D-14

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
50	None Taken	None Taken	49.0-59.0' Native Alluvium: dark gray, clayey and silty, very fine-grained sand; moist; warm.
55	None Taken	None Taken	
60	WL-109B 59'	None Taken	Auger refusal @ 59.0' (bedrock)

Notes:

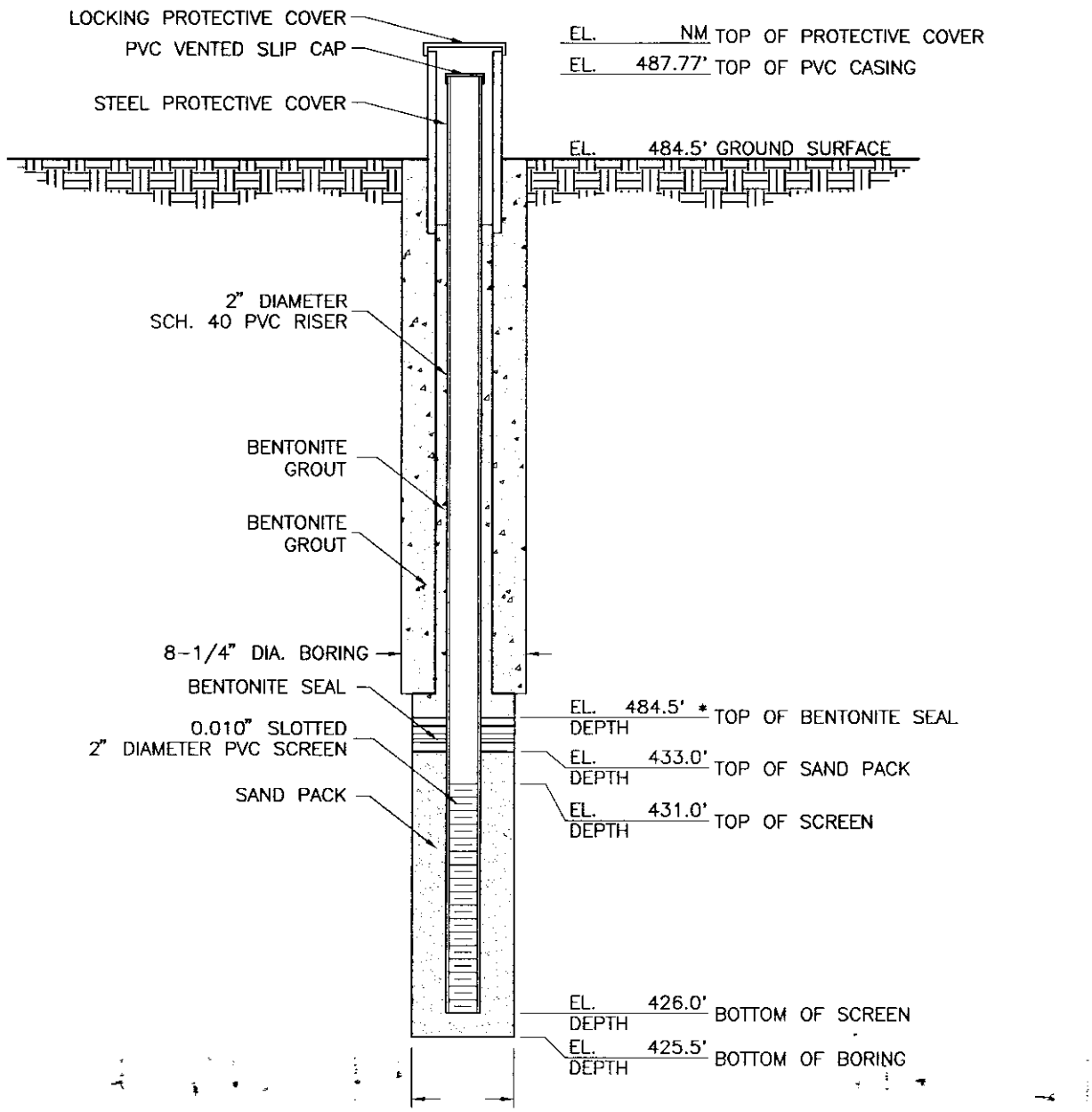
Radiological samples not collected during boring activities.
Non-radiological samples not collected during boring activities.
Perched water not encountered during boring activities.
Groundwater not encountered during boring activities.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. D-14

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 10/24/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-109B FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED.
4. * = HYDRATED BENTONITE CHIPS USED TO SEAL WELL UP TO SURFACE.

(W14)

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL PLUGGING REGISTRATION RECORD

OFFICE USE ONLY		DATE RECEIVED	
REF NO. 514518			
C.R. NO.		CHECK NO.	TRANSMITTAL NO.
STATE WELL NUMBER		APPROVED BY	DATE APPROVED
ENTERED Ph1 Ph2 Ph3		ROUTE	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME		TELEPHONE NUMBER		VARIANCE NUMBER (IF APPLICABLE)
ENGINEERING MGMT.SUPPORT INC. EMSI. PAUL ROSASCO				6023
OWNER ADDRESS	CITY	STATE	ZIP CODE	
7220 W. JEFFERSON AVE. SUITE 406	LAKEWOOD	CO	80235	
ADDRESS OF WELL SITE	CITY	STATE	ZIP CODE	REFERENCE NUMBER OF ORIGINAL WELL (IF KNOWN)
13570 ST. CHARLES ROCK ROAD	BRIDGETON	MO	63044	N/A
SITE NAME	WELL NUMBER		DATE	
WEST LAKE LANDFILL	D - 14			

LOCATION OF WELL
LAT. 38 ° 46 ' 9.9 "
LONG. 90 ° 26 ' 30.9 "

DRILL AREA: AREA 1
COUNTY: ST. LOUIS

SMALLEST ¼ ____ ¼ ____ ¼ LARGEST
Sec. ____ Township ____ North Range ____ ☐ East ☐ West

PLUGGING INFORMATION

ORIGINAL DRILLER (IF KNOWN)	DATE ORIGINALLY DRILLED	STATIC WATER LEVEL	DRILLER NOTES
N/A	N/A		

☑ MONITORING WELL

DEPTH OF WELL: 60 FT.
LENGTH OF RISER: N/A FT. BGS
SCREEN/RISER DIAMETER: 2 IN.
WELL SCREEN AND RISER REMOVED? ☑ Yes ☐ No
PUMP AND SAMPLING EQUIPMENT REMOVED? ☐ Yes ☑ N/A ☐ No
CASING REMOVED? ☑ Yes ☐ N/A ☐ No

☐ SOIL BORING(S) Boring Diameter: ____ IN.

QUANTITY	DEPTH
TOTAL ____ BORING(S)	TOTAL ____ FT.

TYPE OF FILL MATERIAL: ☐ Gravel ☐ Sand ☐ Other
AMOUNT OF FILL USED: ____ ☐ TONS ☐ CUBIC YARDS
DEPTH TO TOP OF FILL: ____ FT.

GROUT INSTALLATION METHOD: ☐ Gravity ☑ Tremie ☐ Excavation
GROUT MATERIAL USED: Neat Cement Bentonite ☐ Hi-Early ☑ Slurry ☐ Granular ☐ Pellets ☐ Type 1 ☐ Chips ☐ Other ____
HOW MANY GALLONS OF WATER MIXED PER BAG OF CEMENT OR BENTONITE? 5 ☐ Hydrated to Saturation
TOTAL NUMBER OF BAGS OF GROUT USED: 3
POUNDS OF GROUT PER BAG: 50

DATE 1ST WELL PLUGGED	DATE LAST WELL PLUGGED	FINISHED SURFACE MATERIAL	SURFACE MATERIAL LENGTH
04/13/2016	04/15/2016	☑ Soil ☐ Concrete ☐ Asphalt ☐ Other	____ FT. ____ IN.

REMARKS: (REDI JOB# 162075-AB)
REASON FOR ABANDONMENT:

I hereby certify that the monitoring well herein described was plugged in accordance with the Department of Natural Resources requirements for the plugging of wells.

SIGNATURE (PRIMARY CONTRACTOR)		SIGNATURE (CONTRACTOR)	PERMIT NUMBER	DATE
PERMIT NUMBER	DATE	SIGNATURE (APPRENTICE)	PERMIT NUMBER	DATE
3360 - M	5/17/2016			

MO-780-2161 (1-12)

REMIT TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY
WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165
ENCLOSE $50 FEE WITH REGISTRATION RECORD WITHIN 60 DAYS AFTER WELL PLUGGING OR WITHIN 180 DAYS AFTER THE PLUGGING OF TEMPORARY WELLS

Drilling Log

Project Name: WESTLAKE						Boring No.: D-81	
Project No.: 84-075-4-002						Page: 1 of 4	
Ground Elevation: 447.8	Location: N. 1196.2728, E. 922.8145					Total Footage: 61.5'	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	SEE REMARKS	61.5	0	11	0	SEE REMARKS	—
Drilling Co.: WABASH DRILLING CO.				Driller (s): DORL THORNTON			
Drilling Rig.: ACKER MP-5, TRUCK				Type of Penetration Test: STANDARD			
Date: 8-13-84 To 8-15-84				Field Observer (s): GLEN ERNSTMANN			

Depth	Description	Class.	Blow Count	Recov.		Sample or Box No.	Remarks
1	BROWN FINE SANDY SILT, LOW PLASTICITY, DAMP (FILL)						5" SOLID AUGERS 0' TO 15'
2							
3	GRAY-BROWN COARSE GRAVEL (MAX. 2" DIA.), SOME FINE GRAVEL AND SAND, DAMP (FILL)						
4							
5							
6							
7	BROWN CLAYEY SILT, LOW PLASTICITY, DAMP TO MOIST (FILL)						
8							
9							
10							
10.0	BROWN FINE TO MEDIUM SAND, MEDIUM DENSE TO LOOSE, DAMP (FILL)		5/5/4	16" / 18"		SS-1	
11.5	BROWN CLAYEY SILT, LOW PLASTICITY, MOIST (FILL)						STOPPED 8-13-84 RESUMED 8-14-84
12							
13	BROWN SILTY FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED BELOW APPROX. 13' (FILL?)						SATURATED MATERIAL FIRST ENCOUNTERED @ APPROX. 13'

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-81

Project Name: WESTLAKE — Page 2 of 4

Project No.: 84-075-4-002 — Date: 8-13-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
15	BROWN SILTY FINE TO MEDIUM SAND, MEDIUM DENSE SATURATED BELOW APPROX. 13' (FILL(?)		3/5/7	19"/18"	15.0 SS-2 16.5	BEGAN 4½" DIA. TRI-CONE, WASH BORING @ 15'. CONTINUED TO 61.5'.
16						
17						
18	BROWN FINE TO MEDIUM SAND, WELL SORTED, SUBROUNDED GRAINS, MEDIUM DENSITY, SATURATED					
19						
20			6/10/16	10"/18"	20.0 SS-3 21.5	
21						
22						
23						
24						
25			9/14/15	10"/18"	25.0 SS-4 26.5	
26						
27						
28	GRAY FINE SAND, TRACE SILT, SAND IS MICHLY QUARTZOSE, MEDIUM DENSE, SATURATED					
29						
30			10/12/5	11"/18"	30.0 SS-5a	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-81
Page 3 of 4
Project Name WESTLAKE
Project No. 84-075-4-002
Date 8-13-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
32	GRAY SILTY CLAY MEDIUM TO HIGH PLASTICITY, STIFF TO MEDIUM STIFF, MOIST TO SATURATED				SS-5	
33				31.5		
34	GRAY SILT AND SAND INTERBEDS, SILT IS LOW PLASTICITY, VERY LOOSE, SATURATED					
35			*0/1/4	*0" / 18"	35.0 SS-6	*NOTE: RODS SUNK 6" WHEN SAMPLE SS-6 WAS FIRST ATTEMPTED; NO RECOVERY ON FIRST ATTEMPT SO RODS WERE DROPPED BACK DOWN THE HOLE AND A SAMPLE OBTAINED.
36					36.5	
37						
38						
39						
40					40.0	
41				18" / 18"	ST-7	Q_p = N.A.
42	GRAY FINE TO COARSE SD, SUBANGULAR TO SUBROUND GRAINS, HIGHLY QUARTZ, SATURATED				41.5	
43						
44	GRAY SAND AND GRAVEL MIX, SATURATED					
45			15/20/18	7" / 18"	45.0 SS-8	
46	GRAY COARSE SAND, SOME MEDIUM AND FINE, SUBRND TO SUBANGULAR, DENSE				46.5	
47						
	(SEE DESCRIPTION BELO					

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-81
Project Name WESTLAKE
Page 4 of 4
Project No. 84-075-4-002
Date 8-13-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
49	GRAY SAND AND FINE GRAVEL INTERBEDS, SAND IS FINE TO COARSE, SUBROUNDED, QUARTZOSE GRAVEL IS SUBANGULAR TO SUBROUNDED, QUARTZ, FELDSPAR AND SOME MAFIC MINERALS, DENSE TO VERY DENSE, SATURATED					
50			15/18/22	10"/18"	50.0 SS-9	← GRAVEL
51					SS-9a	← SAND
52					51.5	
53						
54						
55					55.0	
56			13/21/37	9"/18"	SS-10	A 2" dia. PVC piezometer was installed to 60'.
57					56.5	PVC is flush-joint, threaded couplings. Bottom 15' is .010" machine slotted screen. Bottom 17.5' is gravel packed with a 3' thick bentonite pellet seal above. Annulus is grouted from seal to ground surface. T.O.P. is 3' above ground surface.
57	GRAY-BROWN FINE TO MEDIUM SAND, VERY DENSE, SATURATED					
60			14/20/44	8"/18"	60.0 SS-11	
61					61.5	
62	TOTAL DEPTH 61.5'					WATER LEVEL IS @ 14.43' BELOW T.O.P. 3:05pm 8-15-83 Cal hrs. after installation
63						
64						

Drilling Log

Project Name: WESTLAKE						Boring No.: D-83	
Project No.: 89-075-4-002						Page: 1 of 7	
Ground Elevation: 444.4	Location: North Section of Site; Fig. I-2					Total Footage: 115.3	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	SEE REMARKS	115.3	0	16	0	SEE REMARKS	—
Drilling Co.: WABASH DRILLING CO.					Driller (s): DORL THORNTON		
Drilling Rig.: ACKER MP-5, TRUCK					Type of Penetration Test: STANDARD		
Date: 8-16-84	To: 8-20-84				Field Observer (s): GLEN ERNSTMANN		

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
1	BROWN FINE SANDY SILT AND ORGANIC MATERIAL, DAMP					5" DIA. SOLID AUGERS 0' TO 5'.
2	BROWN SILTY FINE SAND, DAMP					
3						
4	LIGHT BROWN FINE TO MEDIUM SAND, TRACE SILT, LOOSE TO MEDIUM DENSITY, DAMP SATURATED BELOW APPROX. 10.5'					
5			3/3/3	17"/18"	5.0 SS-1	
6					6.5	
7						
8						
9						
10					10.0	SATURATED MATERIAL ENCOUNTERED @ APPROX. 10.5'
11			3/4/8	16"/18"	SS-2	
12					11.5	
13	LIGHT BROWN FINE SAND INTERBEDDED WITH THIN (3" TO 6") CLAY SEAMS, SATURATED					

A-15

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-83
Project Name WESTLAKE
Page 2 of 7
Project No. 84-075-4-002
Date 8-16-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
15	LIGHT BROWN FINE SAND INTERBEDDED WITH THIN (3" TO 6") CLAY SEAMS, SATURATED					BEGAN 4½" DIA. TRI-CONE WASH BORING @ 15' TO 115.3'.
	BROWN SILTY CLAY, MEDIUM PLASTICITY, MOIST		4/10/15	15"/18"	15.0 SS-3a	
16	LIGHT BROWN FINE TO MEDIUM SAND, TRACE SILT, MEDIUM DENSITY, SATURATED				SS-3b 16.5	STOPPED 8-16-84
17						RESUMED 8-17-84
18						
19	FINE TO COARSE SAND AND FINE GRAVEL, SATURATED					
20			14/19/24	15"/18"	20.0 SS-4	
21	BROWN TO GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE, SATURATED				21.5	
22						
23						
24	GRAY-BROWN MEDIUM TO COARSE SAND, SOME FINE SAND, FEW THIN (3" TO 8" THICK) FINE GRAVEL SEAMS (3/4" MAX. DIA.), MEDIUM DENSE					
25					25.0	
	SAND IS PRIMARILY QUARTZ, SOME FELDSPAR AND MAFIC MINERALS, SUBROUNDED TO SUBANGULAR GRAINS		9/10/10	13"/18"	SS-5	
26					26.5	
27						
28						
29						
30	GRAY FINE TO MEDIUM SAND, TRACE SILT AND COARSE SAND, PRIMARILY QUARTZ, DENSE, SATURATED		10/15/17	8"/18"	30.0 SS-6	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-83
Project Name WESTLAKE
Page 3 of 7
Project No. 84-075-4-002
Date 8-16-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
32	GRAY FINE TO MEDIUM SAND, TRACE SILT AND COARSE SAND, PRIMARILY QUARTZ SAND, DENSE, SATURATED				SS-6	
33						
34						
35			9/15/21	9"/18"	SS-7	
36						
37						
38						
39	GRAY-BROWN MEDIUM TO COARSE SAND, FEW FINE GRAVEL SEAMS, PRIMARILY QUARTZ, WITH SOME FELDSPAR, SUBROUNDED TO SUBANGULAR GRAINS, DENSE, SATURATED		10/13/17	8"/18"	SS-8	
40						
41						
42						
43						
44	GRAY-BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL (3" MAX. DIA.), QUARTZ, FELDSPAR, AND MAFIC MINERALS, SUBANGULAR GRAINS, MEDIUM DENSE, SATURATED		12/10/11	9"/18"	SS-9	
45						
46						
47						

A-17

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-83
Page 4 of 7
Project Name WESTLAKE
Project No. 84-075-4-002
Date 8-16-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
49	GRAY-BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL AS DESCRIBED ABOVE					
50	GRAY FINE TO COARSE SAND, MEDIUM DENSITY, SATURATED		4/7/11	8" / 18"	50.5 SS-10 51.5	
51						
52						
53						
54						
55						
56						
57						
58	SAND AND GRAVEL, SATURATED					
59						
60	GRAY SILTY FINE TO MEDIUM SAND, PRIMARILY QUARTZ, VERY DENSE, SATURATED		35/50/5"	2" / 11"	60.0 SS-11 60.9	
61						
62	SEVERAL THIN (3" TO 6" THICK) FINE TO COARSE GRAVEL SEAMS					
63						
64						

A-18

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-83

Project Name WESTLAKE

Page 5 of 7

Project No. 84-075-4-002

Date 8-16-84

Depth	Description	Log of Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
66	GRAY SILTY FINE TO MEDIUM SAND, PRIMARILY QUARTZ, VERY DENSE						
67							
68	SEVERAL THIN (3" TO 6" THICK) FINE TO COARSE GRAVEL SEAMS AND COARSE SAND SEAMS						
69							
70			14/19/22	7"/18"	70.0	SS-12	
71					71.5		
72							
73							
74							
75							
76							
77	GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND AND FINE GRAVEL, QUARTZ, FELDSPAR AND SOME MAFIC MINERALS, SUBROUNDED, MEDIUM DENSITY TO DENSE, SATURATED						NOTE: SLIGHT ORGANIC OR LEACHATE-LIKE ODOR IN SAMPLES SS-12 & SS-13
78							
79							
80			13/14/14	8"/18"	80.0	SS-13	
81		A-19			81.5		

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-83

Project Name WESTLAKE

Page 6 of 7

Project No. 84-075-4-002

Date 8-16-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
83						
84	GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND AND FINE GRAVEL, QUARTZ, FELDSPAR, AND SOME MAFIC MINERALS, SUBROUNDED, MEDIUM DENCITY TO DENSE, SATURATED					
85						
86						
87						
88						
89						NOTE: MODERATE TO STRONG LEACHATE-LIKE ODOR IN SAMPLE SS-14
90						
			14/16/17	8" / 18"	SS-14	
91						
	OCCASIONAL GRAVEL SEAM (3" TO 4" THICK). 92' TO 104'.					
92						
93						
94						
95						
96						
97						
98						

A-20

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-83
Project Name WESTLAKE
Page 7 of 7
Project No. 84-075-4-002
Date 8-16-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
100	GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND AND FINE GRAVEL, QUARTZ, FELDSPAR AND SOME MAFIC MINERALS, SUBROUNDED, MEDIUM DENSE TO DENSE, SATURATED		18/24/26	9" 18"	100.0 SS-15	SLOWER DRILLING RATE 90' TO 100'.
101					101.5	STOPPED 8-17-84 RESUMED 8-20-84
102	OCCASIONAL GRAVEL SEAM (3" TO 4" THICK), 92' TO 104'.					
103						MUCH SLOWER DRILLING RATE 100' TO 115.3'.
104						
105						A 2" dia. PVC piezometer was installed to 97'. PVC is flush-jointed, threaded couplings, bottom 20' is .010" machine slotted screen.
106						
107						Gravel 115.3' to 100'. Bentonite pellets 100' to 99'. Gravel pack 99' to 75.5' with a 2' thick bentonite pellet seal above. Annulus is grouted from seal to ground surface.
108						
109						
110	— — — — — —				110.0	
111	GRAVEL AND SAND, SOME SILT, DENSE, SATURATED		24/22/27	3" 18"	SS-16	T.O.P. is 3.2' above ground surface.
112					111.5	
113						
114						WATER LEVEL IMMEDIATELY AFTER PIEZOMETER INSTALLED (2:05 pm 8-21-84) is 14.50' BELOW T.O.P.
115	CREAM LIMESTONE TOTAL DEPTH 115.3'	A-21				

Drilling Log

Project Name: WESTLAKE						Boring No.: D - 85	
Project No.: 84-075-4-002						Page: 1 of 6	
Ground Elevation: 453.1		Location: NE section of Site; Figure I-2				Total Footage: 84.1'	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	SEE REMARKS	83.5	0.6	12	0	SEE REMARKS	—

Drilling Co.: WABASH DRILLING CO.		Driller (s): DORL THORNTON	
Drilling Rig: ACKER MP-5, TRUCK		Type of Penetration Test: STANDARD	
Date: 8-21-84	To: 8-22-84	Field Observer (s): GLEN ERNSTMANN	

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
1	LIGHT BROWN SAND, SILT AND GRAVEL, DAMP TO DRY (FILL)					5" SOLID AUGERS 0' TO 10'
2						
3						
4	GREENISH-GRAY TO DARK GRAY SILTY FINE SAND, VERY LOOSE, DAMP (FILL)					
5					5.0	
4			3/2/3	7"/18"	SS-1	
7					6.5	
8						
9						
10					10.0	4½" TRI-CONE WASH BORE 10.0' TO 84.1'.
11			1/1/1	18"/18"	SS-2	
12					11.5	STOPPED 8-21-84 RESUMED 8-22-84
13	GRAY CLAYEY SILT, AND FINE SAND, LOW PLASTICITY, STIFF, MOIST (FILL)	A-25				

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. B-85

Project Name WESTLAKE

Page 2 of 6

Project No. 84-075-4-002

Date 8-21-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
15	GRAY CLAYEY SILT, AND FINE SAND, LOW PLASTICITY, STIFF, MOIST (FILL)		3/4/5	12" / 18"	15.0 SS-3 16.5	
20			2/4/4	10" / 18"	20.0 SS-4 21.5	SATURATED MATERIAL ENCOUNTERED BETWEEN 18' AND 25'.
22	GRAY-BROWN SILTY FINE SAND, MOIST TO SATURATED					
25				17" / 18"	25.0 ST-5 26.5	Q_f = NOT OBTAINABLE
26	GRAY FINE TO COARSE SAND, TRACE SILT, MEDIUM DENSE TO VERY DENSE, SATURATED					
28	PRIMARILY SUBROUNDED QUARTZ GRAINS					
30		A-26	10/10/10	10" / 18"	30.0 SS-6	

Drilling Log, continued

Boring No. D-95
Project Name WESTLAKE
Page 3 of 6
Project No. 84-075-4-002
Date 8-21-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
32	GRAY FINE TO COARSE SAND, TRACE SILT, MEDIUM DENSE TO VERY DENSE, SATURATED				31.5	SS-6	
33	PRIMARILY SUBROUNDED QUARTZ GRAINS						
34							
35					35.0		
36			21/27/26	13" / 18"		SS-7	
37					36.5		
38							
39							
40	GRAY TO GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND, FEW FINE GRAVELLY GRAINS, DENSE, SATURATED				40.0		
41			16/23/21	8" / 18"		SS-8	
42					41.5		
43							
44							
45							
46							
47							

A-27

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-85

Project Name WESTLAKE — Page 4 of 6

Project No. 84-075-4-002 — Date 8-21-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
49	GRAY TO GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND, FEW FINE GRAVELLY SEAMS, DENSE, SATURATED					
50	GREENISH GRAY TO GRAY FINE TO MEDIUM SAND, TRACE SILT AND COARSE SAND, VERY DENSE, TO DENSE, SATURATED		26/34/24	13"/18"	50.0	
51	..... 90% QUARTZ, SUBROUNDED TO SUBANGULAR				SS-9 51.5	
52						
53						
54						
55						
56						
57						
58						
59						
60			14/16/22	8"/18"	60.0 SS-10 61.5	
61						
62						
63						
64						

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-85
Project Name WESTLAKE
Page 5 of 6
Project No. 84-075-4-002
Date 8-21-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
66	GREENISH GRAY TO GRAY FINE TO MEDIUM SAND, TRACE SILT AND COARSE SAND, VERY DENSE TO DENSE, SATURATED					
67	90% QUARTZ, SUBROUNDED TO SUBANGULAR					
68						
69						
70				70.0		
71			17/20/27	15" 18"	SS-11	
72				71.5		
73						
74						
75						
76						
77						
78						
79						
80			17/21/34	80.0 15" 18"	SS-12	VERY SLIGHT LEACHATE LIKE OR ORGANIC ODOR
81		A-29		81.5		

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-85

Project Name WESTLAKE

Page 6 of 6

Project No. 84-075-4-002

Date 8-21-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
83	GRAVEL, COBBLES AND SAND, SATURATED					
84	CREAM TO LIGHT BROWN LIMESTONE					A 2" dia. PVC piezometer was installed to 82'. PVC is flush-jointed, threaded couplings. Bottom 20' is .010" machine slotted screen. Gravel pack from 84.1' to 59.7' with a 2.2' thick bentonite pellet seal above. Anulus is grouted from seal to ground surface. T.O.P. is 3.0' above ground surface.
85	TOTAL DEPTH 84.1'					
86						
87						
88						
89						
90						WATER LEVEL IMMEDIATELY AFTER PIEZOMETER INSTALLATION 20.05' BELOW T.O.P. 10:00am 8-29-84
						WATER LEVEL IS 24.09' BELOW T.O.P. 7:15am 8-27-84.

A-30

Drilling Log

Project Name: WESTLAKE						Boring No.: D - 87	
Project No.: B4-075-4-002						Page: 1 of 7	
Ground Elevation: 460.0		Location: N 114.45, E. 903.6487				Total Footage: 111.7	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	5" @ THE SURFACE	111.0	0.7	22	0	SEE REMARKS	—
Drilling Co.: WABASH DRILLING CO.				Driller (s): DORL THORNTON			
Drilling Rig: ACKER MP-5, TRUCK				Type of Penetration Test: STANDARD			
Date: 8-9-84	To: 8-10-84			Field Observer (s): GLEN ERNSTMANN			

Depth	Description	Class.	Blow Count	Recov.		Sample or Box No.	Remarks
1	LIGHT BROWN FINE TO COARSE SAND, SOME SILT AND GRAVEL, DAMP (FILL)						5" SOLID AUGERS 0' TO 30.0'
2	LIGHT GRAY GRAVEL (2" MAX. DIA.), SOME SAND, VERY DENSE, DAMP (FILL)						
3							
4							
5			50/3"	2"/3"	5.0 / 5.3	SS-1	
6	MOTTLED LIGHT GRAY TO DARK GRAY TO BROWN SANDY SILTY CLAY, MEDIUM PLASTICITY, STIFF, MOIST (FILL						
7							
8	TRACE GRAVEL (2" MAX. DIA.)						
9							
10			2/3/4	12"/18"	10.0	SS-2	
11							
12					11.5		
13							

Drilling Log, continued

Boring No. D-87

Project Name WESTLAKE

Page 2 of 7

Project No. 84-075-4-002

Date 8-9-84

Depth	Description	Log or Class	Blow Counts	Core Recov. & Loss		Sox or Sample No.	Remarks
15	MOTTLED LIGHT GRAY TO DARK GRAY TO BROWN SANDY, SILTY CLAY, MEDIUM PLASTICITY, STIFF MOIST (FILL				15.0		
16	TRACE GRAVEL (2" MAX. DIA.)			23"/24"		ST-3	Q_p = 1.5 TSF
17					17.0		
18							
19							
20	DARK GRAY SILTY CLAY, MEDIUM TO HIGH PLASTICITY, VERY STIFF, MOIST				20.0		
21				21"/24"		ST-4	Q_p = 2.75 TSF
22					22.0		
23							
24	DARK GRAY SANDY SILT AND SILTY SAND INTERBEDS, SAND IS FINE TO MEDIUM, LOW TO NON-PLASTIC, WET TO SATURATED						
25					25.0		
24				4"/24"		ST-5	Q_p = N.A.
27					27.0		
28							SATURATED MATERIAL FIRST ENCOUNTERED @ APPROXIMATELY 27.0' BELOW G.S.
29							
30	BROWN TO GRAY-BROWN SILTY FINE SAND, MEDIUM DENSE SATURATED, SLIGHTLY MICACEOUS		3/7/8	10"/18"	30.0	SS-6	

Drilling Log, continued

Boring No. D-87

Project Name WEST LAKE — Page 3 of 7

Project No. 84-075-4-002 — Date 8-9-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
32	BROWN TO GRAY-BROWN SILTY FINE SAND, MEDIUM DENSE SATURATED				31.5	SS-6	NOTE: HOLE COLLAPSED TO 26.7' AFTER SAMPLE SS-6 WAS OBTAINED. NO FREE WATER OCCURS ABOVE THIS DEPTH.
33	SLIGHTLY MICACEOUS						
34							
35	BROWN FINE TO MEDIUM SAND, TRACE SILT, ~~SOME~~ HIGHLY QUARTZOSE, DENSE, SATURATED				35.0		BEGAN ROTARY WASH BORING W/ 4½" DIA. TRI-CONE BIT @ 30.0'
36			12/14/20	4"/18"		SS-7	
37					36.5		
38	LIGHT BROWN FINE TO COARSE SAND INTERBEDDED WITH THIN (3" TO 10" THICK) GRAVEL SEAMS, TRACE SILT, DENSE TO VERY DENSE, SATURATED						
39							
40					40.0		
41			15/25/25	8"/18"		SS-8	
42					41.5		
43							
44							
45					45.0		
46			17/23/14	8"/18"		SS-9	
47					46.5		

Drilling Log, continued

Boring No. D-87

Project Name WEST LAKE

Page 4 of 7

Project No. 84-075-4-002

Date 8-9-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
49	LIGHT BROWN FINE TO COARSE SAND INTERBEDDED WITH THIN (3" TO 10" THICK) GRAVEL SEAMS, TRACE SILT, DENSE TO VERY DENSE, SATURATED					
50			19/29/50	10"/18"	50.0	
51					SS-10	
52	GREENISH DARK GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE TO VERY DENSE, SATURATED				51.5	
53						
54						
55			12/17/25	9"/18"	55.0	
56					SS-11	
57					56.5	
58						
59						
60			33/35/50/4"	12"/18"	60.0	
61					SS-12	
62					61.5	
63						
64						

Drilling Log, continued

Boring No. D-87

Project Name WESTLAKE

Page 5 of 7

Project No. 84-075-4-002

Date 8-9-84

Depth	Description	Log of Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
	GREENISH DARK GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE TO VERY DENSE, SATURATED		24/25/36	13"/18"	65.0	SS-13	
66					66.5		STOPPED 8-9-84 RESUMED 8-10-84
67							
68							
69							
70			30/23/24	14"/18"	70.0	SS-14	
71					71.5		
72							
73							
74							
75	GRAY TO DARK GREENISH GRAY FINE TO COARSE SAND, HIGHLY QUARTZOSE, SUBROUNDED GRAINS, VERY DENSE TO MEDIUM DENSE, SATURATED FEW THIN (3" TO 6") GRAVEL SEAMS		23/29/34	14"/18"	75.0	SS-15	
76					76.5		
77							
78							
79							
80					80.0		
81			27/37/26	11"/18"		SS-16	
					81.5		

Drilling Log, continued

	Boring No. D - 87
Project Name WESTLAKE	Page 6 of 7
Project No. 84-075-4-002	Date 8-9-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
83	GRAY TO DARK GREENISH GRAY FINE TO COARSE SAND, HIGHLY QUARTZOSE, SUBROUNDED GRAINS, VERY DENSE TO MEDIUM DENSE, SATURATED						
84							
85	FEW THIN (3" TO 6" THICK) GRAVEL SEAMS AT INTERVALS OF 1' TO 5'.		15/16/14	9" / 18"	85.0	SS-17	
86					86.5		
87							
88							
89	NOTE: SAND IS PREDOMINANTLY COARSE WITH TRACE FINE GRAVEL THROUGHOUT BELOW APPROXIMATELY 88'.						
90					90.8		
91			15/17/22	8" / 18"		SS-18	
92					91.5		
93							
94							
95					95.0		
96			19/15/18	7" / 18"		SS-19	
97					96.5		
98							

Drilling Log, continued

Boring No. D-87

Project Name WESTLAKE

Page 7 of 7

Project No. 84-075-4-002

Date 8-9-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
100	GRAY TO DARK GREENISH GRAY FINE TO COARSE SAND, HIGHLY QUARTZOSE SUBROUNDED GRAINS, VERY DENSE TO MEDIUM DENSE, SATURATED		24/50/6"	6"/12"	100.1	SS-20	
101					101.0		
102	FEW THIN (3" TO 6" THICK) GRAVEL SEAMS AT INTERVALS OF ROUGHLY 1' TO 5'.						
103	NOTE = SAND IS PREDOMINANTLY COARSE WITH TRACE FINE GRAVEL THROUGHOUT BELOW APPROXIMATELY 88'.						
104							A 2" dia. PVC piezometer was installed to 111'. PVC is flush-joint, threaded couplings. Bottom 20' is .010" machine slotted screen. Bottom 24' is gravel packed with a 3' thick bentonite pellet seal above. Annulus is grouted from seal to ground surface. T.O.P. is 3' above ground surface.
105					105.0		
106			24/31/48	9"/18"		SS-21	
107					107.5		
108							
109							
110					110.0		
111			17/30/50/4"	10"/16"		SS-22a	
	GRAY TO CREAM LIMESTONE, MEDIUM STRONG TO STRONG, SLIGHTLY TO MODERATELY WEATHERED				111.3	SS-22b	
112							111.7'
113	TOTAL DEPTH 111.7'						WATER LEVEL IMMEDIATELY AFTER PIEZOMETER INSTALLATION 8-10-84 is 4.46 BELOW T.O.P.
114							WATER LEVEL @ 26.05' BELOW T.O.P. 8:15am 8-14-84
115							

Drilling Log

Project Name: WESTLAKE						Boring No.: D-89	
Project No.: 84-075-4-002						Page: 1 of 4	
Ground Elevation: 454.1	Location: N. 1790.5514, E. 602.6094					Total Footage: 49.0'	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	SEE REMARKS	47.8	1.2'	8	0	SEE REMARKS	—
Drilling Co.: WABASH DRILLING CO.				Driller (s): DOEL THORNTON			
Drilling Rig.: ACKER MP-5, TRUCK				Type of Penetration Test: STANDARD			
Date: 8-27-84	To: 8-28-84			Field Observer (s): GLEN ERNSTMANN			

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
1	LIGHT GRAY TO GRAY TO BROWN SAND AND GRAVEL, SOME SILT, DAMP (FILL)					5" SOLID AUGERS 0' TO 25'.
2						
3						
4						
5						
6						
7	GREENISH BROWN TO DARK GRAY SILTY CLAY AND CLAYEY SILT, LOW TO MEDIUM PLASTICITY, STIFF, DAMP TO MOIST (FILL)					
8						
9						
10					10-a	
11	NOTE: COLOR IS GREENISH BROWN WITH SOME BROWN (IRON) STAINS BELOW APPROX. 14'		3/2/3	15"/18"	55-1	
12					11.5	
13						

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-89

Project Name: WESTLAKE — Page: 2 of 4

Project No.: 84-075-4-002 — Date: 8-27-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
15	GREENISH BROWN TO DARK GRAY SILTY CLAY AND CLAYEY SILT, LOW TO MEDIUM PLASTICITY, DAMP TO MOIST, STIFF					
16				18"/24"	ST-2	Q_p = 1.75 TSF
17	NOTE: COLOR IS GREENISH BROWN WITH SOME BROWN (IRON) STAINS BELOW APPROX. 14'.					
18						FEW THIN SATURATED ZONES 15' TO 20'.
19						MATERIAL IS SATURATED BELOW APPROX. 21'.
20						
21				24"/24"	ST-3	Q_p = 1.0 TSF
22						STOPPED 8-27-84 RESUMED 8-28-84
23	GRAY SILTY FINE TO MEDIUM SAND, SATURATED					NOTE: WATER LEVEL @ 19.3' BELOW G.S. 7:00 am 8-28-84
24	GRAYISH SILTY CLAY, MEDIUM PLASTICITY, SATURATED					
25				* 12"/24"	ST-4	Q_p = N.A.
26	GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSE, SATURATED					* Approx. 12" of material was retained in the tube but it slipped out of the tube and was lost when brought to the surface. A jar sample was collected.
27						
28						
29						4½" TRI-CONE WASH-BORE, 25' TO
30			10/12/18	18"/18"	SS-5	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-89

Project Name WESTLAKE

Page 3 of 4

Project No. 84-075-4-002

Date 8-27-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
					SS-5	
31.5						
32	GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSE, SATURATED					
33						
34	GRAY FINE TO MEDIUM SAND, DENSE, SATURATED					
35						
36.0						
			7/14/28	10"/18"	SS-6	
36	90% TO 95% SUBANGULAR QUARTZ GRAINS					
36.5						
37						
38						
39	GRAY TO BROWN FINE TO MEDIUM SAND WELL SORTED, DENSE TO VERY DENSE, SATURATED					
40						
40.0						
			7/11/23	11"/18"	SS-7	
41	80% QUARTZ, 10% CHERT FRAGMENTS, QUARTZ GRAINS ARE SUBROUNDED TO ROUNDED					
41.5						
42						
43						
44						
45						
45.0						
			13/18/39	10"/18"	SS-8	
46						
46.5						
47						
	BUFF LIMESTONE					

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-89

Project Name: WESTLAKE

Page 4 of 4

Project No.: 84-075-4-002

Date: 8-27-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
49	BUFF LIMESTONE					
	TOTAL DEPTH 49.0'					
50						
51						A 2" dia. PVC piezometer was installed to 49'. PVC is flush-jointed, threaded couplings. Bottom 15' is .010" machine slotted screen. Bottom 16.5' is gravel packed with a 2' thick bentonite pellet seal above. Annulus is pressure grouted from seal to surface. T.O.P. is 3' above ground surface.
52						
53						
54						
55						
						WATER LEVEL IS 22.3' BELOW T.O.P. IMMEDIATELY AFTER PIEZOMETER INSTALLATION, 1:30 pm 8-28-84

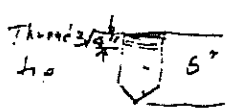
Drilling Log

Project Name				Boring No.
WESTLAKE				D-90
Project No. 84-075-4-004				Page 1 of 1
Ground Elevation 7446'	Location SW cnr of site; Fig I-2			Total Footage 47

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
Solid 4" Auger & Rotary Wash	4" & 3 7/8"	46	1	9	0	9'	3/7/85

Drilling Co. WABASH (Subsurface Construction Company)	Driller (s) Gary Hiles, Gary Feldmann
Drilling Rig. CME-750	Type of Penetration Test SPT
Date Aug 6, 1985 To Aug 7, 1985	Field Observer (s) Stathis Payiatakis

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
	Sl. sandy silt - tan, brown, damp					10:10 Start drilling w/ 4" solid auger
5	Br. Grey mottled sl. silty clay, damp, med. plastic		3/5/5	18/18	SPT-1	[illegible] rotary wash w/ 3 7/8 [illegible] rotary bit.
10	Br. silty fine sand, loose		2/3/4	12/18	SPT-2	
15	Br sl. silty fine sand, med. dense		5/7/7	12/18	SPT-3	
20	Same as above		3/6/7	10/18	SPT-4	
25	Br. sl. silty fine to medium sand, dense.		9/16/18	19/18	SPT-5	
30	Tan brown medium to coarse sand med. dense		15/15/12	4/18	SPT-6	
35	Dk Grey silty v. fine sand, loose		5/3/3	12/18	SPT-7	
40	Dk. Grey silty clay, moist, v. weak, plastic		0/0/1	18/18	SPT-8	Settled 12" under weight of 40' rods [illegible]
	- - - ? - - -					
45	Dk Grey sl. silty fine sand, dense		19/50-5.5"	11.5/11.5	SPT-9	8/7/85 Start again @ 40'
	Limestone, lt brown, very hard, sl. weathered; 1.5" seam - Loose water pressure					Rock @ 46'
	BOB @ 46.9'					Rate @ 500 psi [illegible]
50	Total pipe length 50'-5¼"					5 min for 2"
	Piezometer @ ~ 45'-3¼" depth below G.S.					30 min for 10"
55						3:25 Start piezometer installation
60	Piezometer tip Threads 3/4 [illegible] 5"					9:30 Grout [illegible]
						1:50 Remove top casing
65						
70						



A-45

Drilling Log

Project Name: WESTLAKE						Boring No.: D-91	
Project No.: 84-075-4-004						Page: 1 of 1	
Ground Elevation: ± 448	Location: Southwest of Site ; Figure I-2					Total Footage: 45	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	SEE REMARKS	44'	1'	4	0	9.25' from GS	2:45 8/6/85
Drilling Co.: WABASH						Driller(s): Gary Miles, Gary Feldmann	
Drilling Rig: CME-750						Type of Penetration Test: SPT	
Date: Aug 5, 1985	To: Aug 6, 1985					Field Observer(s): Stathis Payiatacis	

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
0	Topsoil, organic					Start drilling @ 11:00 w/ 4" solid augers. Push 4 5/8" OD 4" ID casing & use water tank. Tricone bit 3 7/8" ø
	lt br. f. sandy silt, sl. plastic, v. loose, damp					
5						
	Gr. brn silty clay, mod. plastic					
10						
	Gr. brn f sandy silt, some clay					
15						
Bentonite Pellets and Grout						
	Gr. silty clay, mod. plastic, tr. sand					
20						
	Gr. sl. silty clay, mod plastic, soft, moist		0/1/1	18/18	SPT-1	Sonk 6" under weight of 25' rod.
25	becomes more silty near 30'					
	Dk. grey v.f. sand, loose, saturated, tr. silt		1/2/2	18/18	SPT-2	
30						
Sand			3/2/3	10/18	SPT-3	
35						
screen						
	Tan, grey f. to med sand, md. dense. w/ thin (2"-4") clay lenses		3/9/11	9/18	SPT-4	
40						
	Limestone, white/creamy mod. strong, mod. hard sl. weathered					14:00 Finish drilling @ 14:10 Start piezometer installation. 10' screen SCH 80 + 40' 2" "Tri/ax" PVC pipe, flush threaded schedule 80 & sch. 20 screen (200 slots/inch) 15:15 Finish for day 8/6/85. Grout to surface. Finish @ 9:00
45	Bog					
50						
55						
60						
65						
70		A-46				

Drilling Log

Project Name: WESTLAKE						Boring No.: D - 92	
Project No.: 84-075-4-004						Page: 1 of 9	
Ground Elevation: 475.37	Location: North Central Section of Site ; Fig I-2					Total Footage: 143.6	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	4 7/8"	143.6	0.0	19	0	SEE REMARKS	-
Drilling Co.: SUBSURFACE CONSTRUCTORS (WABASH)					Driller (s): DORL THORNTON, DEAN		
Drilling Rig: ACKER MP-5, TRUCK					Type of Penetration Test: STANDARD		
Date: 4-9-85	To: 4-11-85				Field Observer (s): G. ERNSTMANN		

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
1	LIGHT GRAY-BROWN SAND AND GRAVEL (3" MAX. DIA.),					4" SOLID AUGERS 0' TO 40.0'
2						
3	GRAY AND BROWN GRAVELLY SAND, SOME SILT, LOOSE TO MEDIUM DENSE, MOIST (FILL)					
4	SLIGHT LEACHATE-LIKE ODOR					
5					5.0	
6			5/6/6	9" / 18"	SS-1	
7					6.5	
8						
9						
10					10.0	
11			2/3/3	7" / 18"	SS-2	
12					11.5	
13	BROWN SANDY SILT, LOW PLASTICITY, TRACE GRAVEL, LOOSE (FILL)					

P.2 AUG 04 '93 08:33AM FYD STL

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-92

Project Name WESTLAKE

Page 2 of 9

Project No. 84-075-4-004

Date 4-9-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
15	BROWN SANDY SILT, LOW PLASTICITY, TRACE GRAVEL, LOOSE TO MEDIUM DENSE, MOIST (FILL)		3/5/5	6"/18"	15.0		
16					16.5	SS-3	
17							
18							
19							
20					20.0		
21			3/5/6	8"/18"	21.5	SS-4	
22							
23							
24							
25					25.0		
26			6/5/5	11"/18"	26.5	SS-5	
27							
28							
29							
30					30.0		
			5/6/7	15"/18"		SS-6	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-92
Project Name WESTLAKE
Page 3 of 9
Project No. 84-075-F-004
Date 4-9-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
32	BROWN SANDY SILT, LOW PLASTICITY, TRACE GRAVEL, LOOSE TO MEDIUM DENSE, MOIST				SS-6	
35	DARK GRAY SILTY CLAY, MEDIUM PLASTISITY, VERY STIFF, MOIST					
34	SLIGHT LEACHATE-LIKE ODOR					
35			5/7/13	16"/18"	SS-7	
36						
37						
38	GRAY FINE TO MEDIUM SAND, MOIST					
39						SATURATED MATERIAL ENCOUNTERED @ APPROX. 39.5'
40	GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSE, SATURATED		6/11/7	11"/18"	SS-8	
41						STOPPED 4-9-85
42						RESUMED 4-10-85
43						BEGAN WASH BORING W/ 3 7/8" TRI-CONE BIT AND BENTONITE MUD @ 40.0'.
44	GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE, SATURATED					
45			10/11/17	15"/18"	SS-9	
46						
47						

111479

Burns & McDonnell

Form TS-GT-2-2

P.4

AUG 04 '93 08:34AM FVD STL

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-92

Project Name WESTLAKE

Page 4 of 9

Project No. 84-075-4-004

Date 4-9-85

Depth	Description	Log of Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
49	GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE, SATURATED						
	— — — — — — —						
	BROWN FINE TO COARSE SAND, VERY DENSE, SATURATED						
50					50.0		
			28/28/26	11" / 18"		SS-10	
51					51.5		
52							
53							
54							
55							
56							
57							
58							
59							
60					60.0		
			16/26/34	10" / 18"		SS-11	
61					61.5		
62							
63							
64							

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-92
Project Name WESTLAKE
Page 5 of 9
Project No. 84-075-4-004
Date 4-9-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
66	BROWN FINE TO COARSE SAND, VERY DENSE, SATURATED					
67						
68	GRAY MEDIUM TO COARSE SAND, VERY DENSE, SATURATED					
69						
70					70.0	
			21/34/36	15"/18"	SS-12	
71					71.5	
72						
73						
74						
75						
76	GRAY-BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, MEDIUM DENSE TO VERY DENSE, SATURATED					
77						
78						
79						
80					80.0	
			15/11/13	7"/18"	SS-13	
81					81.5	

111479

Form TS-GT-2-2

AUG 04 '93 08:35AM FWD STL P.6

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-92
Project Name WESTLAKE
Page 6 of 9
Project No. 84-075-4-004
Date 4-9-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
83	GRAY-BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, MEDIUM DENSE TO VERY DENSE, SATURATED						
84							
85							
86							
87							
88							
89	GRAY FINE TO MEDIUM SAND, TRACE SILT, VERY DENSE, SATURATED						
90					70.0		
91	GRAY SILTY FINE SAND, VERY DENSE, SATURATED		25/28/39	9"/18"	91.5	SS-14	
92							
93							
94	GRAY-BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, DENSE						
95							
96							
97							
98							

AUG 04 '93 08:35AM FYD STL
P.7

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-92
Project Name WESTLAKE
Page 7 of 9
Project No. 84-075-4-004
Date 4-9-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
100	GRAY-BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, DENSE		17/22/24	8"/18"	100.0 SS-15 101.5	
101						
102						
103						
104						
105						
106						
107						
108	BROWN-GRAY COARSE SAND, TRACE MEDIUM SAND AND FINE GRAVEL, VERY DENSE, SATURATED					
109						
110					110.5	
111			31/50/5"	8"/12"	SS-16 111.0	STOPPED 4-10-85 RESUMED 4-11-85
112						
113	GRAY-BROWN MEDIUM TO COARSE SAND WITH THIN (1" TO 3" THICK) GRAVEL INTERBEDS, SATURATED					
114						
115						

8'd
AUG 04 '93 08:36AM FVD STU P.8

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-92

Project Name WESTLAKE

Page 8 of 9

Project No. 84-075-4-004

Date 4-9-85

Depth	Description	Log of Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
117	GRAY-BROWN MEDIUM TO COARSE SAND WITH THIN (1" TO 3" THICK) GRAVEL INTERBEDS, SATURATED						
118							
119	GRAY MEDIUM TO COARSE SAND, TRACE SILT, VERY DENSE, SATURATED						
120					120.0		
121			17/24/28	8"/18"		SS-17	
122					121.5		
123	GRAVEL SEAM 123.0' to 123.3'						
124							
125							
126							
127							
128							
129							
130					130.0		
131			28/19/31	6"/18"		SS-18	
132					131.6		

111479

Burns & McDonnell

Form TS-GT-2-7

AUG 04 '93 08:36AM FVD STL P.9

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-92
Project Name WESTLAKE
Page 9 of 9
Project No. 84-025-4-004
Date 4-9-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
34	GRAY MEDIUM TO COARSE SAND, TRACE SILT, VERY DENSE, SATURATED					HOLE WAS REAMED W/ A 4 7/8" TRI-CONE BIT.
35						
136						4 1/2" O.D. steel casing was temporarily installed to 143.6'.
137						
138						The bentonite mud was flushed from the casing w/ potable water.
139						
140					139.8	A 2" dia. PVC piezometer was installed to 143'. Flush-joint, thread-d couplings.
141			21/36/50/44	9"/16"	SS-19	Bottom 20' is .010 machine-slotted screen.
142					141.3	Gravel pack w/ quartz sand to 120.0'.
143						Bentonite pellets 120.0' to 117.5'.
144	LIMESTONE					143.6
145	TOTAL DEPTH 143.6					HOLE COLLAPSED ABOVE THE BENTONITE SEAL TO 40' BELOW G.S.
146						GROUT 0' TO 40'.
147						WATER LEVEL IN PIEZOMETER - IMMEDIATELY AFTER INSTALLATION 59.6' BELOW G.S. 10:00 am 4-15-85.
148						T.O.P. IS 0.2' BELOW G.S.
149						4-17-85 11:15 am 38.9' BELOW T.O.P.

11479

Burns & McDonnell

Form TS-GT-2-2

P.10
AUG 04 '93 08:37AM FYD STL

Drilling Log

Project Name: WESTLAKE						Boring No.: D-93	
Project No.: 84-075-4-004						Page: 1 of 8	
Ground Elevation: 450.70	Location: West Central Section of Site - Fig I-2					Total Footage: 169.2	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
WASH BORE	4 7/8"	118.0	1.2	16	0	SEE REMARKS	—
Drilling Co.: SUBSURFACE CONSTRUCTION (WABASH)				Driller (s): GARY MILES			
Drilling Rig: CME 750, ATV				Type of Penetration Test: STANDARD			
Date: 4-15-85	To: 4-18-85			Field Observer (s): GLEN ENNSTMANN			

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
1	GRAY TO BROWN SILTY CLAY, AND SAND, SOME GRAVEL AND FEW BOULDERS, MOIST (FILL)					6" H.S. AUGER 0.0' TO 3.0'. 5" CASING SET TO 8'. 4 7/8" TRI-CONE WASH BORE 8.0' TO BENTONITE DRILLING MUD.
2						
3						
4						
5					5.0	
6			2/3/5	7" / 18"	SS-1	
7					6.5	
8						STOPPED 4-15-85. RESUMED 4-16-85
9						
10					10.0	
11			5/3/4	0" / 18"	SS-2	NO RECOVERY (PROBABLY A PIECE OF GRAVEL IN THE SPOON TIP)
12					11.5	
13		A-56				

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. B-93
Project Name WESTLAKE
Page 2 of 8
Project No. 84-075-4-004
Date 4-15-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
15	GREENISH BROWN FINE SAND, SOME MEDIUM SAND, MEDIUM DENSE, MOIST, TRACE SILT		5/8/9	8" / 18"	15.0 SS-3 16.5	
16						
17						
18						
19						
20	BROWN MEDIUM SAND, SOME FINE SAND, MEDIUM DENSE, SATURATED		9/10/11	9" / 18"	20.0 SS-4	
21						
22						
23	BROWN COARSE SAND SEAM 22.0 - 22.4					
24	BROWN MEDIUM TO COARSE SAND, MEDIUM DENSE, SATURATED					
25			6/9/12	9" / 18"	25.0 SS-5	
26					26.5	
27	SEVERAL COARSE SAND AND FINE GRAVEL SEAMS, 26.0 TO 30.0					
28						
29						
30		A-57	10/19/14	9 / 18"	30.0 SS-6	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-93
Project Name WESTLAKE
Page 3 of 8
Project No. 84-675-4-004
Date 4-15-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sampler No.	Remarks
32	BROWN MEDIUM TO COARSE SAND MEDIUM DENSE, SATURATED			31.5	SS-6	
33						
34						
35	GRAY-BROWN FINE TO MEDIUM SAND, TRACE SILT, FEW THIN GRAY CLAY SEAMS, DENSE, SATURATED		9/17/18	35.0 10" / 18"	SS-7	
36						
37				36.5		
38						
39	GRAY COARSE SAND, SOME MEDIUM SAND, TRACE GRAVEL, MEDIUM DENSE, SATURATED					
40				40.0		
41			8/13/14	8" / 18"	SS-8	5.0
42				41.5		
43						
44						
45				45.0		
46			9/14/14	9" / 18"	SS-9	5.0
47				46.5		
		A-58				

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-93
Page 4 of 8
Project Name WESTLAKE
Project No. 84-075-4-004
Date 4-15-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
49	GRAY COARSE SAND, SOME MEDIUM SAND, TRACE GRAVEL, MEDIUM DENSE, SATURATED						
50	GRAY SILTY FINE SAND, SOME MEDIUM SAND, VERY DENSE, SATURATED		18/25/26	15"/18"	50.0	SS-10	
51					51.5		
52							
53							
54							
55							
56							
57							
58	FINE GRAVEL, SOME SAND AND COARSE GRAVEL, SATURATED						
59							
60	GRAY SILTY FINE SAND, SOME SILTY MEDIUM SAND SEAMS, DENSE TO VERY DENSE, SATURATED		14/25/20	13"/18"	60.0	SS-11	S.O.
61					61.5		
62							
63							
64		A-59					

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-93
Project Name WESTLAKE
Page 5 of 8
Project No. 84-075-4-004
Date 4-15-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
66	GRAY SILTY FINE SAND, SOME SILTY MEDIUM SAND SEAMS DENSE TO VERY DENSE, SATURATED					
67						
68						
69						
70						
			17/34/28	8"/18"		60.0
71					SS-12	
						71.5
72						
73						
74						
75						
76	FINE GRAVEL AND SAND, SOME COARSE GRAVEL					
77	GRAY MEDIUM TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, DENSE, SATURATED					
78						
79						
80						80.0
			14/25/24	14"/18"	SS-13	
81		A-6Q				81.5

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-93
Project Name WESTLAKE
Page 6 of 8
Project No. 84-075-4-004
Date 4-15-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
83	FINE TO COARSE GRAVEL					
84	GRAY-BROWN COARSE SAND: SOME FINE GRAVEL, DENSE, SATURATED					SLOWER DRILLING RATE AND MUCH GREATER CIRCULATION LOSS 80' TO
85	COARSE GRAVEL SEAM 85.5' TO 86.0'					
86						
87						
88						
89	—					
90					90.0	
91			13/16/19	9"/18"	SS-14	
92	— — — — — —				91.5	STOPPED 4-16-85 RESUMED 4-17-85
93	GRAY-BROWN COARSE SAND AND FINE GRAVEL, SOME COARSE GRAVEL, FEW THIN (1" TO 12" THICK) SAND SEAMS, VERY					
94	DENSE, SATURATED					
95						
96						
97						
98						

A-61

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-93
Project Name WESTLAKE
Page 7 of 8
Project No. 84-075-4-004
Date 4-15-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
100	GRAY-BROWN COARSE SAND AND FINE GRAVEL, SOME COARSE GRAVEL FEW SAND SEAMS (1" TO 12" THICK) VERY DENSE, SATURATED		19/24/48	8"/18"	100.0	
101					SS-15	
102					104.5	
103						
104						
105						
106	COBBLE 106.0' TO 106.5'					
107	COARSE SAND, TRACE FINE GRAVEL					
108						
109	FINE TO COARSE GRAVEL, SOME SAND					
110	COBBLE 110.0' TO 110.4'.					
111						
112	GRAY COARSE SAND AND FINE GRAVEL, SOME COARSE GRAVEL, DENSE, SATURATED					
113						
114						
115		A-62	15/22/27	5"/18"	SS-16	STOPPED 4-17-85 RESUMED 4-19-85.

Burns & McDonnell
Engineers-Architects-Consultants

Drilling Log, continued

Boring No. D-93

Project Name WESTLAKE

Page 8 of 8

Project No. 84-075-4-004

Date 4-15-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
117	GRAY COARSE SAND AND FINE GRAVEL, SOME COARSE GRAVEL, DENSE, SATURATED			1165	SS-16	
118	FRACTURED LIMESTONE					4½" dia. steel casing was temporarily installed to 112'. Hole collapsed to 112'.
119	LIMESTONE					A 2" dia. PVC flush-joint, threaded coupling piezometer was installed to 112'. The casing was pulled back to 90' and the hole collapsed to 91'. Bentonite pellets 91' to 89.6'. Grout 89.6' to surface. 20' of .010 machine-slotted screen. T.O.P. is 3.3' above ground surface.
120	TOTAL DEPTH 119.2'					
121						
122						
123						
124						
125						
126						
127						
128						Water level in piezometer immediately after installation 4-18-85 1:30pm is 15.4' below T.O.P.
129						
130						
131						
132		A-63				

Drilling Log

Project Name: WESTLAKE						Boring No.: D-94	
Project No.: 84-075-4-004						Page: 1 of 7	
Ground Elevation: 442.68	Location:					Total Footage: 109.0	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
WASH BORE	3 7/8"	108.8	0.2	15	0	SEE REMARKS	—
Drilling Co.: SUBSURFACE CONSTRUCTORS (WABASH)				Driller (s): GARY MILES			
Drilling Rig.: CME 750, ATV				Type of Penetration Test: STANDARD			
Date: 4-18-85	To: 4-24-85			Field Observer (s): GLEN ERNSTMANN			

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
0	BROWN SANDY SILT AND ORGANIC MATERIAL, moist					4" solid auger 0' to 5'. 5' of 4" casing set. Wash bore w/ 3 7/8" tri-cone roller bit 5' to
1	BROWN FINE TO MEDIUM SAND, TRACE SILT, VERY LOOSE TO VERY DENSE, SATURATED BELOW 2'.					
2						
3						SATURATED MATERIAL @ APPROX. 3'.
4						
5						5.0
6			1/2/3	17" / 18"	SS-1	
7						6.5 STOPPED 4-18-85 RESUMED 4-19-85
8						
9						
10						10.0
11			3/5/7	6" / 18"	SS-2	
12						11.5
13						

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-94

Project Name WESTLAKE

Page 2 of 7

Project No. 84-075-4-004

Date 4-18-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
15	BROWN FINE TO MEDIUM SAND, TRACE SILT, VERY LOOSE TO VERY DENSE, SATURATED		11/22/28	7"/18"	15.0 SS-3 16.5	
20			18/29/31	15"/18"	20.0 SS-4 21.5	
25			9/11/15	15"/18"	25.0 SS-5 26.5	
28	GRAY-BROWN FINE TO COARSE SAND, FEW COARSE SAND SEAMS (1" TO 2" THICK), MEDIUM DENSE, SATURATED		12/8/7	9"/18"	30.0 SS-6	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-94

Project Name WESTLAKE

Page 3 of 7

Project No. 84-075-4004

Date 4-18-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
	GRAY-BROWN FINE TO COARSE SAND, FEW COARSE SAND SEAMS (1" TO 2" THICK), MEDIUM DENSE, SATURATED				31.5	SS-6	
32							
33							
	BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, MEDIUM DENSE, SATURATED						
34							
35					35.0		
			9/13/12	8"/18"		SS-7	
36							
					36.5		
37							
38							
39							
40					40.0		
			6/8/9	6"/18"		SS-8	
41							
					41.5		
42							
43							
44							
	GRAY MEDIUM TO COARSE SAND, MEDIUM DENSE, SATURATED						
45					45.0		
			10/12/14	9"/18"		SS-9	
46							
					46.5		
47							

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-94

Project Name WESTLAKE

Page 4 of 7

Project No. 84-075-4-004

Date 4-18-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
49	GRAY MEDIUM TO COARSE SAND, MEDIUM DENSE, SATURATED					
50	GRAY COARSE SAND, SOME MEDIUM SAND, MEDIUM DENSE TO DENSE, SATURATED		7/10/10	10"/18"	50.0 – 51.5 SS-10	
51						
52						
53	GRAVEL SEAM 53.0' TO 53.2'					
54						
55						
56						
57	GRAVEL SEAM 57.0' TO 57.8'					
58						
59						
60			15/16/16	4"/18"	60.0 – 61.5 SS-11	
61						
62						
63						
64						

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-74

Project Name WESTLAKE

Page 5 of 7

Project No. 84-075-4-004

Date 4-18-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
66	GRAY COARSE SAND, SOME MEDIUM SAND, MEDIUM DENSE TO DENSE, SATURATED						
67	GRAVEL SEAM 67.0 TO 67.4.						
68							
69							
70			13/20/19	7"/18"	70.0	SS-12	
71					71.5		STOPPED 4-19-85 RESUMED 4-22-85
72	GRAVEL SEAM 72' TO 72.3'						
73							
74							
75							
76							
77							
78							
79							
80			9/20/22	6"/18"	80.0	SS-13	
81					81.5		

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-94

Project Name WESTLAKE

Page 6 of 7

Project No. 84-075-4-004

Date 4-18-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
83	GRAY COARSE SAND, SOME MEDIUM SAND, MEDIUM DENSE TO DENSE, SATURATED					
84						
85						
86	GRAVEL SEAM 86.0' TO 86.4'					
87	GRAY FINE TO COARSE SAND, VERY DENSE, SATURATED					
88						
89						
90	SILTY SAND SEAM 90.4 TO 90.8		22/32/36	7"/18"	SS-14	
91						
92						
93						
94						
95						
96						
97						
98						

Drilling Log, continued

Boring No. D-94

Project Name WESTLAKE

Page 7 of 7

Project No. 84-075-4-004

Date 4-18-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
100	GRAY FINE TO COARSE SAND, VERY DENSE, SATURATED		14/28/27	4"/18"	100.0	SS-15	
101							
102							
103							
104							
105							STOPPED 4-23-85 RESUMED 4-24-85
106							
107							
108	GRAVEL						A 2" PVC, flush-joint, threaded couple piezometer was installed To 106'. 20' of .010 machine slotted screen. Hole collapsed to a depth of 65'. Bentonite pellets 5' TO 64'. Grout 64' to surface. water level immediately after installation 4-23-85, 3:00pm 2.6' below T.O.P. T.O.P is 4.0' above G.S.
109	LIMESTONE						
110	TOTAL DEPTH 109.0'						
111							
112							
113							
114							
115							

Drilling Log

Project Name: WESTLAKE						Boring No.: D-95	
Project No.: 84-075-4-004						Page: 1 of 7	
Ground Elevation: 453.09	Location: NE of site · Figure I-2					Total Footage: 101.0	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	3 7/8"	100.8'	0.2'	15	0	See Remarks	
Drilling Co.: SUBSURFACE CONSTRUCTORS (WABASH)				Driller (s): GARY JOHANNING			
Drilling Rig.: CME 55, TRUCK				Type of Penetration Test: STANDARD			
Date: 4-22-85	To:			Field Observer (s): G. ERNSTMANN			

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
1	GRAVEL					6" HOLLOW AUGERS 0' TO 20'.
2	DARK BROWN SAND AND GRAVEL, MOIST (FILL)					
3						
4						
5					5.0	
6			3/6/9	8" 18"	SS-1	
7					6.5	
8						
9	BROWN TO BLACK SILT, SAND AND GRAVEL, VERY LOOSE, MOIST					
10					10.0	
11			2/3/2	9" 18"	SS-2	
12					11.5	
13	BROWN FINE SANDY SILT, LOW PLASTICITY, VERY LOOSE, MOIST - SATURATED BELOW APPROX. 15'					

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-95
Project Name WESTLAKE
Page 2 of 7
Project No. 84-075-4-004
Date 4-22-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
15	BROWN FINE SANDY SILT, LOW PLASTICITY, VERY LOOSE, MOIST – SATURATED BELOW APPROX. 15'		2/2/3	6" / 18"	15.0 SS-3 16.5	WATER LEVEL @ 13.6' BELOW G.S. 7:15am 4-23-85 (HOLE SAT OVERNIGHT AFTER BRING DRILLED 20').
16						
17						
18	— — — — — — —					
19	BROWN FINE TO MEDIUM SAND, LOOSE TO MEDIUM DENSE, SATURATED					
20					20.0	
21			1/3/3	6" / 18"	SS-4 21.5	STOPPED 4-22-85 RESUMED 4-23-85 SET 4½" CASING AND BEGAN WASH BORING W/ 3⅞" DIA. TRI-CONE BIT,
22						
23						
24	SILTY SAND SEAM 25.0' TO 25.3'				24.0	
25				13" / 18"	SS-5	
26	— — — — — — —		11/13/15		26.5	
27	BROWN SILTY FINE TO MEDIUM SAND, DENSE, SATURATED					
28						
29					29.0	
30			15/21/20	12" / 18"	SS-6 30.5	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-95

Project Name WESTLAKE

Page 3 of 7

Project No.

Date 4-23-85

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
32	BROWN SILTY FINE TO MEDIUM SAND, DENSE, SATURATED					
33						
34			11/16/23	14"/18"	34.2 SS-7	
35					35.5	
36						
37	— — — — — —					
38	GRAY FINE TO MEDIUM SAND, MEDIUM DENSE TO VERY DENSE, SATURATED					
39			4/9/14	8"/18"	39.5 SS-8	
40					40.5	
41						
42						
43						
44			9/4/5	6"/18"	44.5 SS-9	
45					45.5	
46						
47	FEW THIN COARSE SAND SEAMS 47' TO 49'.					

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-95

Project Name WESTLAKE

Page 4 of 7

Project No. 84-075-4004

Date

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
49	GRAY FINE TO MEDIUM SAND, MEDIUM DENSE TO VERY DENSE, SATURATED		13/29/43	5" / 18"	49.0	
50					SS-10	
51					50.5	
52						
53						
54	GRAY FINE TO COARSE SAND, TRACE FINE GRAVEL, DENSE					
55						
56						
57						
58						
59			14/13/24	6" / 18"	59.0	
60					SS-11	
61					60.5	
62						
63						
64						

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-95
Project Name WESTLAKE
Page 5 of 7
Project No. 84-075-4-004
Date

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
66	— — — — — —					
67	GRAY FINE TO MEDIUM SAND, VERY DENSE, SATURATED					
68						
69			24/50/6"	10"/12"	69.0 SS-12	
70					70.0	
71						
72	GRAVEL SEAM 72.0'-72.2'					
73						
74						
75						
76						
77	— — — — — — —					
78	GRAY COARSE SAND, SOME MEDIUM AND FINE SAND, VERY DENSE					
79					79.0	
80			16/25/27	7"/18"	SS-13	
81					80.5	

Drilling Log, continued

Boring No. D-95

Project Name WESTLAKE

Page 6 of 7

Project No. 84-075-4-004

Date

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
83	GRAY COARSE SAND, SOME MEDIUM AND FINE SAND, VERY DENSE, SATURATED					
84	GRAVEL SEAM 83.5 TO 83.8					
85						
86						
87						
88						
89			15/23/29	7" 18"	89.0 SS-14	
90					90.5	STOPPED 4-23-85 RESUMED 4-24-85
91						
92						
93						
94						
95	TRACE OF COARSE GRAVEL 95.5 TO					
96						
97						
98						

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. D-95

Project Name WESTLAKE

Page 7 of 7

Project No. 84-075-4-004

Date

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
100	GRAY COARSE SAND, SOME MEDIUM AND FINE SAND, VERY DENSE, SATURATED		17/23/43	7"/18"	99.0	SS-15	
					100.5		
101	LIMESTONE						1-2" dia., flush-joint, threaded couple PVC piezometer was installed to 101.0'. Bottom 20' is .010 machine slotted screen. Hole collapsed to 62' after PVC installed. Grout 62' to surface.
	TOTAL DEPTH 101.0'						
102							T.O.P. is 3.3' above ground surface
103							
104							Water level in piezometer immediately after installation 4-29-85 3:00pm is 16.7' below T.O.P.
105							
106							
107							
108							
109							
110							
111							
112							
113							
114							
115							

LOG OF TEST BORING NO.: P-1-D

CLIENT: LAIDLAW/BRIDGETON
PROJECT: AUG 90 WELL INSTALL
PROJECT NUMBER: 89L46
LOCATION:

SURFACE ELEVATION:
BORING DEPTH: 79.5
DATE: 9-1-90

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	FIELD INSTRUMENTS	DRILLING AND SAMPLING NOTES
0.0	--0									
		0-5	SB	1	-	4.8	Top 4' dark yellowish brown (10YR-4/4) lean CLAY w/ sand, some silt and little gravel; (FILL)		RAD = < 0.01 mR/hr.	
-5.0	--5						Bottom 1' dk. grey (5Y 4/1) SILT w/ some black colored intermixing.	FILL	TIP = 0 ppm	
		5-10	SB	2	-	3.5	Intermixed grey silt (as above) w/ gravel, sand, and some clay (FILL)		RAD = < 0.01 mR/hr. TIP = 0 ppm	
-10.0	--10							------		
		10-15	SB	3	-	3.5	Mottled dk. grey (5Y 4/1), greenish grey (5BG 5/1) & dk. yellowish brown (10YR 4/4) lean CLAY w/ some silt.	cl	RAD = < 0.01 mR/hr. TIP = 0 ppm	Becomes v.moist to wet at 13.5'.
-15.0	--15									
		15-20	SB	4	-	3.9	Same as above w/ increasing silt content w/ depth.	------	RAD = < 0.01 mR/hr. TIP = 0 ppm	
-20.0	--20							ml		
		20-25	SB	5	-	4.8	Top is dk. Grey (2.5Y 4/0) SILT w/ little clay.		RAD = < 0.01 mR/hr.	
-25.0	--25						Bottom 2' grey (5Y 4/1), v.fine to fine, SAND stratified (lamina) w/ darker layers.	------		
		25-30	SB	6	-	2.0	Dk. grey (5Y 4/1), f. to v. fine SAND a litter coarse than above.		RAD = < 0.01 mR/hr.	
-30.0	--30	30-32	SS	7	-	1.5	Same as above.			Water added and maintained in augers to prevent sand blows.
		32.5-34.5	SS	8	38	1.1	Same as above.			
-35.0	--35	34.5-36.5	SS	9	50	1.0	Grey (5Y 5/1), f. to v.fine SAND; contains little gravel upto 1/4" in diameter bottom 3".			50 blows for 6"
		37.5-39.5	SS	10	100	0.9	Grey (5Y 5/1), f. to v.fine SAND very dense (without gravel).	sp		
-40.0	--40	39.5-41.5	SS	11	11	0.8	Same as above but not as dense although density seems higher than blow counts indicate.		SAMPLE #12 OXY = 21.1% H2S = 1 ppm CO = 0 ppm EXP = 0% TIP = 0 ppm	
		42.5-44.5	SS	12	18	0.8	Grey (5Y 5/1), v.f. to c., poorly graded SAND w/ trace of f. gravel.			
-45.0	--45	44.5-46.5	SS	13	86	0.7	Same as above.			
-50.0	--50	49.5-51.5	SS	14	19	1.4	Top is same as above. Bottom 12" Dark grey (5Y 4/1) v.f. to fine SAND w/ some v. dark grey layers (?) stratified or intermixed (?).			

DRILLING DATA

START DATE: 8/6/90
COMPLETION DATE: 8/8/90
LOGGED BY: LDA
DRILLING METHOD: 4-1/4" I.D. HSA's
DRILLING CONTRACTOR: BROTCKE ENGR.

WATER LEVEL INFORMATION

DEPTH AT COMPLETION: approx. 20'
LATER TIME/DEPTH: 15 hrs / 25.2'
LATER TIME/DEPTH:
CAVE IN DEPTH:
DRILLING LOSSES:

LOG OF TEST BORING NO.: F-1-D

CLIENT: LAIDLAW/BRIDGETON
PROJECT: AUG 90 WELL INSTALL
PROJECT NUMBER: 89L46
LOCATION:

SURFACE ELEVATION:
BORING DEPTH: 79.5
DATE: 9-2-90

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	FIELD INSTRUMENTS	DRILLING AND SAMPLING NOTES
-55.0	--55	54.5-56.5	SS	15	21	1.4	Upper 3.5" v.dark grey (2.5Y 3/0) lean CLAY w/ no to some sand. Bottom v.dark grey, v.fine to c, stratified SAND; find pc of wood.	cl		
-60.0	--60	59.5-61.5	SS	16	27	0.8	Very dark grey (2.5Y 3/0), v.fine to coarse, poorly graded SAND.	sp		
-65.0	--65	64.5-66.5	SS	17	37	2.0	2" v.f. to f. v.dark grey SAND. 2" v.f. to v.c., v.dk grey SAND. 3" v.dk grey lean CLAY. 1/2" fine GRAVEL; sub rnded. 1" v.c. to c., grey SAND. Bottom f. to v.f., v.dk grey SAND.	cl / gp		
-70.0	--70	69.5-71.5	SS	18	28	0.0	No recovery.			
-75.0	--75	74.5-76.5	SS	19	25	1.8	Top is v.dark to dark grey (2.5Y-3/0 to 4/0), m. to v.f. SAND. Middle 3" is v.f. to v.c. SAND w/ tr. to little v.f. gravel. Bottom 7" is black to v. dk. grey (2.5Y 2/0 to 3/0) v.f. to f. SAND w/ silt & organics (black color).	sp		
-80.0	--80	78.5-79.5	SS	20	100	0.9	Fine to coarse, poorly graded GRAVEL (rnded to angular) w/ v.f. to c. sand. Limestone bedrx @ 79.4	gp / ls		100 blows for last 1"
-85.0	--85						R.O.B. = 79.5'			Auger refusal at 79.5'
-90.0	--90						Piezometer F-1-D installed.			
-95.0	--95									
-100.0	--100									
-105.0	--105									

DRILLING DATA

START DATE: 8/6/90
COMPLETION DATE: 8/8/90
LOGGED BY: LDA
DRILLING METHOD: 4-1/4" I.D. HSA's
DRILLING CONTRACTOR: BROTCKE ENGR.

WATER LEVEL INFORMATION

DEPTH AT COMPLETION: approx. 20'
LATER TIME/DEPTH: 15 hrs / 25.2'
LATER TIME/DEPTH:
CAVE IN DEPTH:
DRILLING LOSSES:

Foth & Van Dyke

DTW = 28.22 from PVC TOP

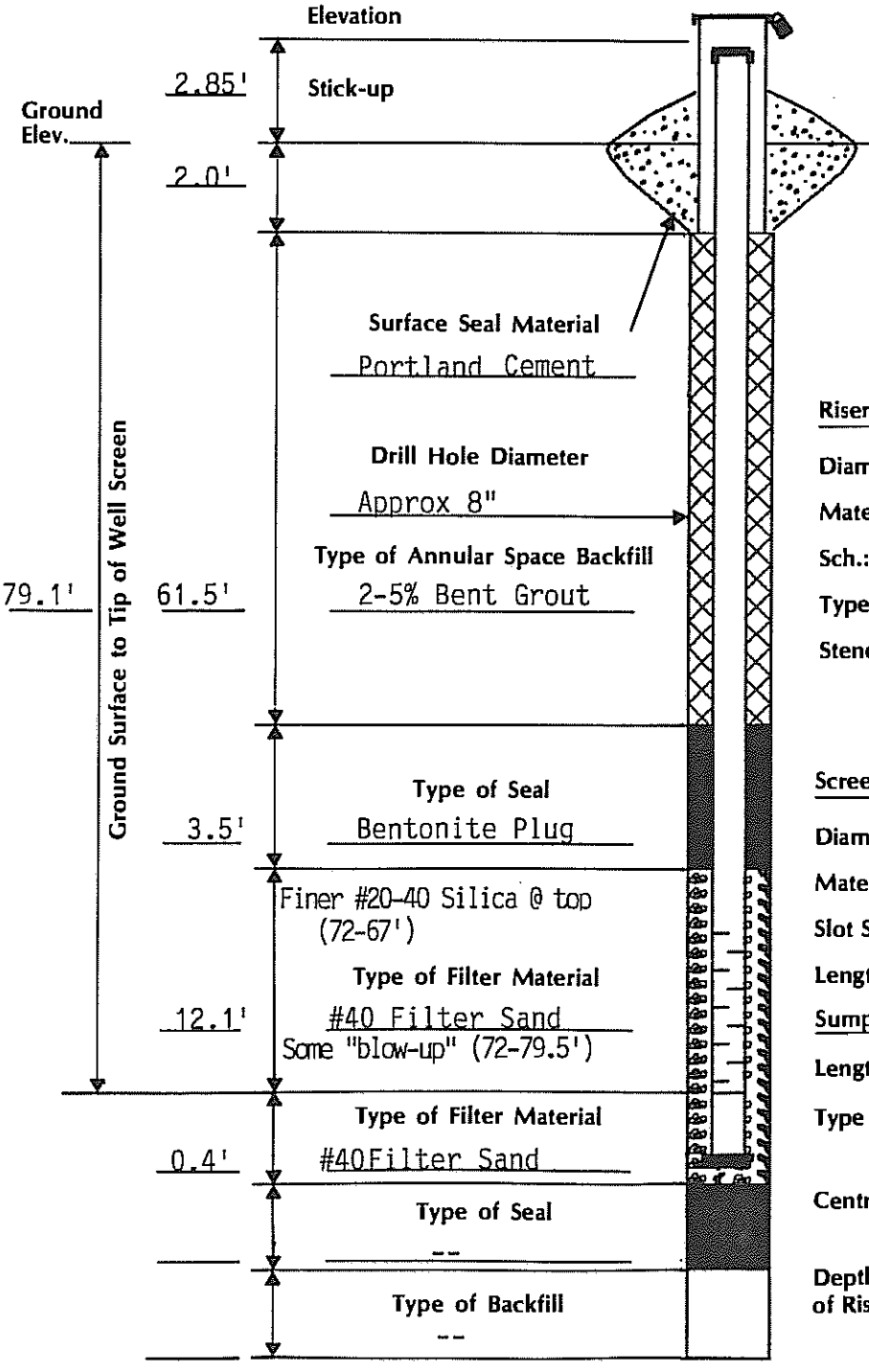
Client: Laidlaw/Bridgeton Scope I.D.: 8914 6-21
Project: 8/90 Well Installation Page: 1
Prepared by: L.D. Aughenbaugh Date: 8/9/90
Checked by: R.T. Bloese Date: 9/6/90

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Mike Foppe of Brotcke Engineering
Well No.: F-1-D
Drilling Method: 4 1/4" I.D. HSA's
Date Installed: 8/8/90

Coordinates: --

Protector Pipe:
Size: 4" x 4" x 5'
Material: Steel
Lock No.: --



Riser:
Diameter: 2"
Material: PVC
Sch.: 40
Type of Joints: flush threaded
Stenciled? No

Screen:
Diameter: 2"
Material: PVC
Slot Size: 10 slot
Length: 5'

Sump:
Length: 5"
Type of Cap: Point/sump

Centralizer: Used ☐
Not Used ☒

Depth to Water From Top of Riser at Completion: Approx. 20'

NOTE: Not to Scale

LOG OF TEST BORING NO.: F-1-S

CLIENT: LAIDLAW/BRIDGETON
PROJECT: AUG 90 WELL INSTALL
PROJECT NUMBER: 89146
LOCATION:

SURFACE ELEVATION:
BORING DEPTH: 34.0
DATE: 9/3/90

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	FIELD INSTRUMENTS	DRILLING AND SAMPLING NOTES
0.0	--0									
-5.0	--5									
-10.0	--10	10	FA						TIP = 10.1 ppm maximum reading by headspace.	Notice petroleum like odor.
							NOTE: Blind drill to 34'. See log for F-1-D which is located approx. 7' Northwest of this location.			
-15.0	--15									
-20.0	--20	20	FA						TIP = 0.0 ppm by headspace analysis.	Notice slight earthy but sharp like odor in soil
-25.0	--25									
-30.0	--30									
-35.0	--35						E.O.B. = 34.0'			
-40.0	--40									
-45.0	--45									
-50.0	--50									

DRILLING DATA
START DATE: 8/9/90
COMPLETION DATE: 8/9/90
LOGGED BY: LDA
DRILLING METHOD: 4-1/4" I.D. HSA's
DRILLING CONTRACTOR: BROTCKE ENGR.

WATER LEVEL INFORMATION
DEPTH AT COMPLETION:
LATER TIME/DEPTH:
LATER TIME/DEPTH:
CAVE IN DEPTH:
DRILLING LOSSES: roughly 150 gal

Foth & Van Dyke

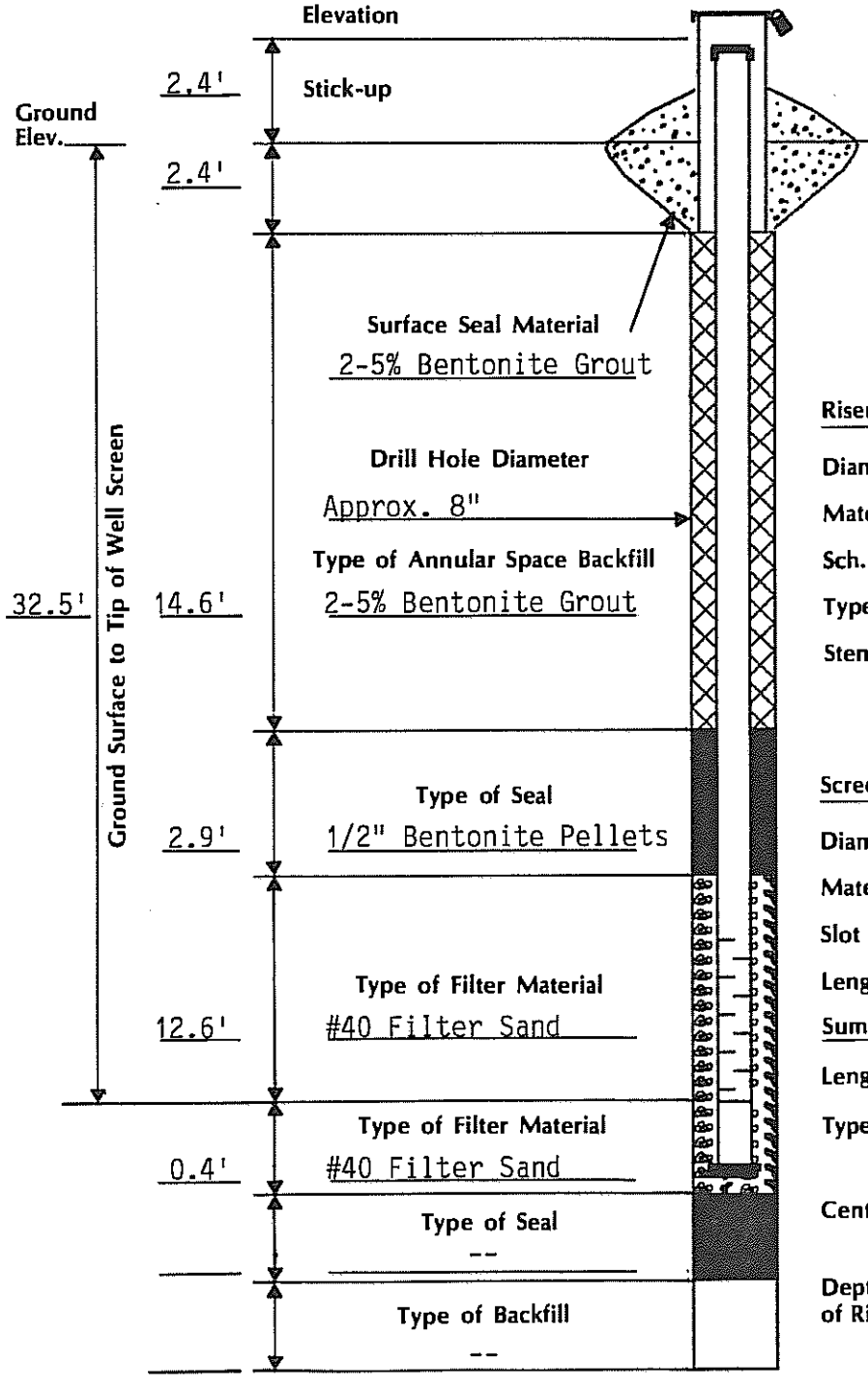
DTW = 27.98 from PVC Top

Client: Laidlaw/Bridgeton Scope I.D.: 89L46-21
Project: 8/90 Well Installation Page: 1
Prepared by: L.D. Aughenbaugh Date: 8/10/90
Checked by: R.T. Bloese Date: 9/6/90

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Mike Foppe of Brotcke Engineering
Drilling Method: 4 1/4" I.D. HSA's
Well No.: F-1-S
Date Installed: 8/9/90

Coordinates: --



Protector Pipe:
Size: 4" x 4" x 5'
Material: Steel
Lock No.: --

Riser:
Diameter: 2"
Material: PVC
Sch.: 40
Type of Joints: Flush threaded
Stenciled? NO

Screen:
Diameter: 2"
Material: PVC
Slot Size: 10 slot
Length: 10 feet

Sump:
Length: 5"
Type of Cap: Point/sump

Centralizer: Used ☐
Not Used ☒

Depth to Water From Top of Riser at Completion: --

NOTE: Not to Scale

LOG OF TEST BORING NO.: F-2

CLIENT: LAIDLAW/BRIDGETON
PROJECT: AUG 90 WELL INSTALL
PROJECT NUMBER: 89L46
LOCATION:

SURFACE ELEVATION:
BORING DEPTH: 25.0
DATE: 9-3-90

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	FIELD INSTRUMENTS	DRILLING AND SAMPLING NOTES
0.0	--0						Top is Brown (10YR 5/3) silt with some sand & clay; turns to Brown lean CLAY w/ silt later dk. brown (10YR 3/3); Grey v.f. SAND layer (lift ?) at 2.0'. See some crushed white limestone gravel at 4.5'	FILL	TIP = 9.4 ppm maximum	Underground utility running nearby approx. 15' (?). Organics/sewer like odor noticed.
-5.0	--5	0-5	SB	1	-	2.8		-----		
		5-10	SB	2	-	4.8	Brown (10YR 4/3) lean CLAY with little silt & trace of gravel; Bottom 1' is mottled brown, yell-brown(10YR 5/6) & grey (2.5YR 4/0) lean CLAY.	cl	TIP = 2.3 ppm max.	
-10.0	--10	10-15	SB	3	-	0.0	No recovery.	--?--	EXP = 28% LEL	First notice strong petroleum & ligbter fluid like odors @ approx 13'
-15.0	--15							ml	TIP = 220 ppm from cuttings RAD = 0 mR/hr	
		15-20	SB	4	-	2.8	Dark Grey (2.5YR 4/0) SILT w/ some v.fine sand and some stratified CLAY layers (<2") 2" clay layer at 17.8'. Silt gradually coarsening to a v.f. SAND w/ little silt.	----- cl -----	TIP = 471 ppm max.	Water added to lower EXP. level.
-20.0	--20	20-25	SB	5	-	2.7	Dark Grey (2.5YR 4/0), f. to v.f. clean SAND; very stiff.	sp	TIP = 930 ppm max.	Strong gasoline like odor.
-25.0	--25						E.O.B. = 25.0'	-----		
-30.0	--30									
-35.0	--35									
-40.0	--40									
-45.0	--45									
-50.0	--50									

DRILLING DATA
START DATE: 8/9/90
COMPLETION DATE: 8/9/90
LOGGED BY: LDA
DRILLING METHOD: 4-1/4" I.D. HSA's
DRILLING CONTRACTOR: BROTCKE ENGR.

WATER LEVEL INFORMATION
DEPTH AT COMPLETION: 13.5'
LATER TIME/DEPTH: 15 hrs / 14.9'
LATER TIME/DEPTH:
CAVE IN DEPTH:
DRILLING LOSSES:

Foth & Van Dyke

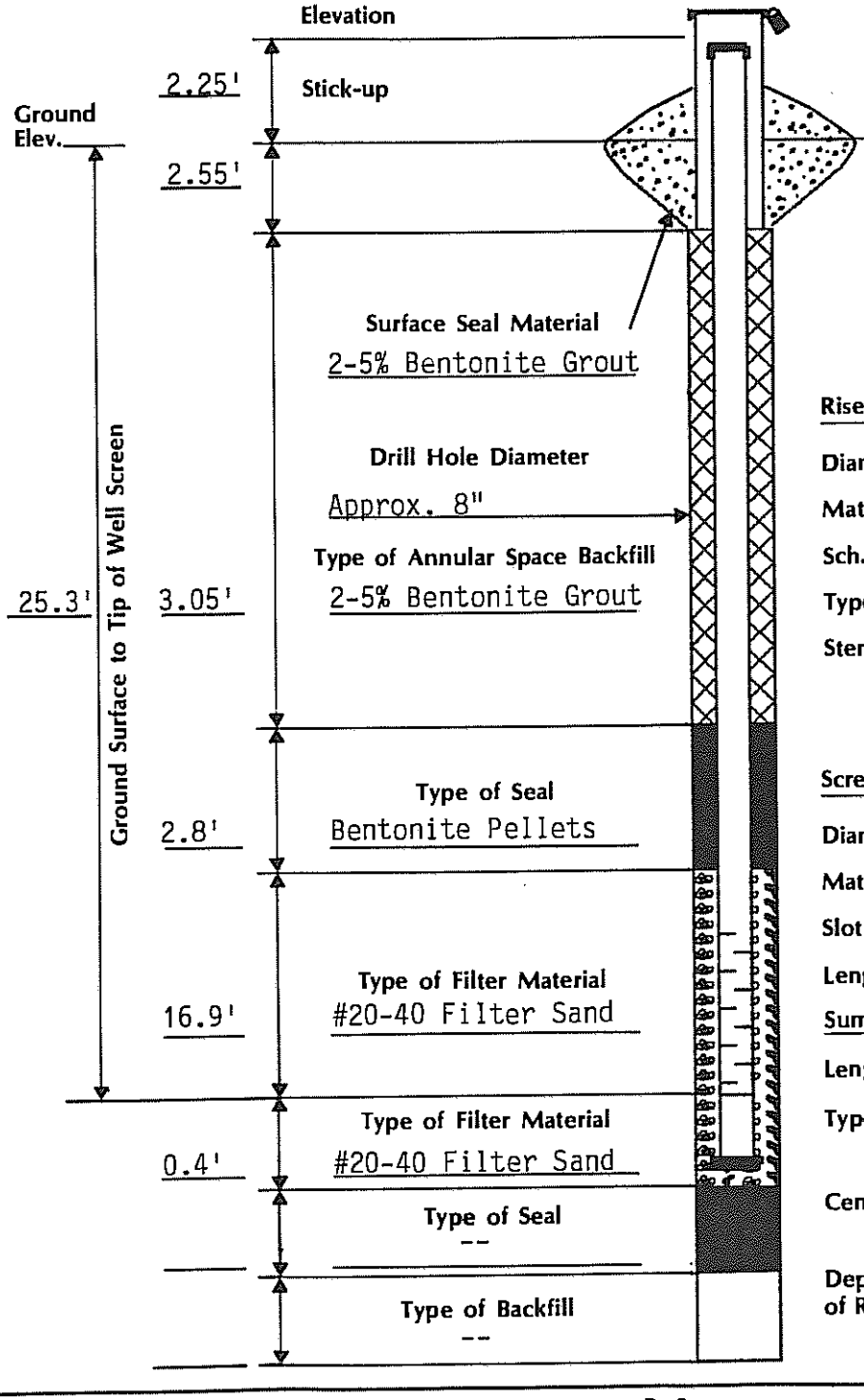
DTW = 16.73 from PVC Top

Client: Laidlaw/Bridgeton Scope I.D.: 89L46-21
Project: 8/90 Well Installation Page: 1
Prepared by: L.D. Aughenbaugh Date: 8/10/90
Checked by: R.T. Bloese Date: 9/6/90

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Mike Foppe of Brotcke Engineering
Well No.: F-2
Drilling Method: 4 1/4" I.D. HSA's
Date Installed: 8/10/90

Coordinates: --



Protector Pipe:
Size: 6" x 6" x 5'
Material: Steel
Lock No.: --

Riser:
Diameter: 2"
Material: PVC
Sch.: 40
Type of Joints: Flush threaded
Stenciled? NO

Screen:
Diameter: 2"
Material: PVC
Slot Size: 10 slot
Length: 15 feet

Sump:
Length: 5"
Type of Cap: Point sump

Centralizer: Used ☐
Not Used ☒

Depth to Water From Top of Riser at Completion: 14'

NOTE: Not to Scale

LOG OF TEST BORING NO.: F-3

CLIENT: LAIDLAW/BRIDGETON
PROJECT: AUG 90 WELL INSTALL
PROJECT NUMBER: 89L46
LOCATION:

SURFACE ELEVATION:
BORING DEPTH: 46.5
DATE: 9-3-90

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	FIELD INSTRUMENTS	DRILLING AND SAMPLING NOTES
0.0	--0						Top is Brown (10YR 4/3) lean CLAY w/ silt. 4" or refuse at 1.5'.	FILL	TIP = 5.7 ppm	
		0-5	SB	1	-	4.5	5" dk. grey (10YR 4/1) SILT with some v.f. sand & tr to little clay. Bottom 1.6' is Grey (10YR 5/1) v.f. to med., clean SAND; moist.	ml/sp		
-5.0	--5									
		5-10	SB	2	-	1.9	Dark grey SILT w/ v.f. SAND & tr. to little clay; moist.	ml	TIP < 1 ppm	
-10.0	--10									
		10-15	SB	3	-	2.4	Dark grey to grey, v.f. to f. SAND w/ silt; decreasing silt content with depth; moist.	sm / sp	TIP < 1 ppm	
-15.0	--15									
		15-20	SB	4	-	3.2	Top is dk. grey (10YR 4/1) to dk. greyish brown (10YR 4/2) SILT w/ some v.f. sand & little clay. Bottom 5" is dk. grey v.f. to fine SAND w/ little to tr silt, & clay.	ml	TIP < 1 ppm	
-20.0	--20							sp/sm		
		20-25	SB	5	-	4.0	Top 2.8' is grey (10YR 5/1) v.f. to f. SAND w/ little to trace silt. Bottom 1.2' is dk. brownish grey SILT/CLAY w/ tr. of v.f. sand.	ml/cl	TIP < 1 ppm	
-25.0	--25							ml		
		25-30	SB	6	-	3.6	Top 2.2' is dk grey(10YR 4/1) SILT w/ tr. of clay. Bottom 1.4' is v.f. SAND; grey overall (10YR 5/1); moist.		TIP = 3 ppm max.	
-30.0	--30									
		30-35	SB	7	-	3.9	Top is same as above becoming more silty. Bottom 1.3' is dk. grey (10YR 4/1) v.f. to fine SAND (color change from above); moist to wet.	sp	TIP = 3 ppm max.	Water added for pressure head.
-35.0	--35									
-40.0	--40	40-41.5	SS	8	22	1.5	Dk grey (10YR 4/1) v.f. to med. clean SAND.		TIP < 1 ppm	
-45.0	--45	45-46.5	SS	9	85	1.4	Same as above.		TIP < 1 ppm	85 blows for 11.5"
							E.O.B. = 46.5'			
-50.0	--50									

DRILLING DATA
START DATE: 8/10/90
COMPLETION DATE: 8/10/90
LOGGED BY: LDA
DRILLING METHOD: 4-1/4" I.D. HSA's
DRILLING CONTRACTOR: BROTCKE ENGR.

WATER LEVEL INFORMATION
DEPTH AT COMPLETION: approx. 33'
LATER TIME/DEPTH:
LATER TIME/DEPTH:
CAVE IN DEPTH:
DRILLING LOSSES:

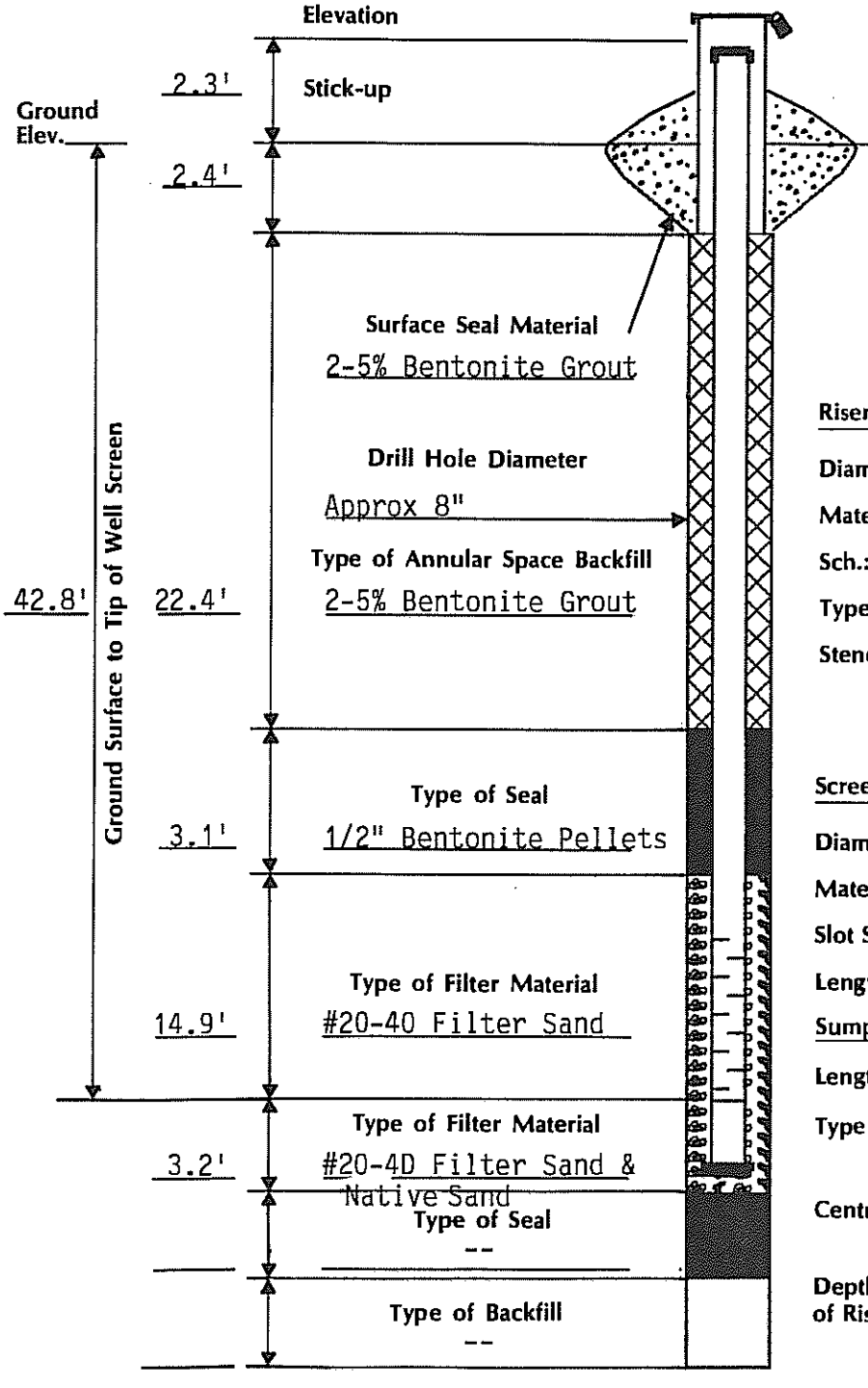
Foth & Van Dyke

Client: Laidlaw/Bridgeton — Scope I.D.: 89L46-21
Project: 8/90 Well Installation — Page: 1
Prepared by: L.D. Aughenbaugh — Date: 8/10/90
Checked by: R.T. Bloese — Date: 9/6/90

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Mike Foppe of Brotcke Engineering — Well No.: F-3
Drilling Method: 4 1/4" I.D. HSA's — Date Installed: 8/10/90

Coordinates: --



Protector Pipe:
Size: 6" x 6" x 5'
Material: Steel
Lock No.: --

Riser:
Diameter: 2"
Material: PVC
Sch.: 40
Type of Joints: Flush threaded
Stenciled? No

Screen:
Diameter: 2"
Material: PVC
Slot Size: 10 slot
Length: 10 feet

Sump:
Length: 5"
Type of Cap: Point sump

Centralizer: Used ☐ Not Used ☒

Depth to Water From Top of Riser at Completion:

NOTE: Not to Scale

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
WL-205	07.0803035.003.002	1 of 1

Start/Finish Date	Site Name and Location
8/1/95 / 8/3/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location:	Area 2
Hart Environmental Drilling	Ground Surface Elevation:	443.2
Driller	**Northing:**	1069698.26
Max Tinnin	**Easting:**	514212.18

Drilling Equipment	McLaren/Hart Geologist/Office
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	52'	I-2

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-205 5'	Background (0.05-0.07)	0.0-52.0' Native Alluvium: olive brown silty clay grading to grayish brown, coarse-grained sand with gravel; dry to wet.
10	WL-205 10'	Background (0.05-0.07)	@ 8' wet
15	WL-205 15'	Background (0.05-0.07)	
20	WL-205 20'	Background (0.05-0.07)	
25	WL-205 25'	Background (0.05-0.07)	
30	None Taken	Background (0.05-0.07)	
35	WL-205 32'	Background (0.05-0.07)	
40	WL-205 37'	Background (0.05-0.07)	
45	WL-205 42'	Background (0.05-0.07)	
50	WL-205 47'	Background (0.05-0.07)	
55	WL-205 52'	Background (0.05-0.07)	Boring terminated @ 52.0'

Notes:

Radiological samples collected at 5 and 15 feet below ground surface.

Non-radiological samples not collected.

Perched water not encountered during boring activities.

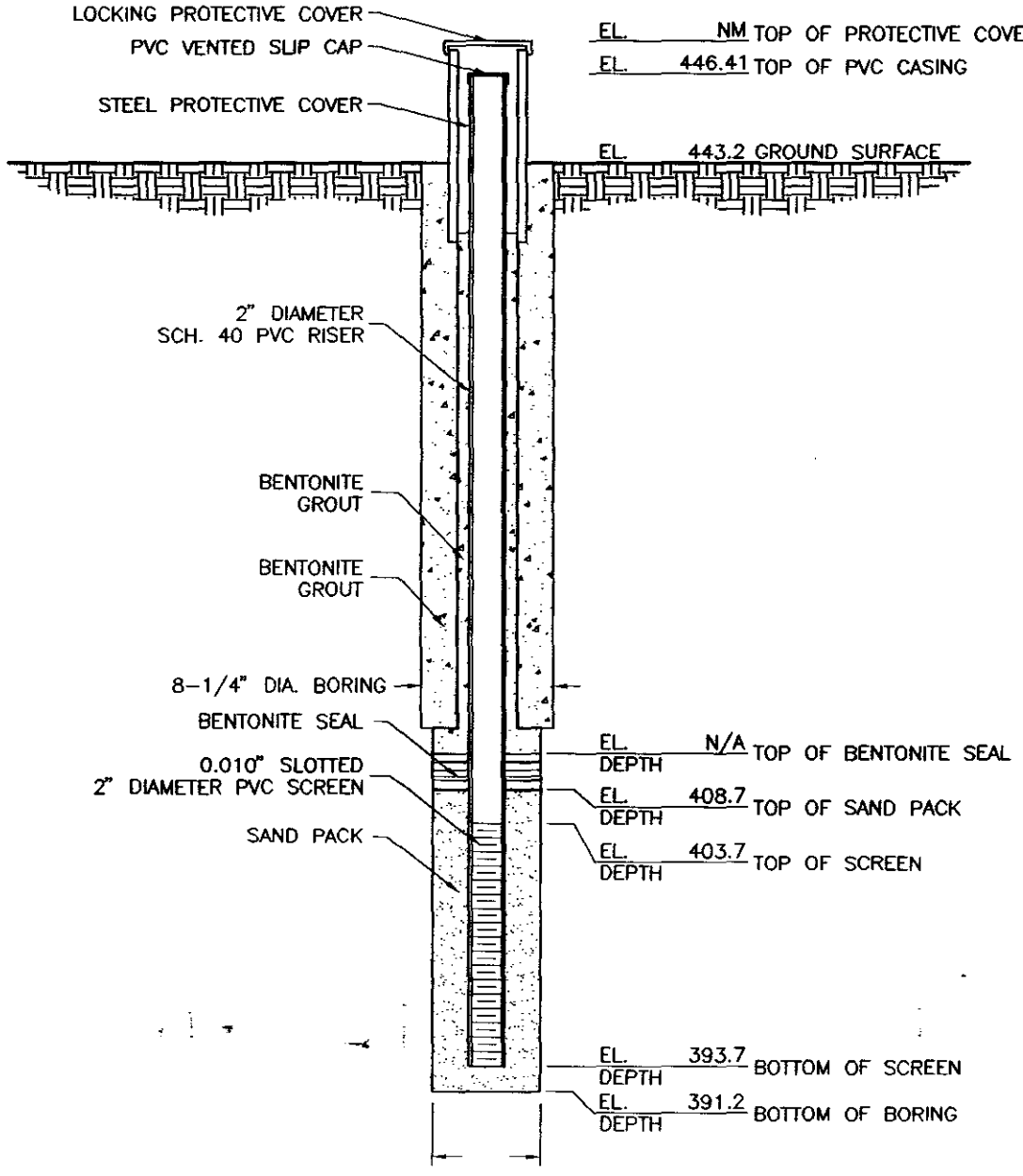
Groundwater encountered at 8 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. I-2

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 8/2/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-205 FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED
4. N/A NOT APPLICABLE, BENTONITE GROUT WAS USED TO SEAL WELL UP TO SURFACE.

(W2.DWG)

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL PLUGGING REGISTRATION RECORD

OFFICE USE ONLY		DATE RECEIVED	
REF NO.	514517		
C.R. NO.		CHECK NO.	TRANSMITTAL NO.
STATE WELL NUMBER		APPROVED BY	DATE APPROVED
ENTERED Ph1 Ph2 Ph3		ROUTE	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME		TELEPHONE NUMBER		VARIANCE NUMBER (IF APPLICABLE)
ENGINEERING MGMT.SUPPORT INC. EMSI. PAUL ROSASCO				
OWNER ADDRESS	CITY	STATE	ZIP CODE	6023
7220 W. JEFFERSON AVE. SUITE 406	LAKEWOOD	CO	80235	
ADDRESS OF WELL SITE	CITY	STATE	ZIP CODE	REFERENCE NUMBER OF ORIGINAL WELL (IF KNOWN)
13570 ST. CHARLES ROCK ROAD	BRIDGETON	MO	63044	
SITE NAME	WELL NUMBER		DATE	N/A
WEST LAKE LANDFILL	I - 2			

LOCATION OF WELL	DRILL AREA	
LAT. 38 ° 46 ' 16.5 "	AREA 1	SMALLEST ¼ LARGEST ¼ ¼
LONG. 90 ° 27 ' 2.0 "	COUNTY ST. LOUIS	Sec. Township North Range ☐ East ☐ West

PLUGGING INFORMATION

ORIGINAL DRILLER (IF KNOWN)	DATE ORIGINALLY DRILLED	STATIC WATER LEVEL	DRILLER NOTES
N/A	N/A		

☑ MONITORING WELL ☐ SOIL BORING(S) Boring Diameter: _____ IN.

DEPTH OF WELL	LENGTH OF RISER	QUANTITY	DEPTH	TYPE OF FILL MATERIAL
50 FT.	N/A FT. BGS			☐ Gravel ☐ Sand ☐ Other
SCREEN/RISER DIAMETER	WELL SCREEN AND RISER REMOVED?			AMOUNT OF FILL USED
2 IN.	☐ Yes ☑ No			_____ ☐ TONS ☐ CUBIC YARDS
PUMP AND SAMPLING EQUIPMENT REMOVED?	CASING REMOVED?			DEPTH TO TOP OF FILL
☐ Yes ☑ N/A ☐ No	☐ Yes ☑ N/A ☐ No	TOTAL _____ BORING(S)	TOTAL _____ FT.	_____ FT.

GROUT INSTALLATION METHOD	GROUT MATERIAL USED	HOW MANY GALLONS OF WATER MIXED PER BAG OF CEMENT OR BENTONITE?	TOTAL NUMBER OF BAGS OF GROUT USED
☐ Gravity ☑ Tremie ☐ Excavation	Neat Cement Bentonite ☐ Hi-Early ☑ Slurry ☐ Granular ☐ Pellets ☐ Type 1 ☐ Chips ☐ Other _____	5 ☐ Hydrated to Saturation	3
			POUNDS OF GROUT PER BAG: 50

DATE 1ST WELL PLUGGED	DATE LAST WELL PLUGGED	FINISHED SURFACE MATERIAL	SURFACE MATERIAL LENGTH
04/13/2016	04/15/2016	☑ Soil ☐ Concrete ☐ Asphalt ☐ Other	_____ FT. _____ IN.

REMARKS	REASON FOR ABANDONMENT
(REDI JOB# 162075-AB)	

I hereby certify that the monitoring well herein described was plugged in accordance with the Department of Natural Resources requirements for the plugging of wells.

SIGNATURE (PRIMARY CONTRACTOR)		SIGNATURE (CONTRACTOR)		PERMIT NUMBER	DATE
		PAT Seymour TK		4438 M	5/12/16
PERMIT NUMBER	DATE	SIGNATURE (APPRENTICE)		PERMIT NUMBER	DATE
3368-M	5/17/2016				

MO-780-2161 (1-12) REMIT TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY
WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165
ENCLOSE $50 FEE WITH REGISTRATION RECORD WITHIN 60 DAYS AFTER WELL PLUGGING OR WITHIN 180 DAYS AFTER THE PLUGGING OF TEMPORARY WELLS

Soil Boring Log

I-4

McLaren Hart

Boring No.	Project No./Name	Page:
D-13 WL-105B	07.0803035.003.002	1 of 2

Start/Finish Date	**Site Name and Location**
8/10/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Farmers Field
Hart Environmental Drilling	**Ground Surface Elevation:** 466
Driller	**Northing:** 1069148.42
Max Timin	**Easting:** 515889.50

Drilling Equipment	**McLaren/Hart Geologist/Office**
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	**Sample Method**	**T.D. Borehole**	**Well Installed?**
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	79'	I-4

Remarks:

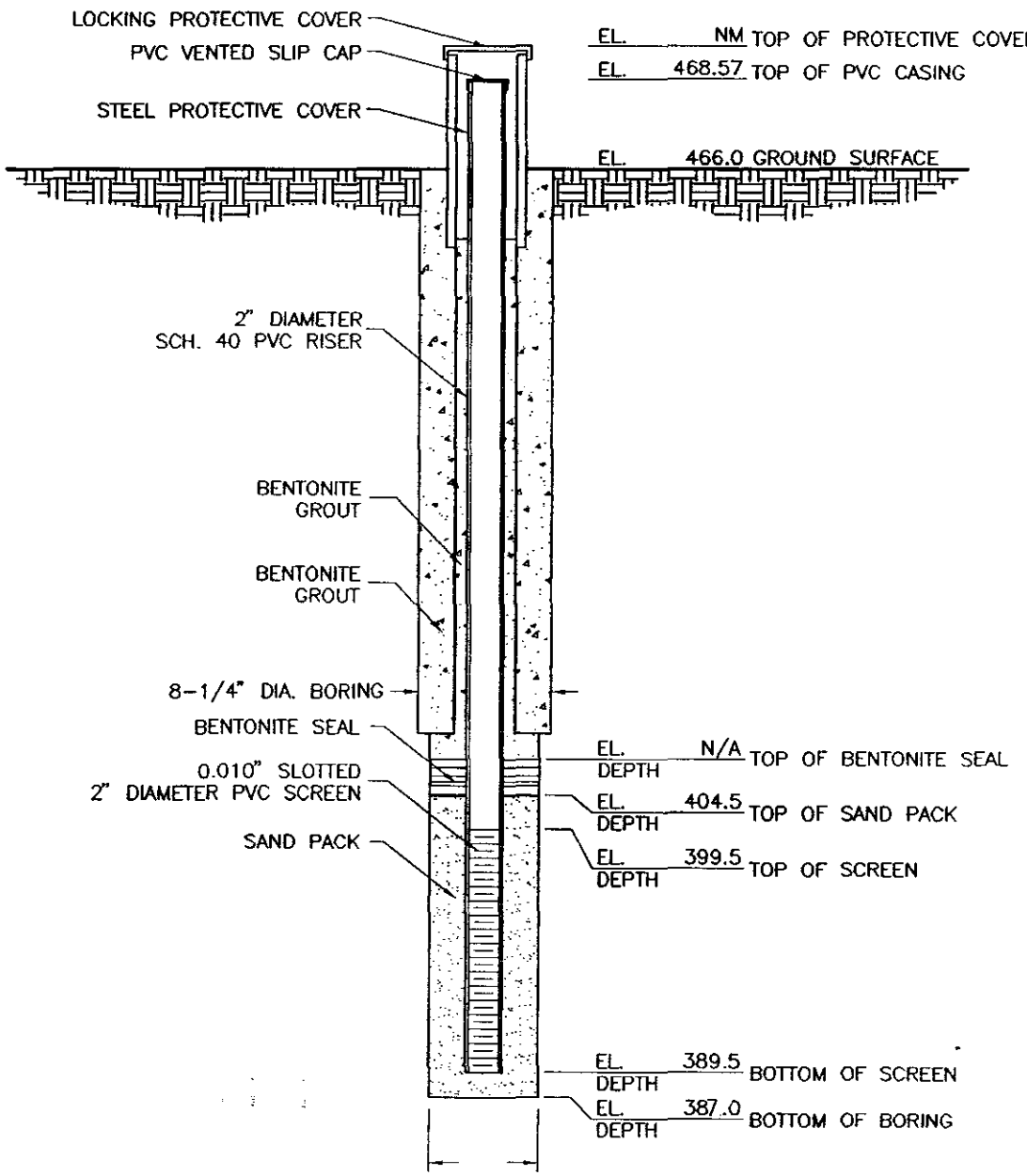
Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	None Taken	None Taken	0.0-30.0' Landfill Debris: trashy debris consisting of cloth, wood, rope, and plastic; soil consisting of brown and gray silt, and crushed rock; dry to moist.
10	None Taken	None Taken	
15	None Taken	None Taken	
20	None Taken	None Taken	
25	None Taken	Background	
30	WL-105B 30'	Background (0.04-0.06)	@30' wet
35	WL-105B 35'	Background (0.04-0.06)	30.0-55.0' Native Alluvium: dark gray clayey silt grading to fine to coarse-grained sand and gravel; wet.
40	WL-105B 40'	Background (0.04-0.06)	
45	None Taken	None Taken	
50	None Taken	None Taken	
55	None Taken	None Taken	

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. I-4

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 8/10/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-105B FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED
4. N/A NOT APPLICABLE, BENTONITE GROUT/CHIPS USED TO SEAL WELL UP TO SURFACE.

(W4.DWG)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
WL-207	07.0803035.003.002	1 of 1

Start/Finish Date	**Site Name and Location**
8/18/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 2
Hart Environmental Drilling	**Ground Surface Elevation:** 444.5
Driller	**Northing:** 1070743.05
Max Tinnin	**Easting:** 514299.87

Drilling Equipment	**McLaren/Hart Geologist/Office**
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	50'	I-7

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-207 5'	Background (0.02-0.04)	0.0-50.0' Native Alluvium: slightly clayey, very fine-grained sand grading to gray coarse-grained sand with gravel; dry to wet
10	WL-207 10'	Background (0.02-0.04)	@ 9.5' wet
15	WL-207 15'	Background (0.02-0.04)	
20	WL-207 20'	Background (0.02-0.04)	
25	WL-207 25'	None Taken	
30	WL-207 30'	None Taken	
35	WL-207 35'	None Taken	
40	WL-207 40'	None Taken	
45	WL-207 45'	None Taken	
50	WL-207 50'	None Taken	Boring terminated @ 50.0'

Notes:

Radiological samples collected at 5 and 10 feet below ground surface.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

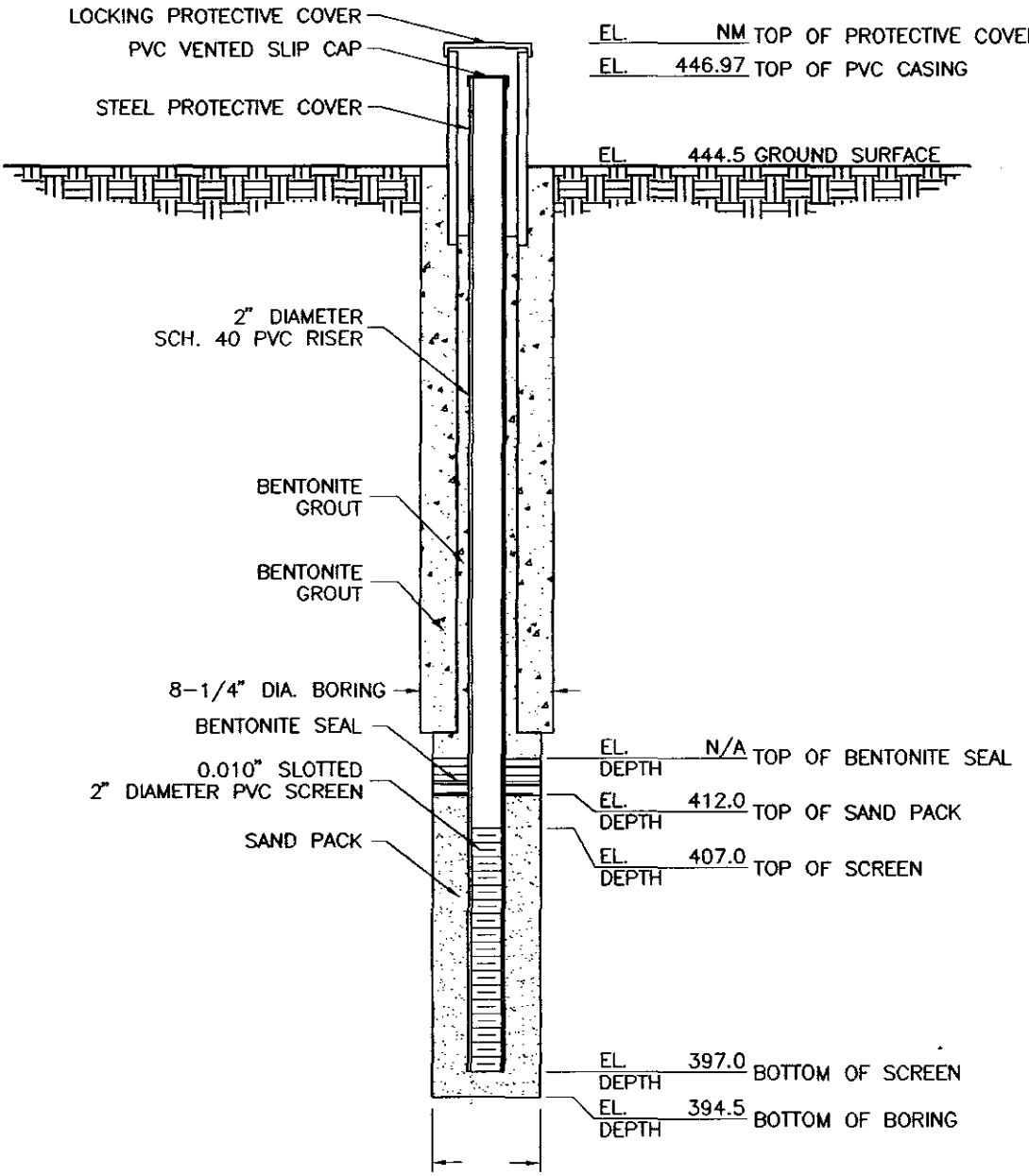
Groundwater encountered at 9.5 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. I-7

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 8/3/95 BY HART ENVIRONMENTAL DRILLING



NOTES:
1. REFER TO SOIL BORING WL-207 SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED
4. N/A NOT APPLICABLE; BENTONITE GROUT USED TO SEAL WELL UP TO SURFACE

(W7.DWG)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
I-9 WL-229	07.0803035.003.002	1 of 2

Start/Finish Date	**Site Name and Location**
9/18/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 2
Hart Environmental Drilling	**Ground Surface Elevation:** 448.5
Driller	**Northing:** 1069329.26
Max Tinnin	**Easting:** 514268.59

Drilling Equipment	**McLaren/Hart Geologist/Office**
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	55.6'	I-9

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-229 5	Background (0.01-0.04)	0.0-5.0' Landfill Debris: soil consisting of brown silt, and asphalt; no trashy debris encountered; dry.
10	None Taken	Background (0.01-0.04)	5.0-56.0' Native Alluvium: dark gray, silty, fine-grained sand grading to coarse-grained sand with gravel; moist to wet.
15	None Taken	Background (0.01-0.04)	
20	WL-229 20'	Background (0.01-0.04)	@ 16' wet
25	WL-229 25'	Background (0.01-0.04)	
30	WL-229 30'	Background (0.01-0.04)	
35	None Taken	None Taken	
40	None Taken	None Taken	
45	None Taken	None Taken	
50	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
I-9 WL-229	07.0803035.003.002	2 of 2

Start/Finish Date	Site Name and Location
9/18/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 2
Hart Environmental Drilling	**Ground Surface Elevation:** 448.5
Driller	**Northing:** 1069329.26
Max Tinnin	**Easting:** 514268.59

Drilling Equipment	McLaren/Hart Geologist/Office
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	55.6'	I-9

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (uR/hr)	Description
55	None Taken	None Taken	50.0-55.6' Native Alluvium: dark gray, silty, fine-grained sand grading to coarse-grained sand with gravel; moist to wet.
60	None Taken	None Taken	Boring terminated @ 55.6'

Notes:

Radiological samples collected at 5 and 20 feet below ground surface.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

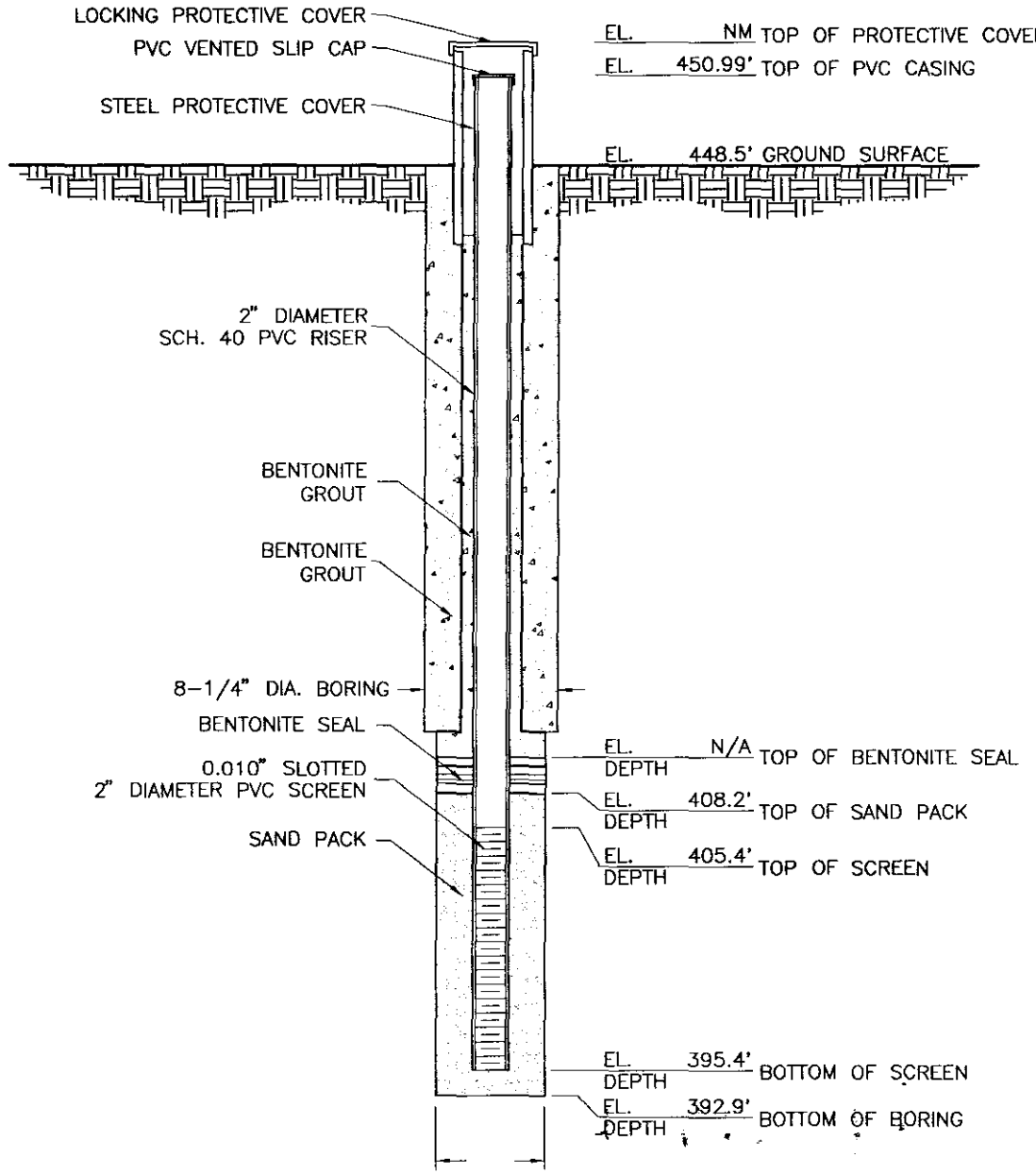
Groundwater encountered at 16 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. I-9

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 9/18/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-229 FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED.
4. N/A = NOT APPLICABLE; BENTONITE GROUT USED TO SEAL WELL UP TO SURFACE.

(W9)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
I-11 WL-216C	07.0803035.003.002	1 of 2

Start/Finish Date	Site Name and Location
8/30/95 / 10/13/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location:	Area 2
Hart Environmental Drilling	Ground Surface Elevation:	477.6
Drilling Service Company	Northing:	1069819.16
Driller	Easting:	514925.06
Max Tinnin	McLaren/Hart Geologist/Office	
Bruce Murphy	Tim Biggs / St. Louis	

Drilling Equipment
CME-55 Drill Rig, Hollow Stem Augers
LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/8" Drag Bit (mud rotary) 4 1/4" ID; 8 1/4" Hole 24" OD Solid Auger	5' Continuous Sampler Grab from Auger	93'	I-11

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-216 5'	0.12	0.0-26.0' Landfill Debris: trashy debris consisting of plastic, cloth, and glass; soil consisting of grayish brown to olive brown silty clay to gray, very fine-grained sand, and limestone rock; dry to moist.
10	None Taken	Background (0.02-0.04)	
15	None Taken	Background (0.02-0.04)	
20	None Taken	Background (0.02-0.04)	
25	None Taken	None Taken	
30	None Taken	None Taken	26.0-60.0' Native Alluvium: gray, silty, very fine-grained sand grading to coarse-grained sand and gravel; moist to wet.
35	None Taken	None Taken	
40	None Taken	None Taken	
45	None Taken	None Taken	
50	None Taken	None Taken	@ 48' wet
55	None Taken	None Taken	
60	None Taken	None Taken	

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
I-11 WL-216C	07.0803035.003.002	2 of 2

Start/Finish Date	Site Name and Location
8/30/95 / 10/13/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location: Area 2
Hart Environmental Drilling	Ground Surface Elevation: 477.6
Drilling Service Company	Northing: 1069819.16
Driller	Easting: 514925.06
Max Tinnin	**McLaren/Hart Geologist/Office**
Bruce Murphy	Tim Biggs / St. Louis

Drilling Equipment

CME-55 Drill Rig, Hollow Stem Augers

LDH-80T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/8" Drag Bit (mud rotary)	5' Continuous Sampler	93'	I-11
4 1/4" ID; 8 1/4" Hole	Grab from Auger		
24" OD Solid Auger			

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
65	None Taken	None Taken	
70	None Taken	None Taken	65.0-93.0' Native Alluvium: gray, silty, very fine-grained sand grading to coarse-grained sand and gravel; moist to wet.
75	None Taken	None Taken	
80	None Taken	None Taken	
85	None Taken	None Taken	
90	None Taken	None Taken	
95	None Taken	None Taken	Auger refusal @ 93.0'

Notes:

Radiological samples not collected during boring activities; downhole logging indicated elevated gamma readings from 1.0-6.5'.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

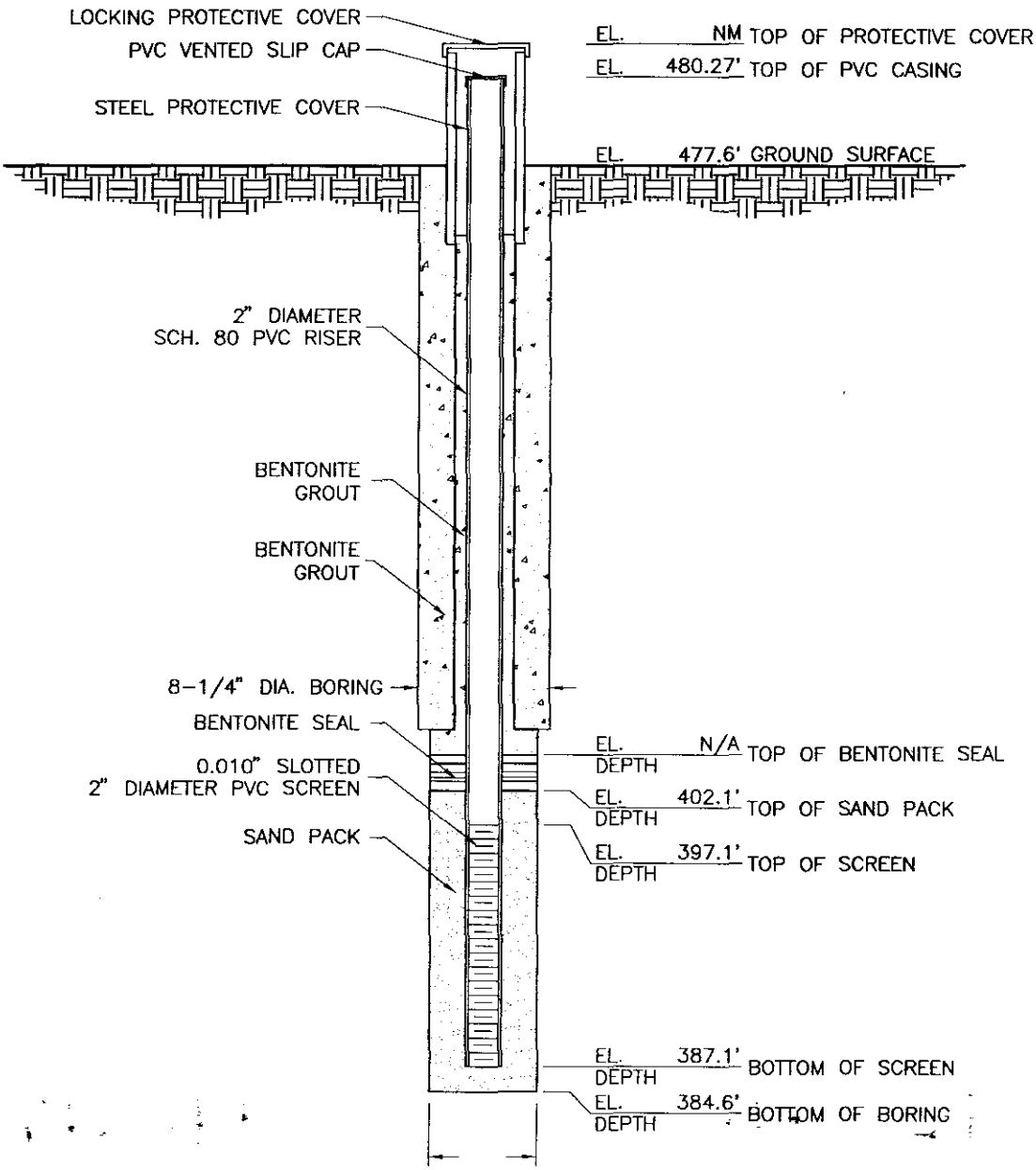
Groundwater encountered at 48 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. I-11

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 10/13/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-216C FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED.
4. N/A = NOT APPLICABLE; BENTONITE GROUT USED TO SEAL WELL UP TO SURFACE.

(W11)

SUBSURFACE EXPLORATION DATA

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-26-78
Finished 6-26-78

Boring No. 35
Coordinates Sheet 1 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Mater
Job Name Westlake Landfill
Job Location St. Charles Rock Road I-55
Casing O.D. I.D
Casing Hammer lbs.
W. D. Co. Foreman Gary Johanning

Client's Job No.
City Bridgeton State Mo.
Sampler O.D. 2" I.D. 1-3/8"
Sampler Hammer 140 lbs. 30" fall

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (Inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Brown, sandy clay and trash	Used 6" H.S. augers
2'6"					Moist, gray, firm to medium stiff, sandy clay and limestone boulders 6" minus	
7'0"					Moist, brown, firm to medium stiff, clay and white chat 1" minus	
14'0"					Moist, gray, firm to medium stiff, sandy clay	
33'0"					Moist, gray, medium stiff, plastic clay	
39'0"					Wet, brown, medium dense, fine, sand with traces of gravel	(Cont'd.)

SUBSURFACE EXPLORATION DATA

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-26-78
Finished 6-26-78

Boring No. 35
Coordinates Sheet 2 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill Client's Job No.

Job Location St. Charles Rock Road City Bridgeton State Mo.

Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8"

Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
45'0"					Wet, gray, medium dense, fine, sand with traces of gravel	Set bottom of well point at 60'0" and back filled hole with ½" minus rock.
60'0"					Total depth of boring 60'0"	

SUBSURFACE EXPLORATION DATA
by
WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-26-78
Finished 6-27-78

Boring No. 34
Coordinates Sheet 1 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material
Job Name Westlake Landfill
Job Location St. Charles Rock Road
Casing O.D. I.D.
Casing Hammer lbs.
W. D. Co. Foreman Gary Johanning

I-56

Client's Job No.
City Bridgeton State Mo.
O.D. 2" I.D. 1-3/8"
Hammer 140 lbs. 30" fall

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Brown, sandy clay, trash and limestone boulders 12" minus	Used 6" H.S. augers
6'0"					Moist, gray, firm to medium stiff, sandy clay with limestone boulders	
15'6"					Moist, gray, fine, dense sand	
23'0"					Moist, gray, soft to firm, sandy clay	
29'0"					Moist, gray, medium stiff, plastic clay	
36'0"					Moist to wet, gray, loose, fine sand with traces of gravel	
40'6"					Wet, gray, medium dense, fine sand with traces of gravel	(Cont'd.)

SUBSURFACE EXPLORATION DATA

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-26-78
Finished 6-27-78

Boring No. 34
Coordinates Sheet 2 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill Client's Job No.

Job Location St. Charles Rock Road City Bridgeton State Mo.

Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8"

Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Wet, gray, medium dense, fine, sand with traces of gravel	Set bottom of well point @ 60'0"; back filled hole with ½" minus rock
50'0"					Wet, gray, medium dense, fine sand	
60'0"					Total depth of boring 60'0"	

SUBSURFACE EXPLORATION DATA

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-28-78
Finished 6-28-78

Boring No. 40
Coordinates Sheet 1 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill — Client's Job No.

Job Location St. Charles Rock Road — City Bridgeton State Mo.

I-58

Casing O.D. I.D. — er O.D. 2" I.D. 1-3/8"

Casing Hammer lbs. — er Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Moist, brown, firm to medium stiff, sandy clay, trash and limestone boulders	Used 6" H.S. augers
7'0"					Moist, brown & gray, firm, sandy-clay	
16'0"					Moist, gray, dense, fine sand	
20'0"					Moist, gray, medium stiff, plastic clay	
26'0"					Wet, brown, medium dense, fine sand with traces of gravel	
34'0"					Wet, gray, medium dense, fine sand with traces of gravel	(Cont'd.)

Date of Drilling:
Started 6-28-78
Finished 6-28-78

SUBSURFACE EXPLORATION DATA
by
WABASH DRILLING COMPANY
110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Boring No. 40
Coordinates Sheet 2 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.
Job Name Westlake Landfill Client's Job No.
Job Location St. Charles Rock Road City Bridgeton State Mo.
Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8"
Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall
W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
50'0"					Wet, gray, fine, medium dense, sand with traces of gravel	Set well point @ 60'0" and back filled hole with ½" minus rock.
60'0"					Total depth of boring 60'0"	

SUBSURFACE EXPLORATION DA

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-22-78
Finished 6-22-78

Boring No. 39
Coordinates Sheet 1 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill Client's Job No.

Job Location St. Charles Rock Road City Bridgeton State Mo.

Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8"

Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					White chat 1" minus	Used 6" H.S. augers
2'0"					Moist, brown & light gray, firm to medium stiff, sandy-clay	
6'6"					Wet, gray, fine, loose sand	
8'0"					Moist to wet, brown, firm, silty-clay	
16'0"					Moist, gray, medium stiff, plastic clay with traces of rust stains	
25'6"					Moist to wet, gray, soft, clayey-silt with traces of fine sand	
33'6"					Wet, gray, soft, clayey-silt with traces of fine sand	
37'0"					Wet, gray, medium dense, sand	(Cont'd.)

AUG 04 '93 08:37AM FVD STL

SUBSURFACE EXPLORATION DA...

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-22-78
Finished 6-22-78

Boring No. 39
Coordinates Sheet 2 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill Client's Job No.

Job Location St. Charles Rock Road City Bridgeton State Mo.

Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8"

Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration (") Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Wet, gray, medium dense, fine sand	Set bottom of well point @ 50'0" and back filled with ½" minus gravel.
50'0"					Total depth of boring 50'0"	

AUG 04 '93 08:37AM FVD STL

SUBSURFACE EXPLORATION DA

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-22-78
Finished 6-23-78

Boring No. 38
Coordinates Sheet 1 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill Client's Job No.

Job Location St. Charles Rock Road City Bridgeton State Mo.

Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8"

Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration (ft Sampler (inches)	FIELD IDENTIFICATION OF SOIL (include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
1'6"					Trash & white chat	Used 6" H.S. auger
7'0"					White chat 1" minus	
13'0"					Moist, yellowish-tan, medium stiff clay	
19'0"					Moist, brown, firm, silty-clay with traces of fine sand	
26'6"					Moist, gray, medium stiff, plastic clay with traces of rust stains	
31'0"					Moist to wet, brown, loose, fine sand with traces of gravel	
					Wet, gray, medium dense, fine sand	(Cont'd.)

AUG 04 '93 08:38AM FVD STL

SUBSURFACE EXPLORATION D A

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-22-78
Finished 6-23-78

Boring No. 38
Coordinates Sheet 2 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill — Client's Job No.

Job Location St.Charles Rock Road — City Bridgeton State Mo.

Casing O.D. — I.D. — Sampler O.D. 2" I.D. 1-3/8

Casing Hammer — lbs. — fall — Sampler Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning — Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Wet, gray, medium dense, fine sand	Set bottom of well point @ 50'0" and back filled with ½" minus rock.
50'0"					Total depth of boring 50'0"	

AUG 04 '93 08:38AM FVD STL

DRILLING LOG

McLaren Hart

SB/MW #: I-73
Log #:
Page 1 of 2
Geoscientist:

PROJECT: Westlake
PROJECT #: 11.0800556
LOCATION: Bridgeton, Missouri
TOC ELEVATION: 462.6
SAMPLING DATE(S): 6/22/78 6/23/78
START:
FINISH:
SAMPLING METHOD:
MONITORING DEVICE:
SUBCONTRACTOR/EQUIPMENT: /
DRILLING METHOD:
NOTES:

Depth Below Surface (ft.)	Sampler Interval/ Recovery	Sample ID #	PID reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	Unified Classification	Graphic Log	Well Construction Details
0				TRASH & white CHAT (FILL)			
2				CHAT; white, 1" minus			
4							
6							
8				CLAY; yellowish tan, med stiff, moist			
10							
12							
14				Silty CLAY; tr fine Sand, brown, firm, moist	CL ML		
16							
18							
20				CLAY; gray, med stiff, tr rust stains, moist			
22							
24							
26							
28 ▼				SAND; brown, loose, fine, tr Gravel	SM GM		
30							
32							
34							
36				SAND; gray, med dense, fine, wet			
38							
40							
42							
44							
46							
48							
50				See Following Page...			

SIGNATURE OF FIELD SUPERVISOR

Assistant Geoscientist
TITLE

SIGNATURE OF REVIEWER

Project Manager
TITLE

DRILLING LOG

McLaren Hart

SB/MW #: I-73
Log #:
Page 2 of 2
Geoscientist:

PROJECT: Westlake PROJECT #: 11.0800556

Depth Below Surface (ft.)	Sampler Interval/ Recovery	Sample ID #	PID reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	Unified Classification	Graphic Log	Well Construction Details
50.0				Total depth = 50.0'			

SIGNATURE OF FIELD SUPERVISOR

Assistant Geoscientist
TITLE

SIGNATURE OF REVIEWER

Project Manager
TITLE

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					LR-100
						SHEET 1 OF 2
	SAMPLING METHOD:					DRILLING
LAIDLAW/OU2 RI-FS/HO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					
	WATER LEVEL	19.0 FT.				TIME / TIME
	TIME	11:55				7:30 / 11:00
	DATE	10/04/95				DATE / DATE
NORTHING: 1067293.73 DATUM EASTING: 514893.56 ELEVATION 467.2	CASING DEPTH	26.0 FT.				10/04/95 / 10/04/95

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	0 6 7 4	1.7' 2.0' (85%)			(0.0-5.5 ft.) Compact, moderate yellowish brown (10YR 5/4), CLAYEY SILT, NR, damp, (CL), (FILL)	SP (1)	Landfill cap 1.5 ft. thick
2	3 1	0.9' 2.0'			@ 0.8 ft., dry		
3	2 2	(45%)			From 1.5-5.5 ft., intermixed organic matter and trace waste	SP (2)	
4	2 3	0.3' 2.0'					
5	4 36	(15%)			@ 5.0 ft., wet (461.7) 5.5	SP (3)	0.0 ppm PID
6	3 14	0.6' 2.0'			(5.5-22.0 ft.) WASTE, wet		
7	5 3	(30%)				SP (4)	
8	4 6	0.5' 2.0'					0.1 ppm PID
9	4 5	(25%)				SP (5)	
10	4 2	0.5' 2.0'					0.0 ppm PID
11	3 8	(25%)				SP (6)	
12	7 14	0.4' 2.0'					
13	26 11	(20%)				SP (7)	
14	50/2	0.1' 2.0'				SP (8)	1.1 ppm PID
		(5%)					

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR100

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067293.73
DATUM EASTING: 514893.56 ELEVATION 467.2

DRILLING METHOD:
4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	19.0 FT.			
TIME	11:55			
DATE	10/04/95			
CASING DEPTH	26.0 FT.			

BORING NO. LR-100

SHEET 2 OF 2

DRILLING

START	FINISH
TIME 7:30	TIME 11:00
DATE 10/04/95	DATE 10/04/95

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	8	0.2' / 2.0' (10%)			(5.5-22.0 Ft.) WASTE, wet	SP 8	
17	11 21 11					SP 9	
18	8	0.4' / 2.0' (20%)				SP 10	0.0 ppm PID
19	13 7 8						
20	4	0.6' / 2.0' (30%)			@ 19.9 ft, increasing amount of olive gray SILT intermixed with waste	SP 11	
21	5 10 5						
22	4	0.1' / 2.0' (5%)				SP 12	0.0 ppm PID
23	7 6 6						
24	5	0.8' / 2.0' (40%)				SP 13	
25	4 4 5						
26	4	0.4' / 2.0' (20%)				SP 14	0.2 ppm PID
27	5 5 7				(440.2) 27.0 (27.0-28.0 Ft.) Compact, olive gray (5Y 4/1), SILT, NR, wet, (ML), (LOESS) (439.2) 28.0		
28					End of Soil Borehole Log at 28.0 ft.		
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR100

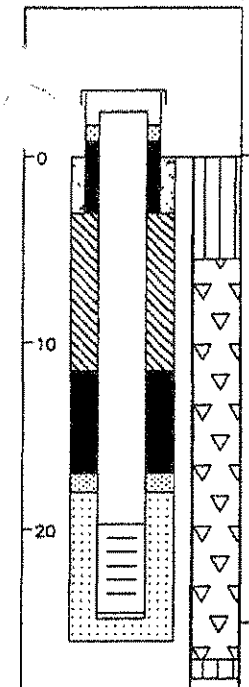
Well No. LR-100

Boring No. X-Ref: LR-100

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067294 ft.
Easting: 514894 ft.

Elevation Ground Level 467.2 ft. NGVD
Top of PVC Casing 469.12 ft. NGVD



Drilling Summary:

Total Depth 26.0 ft.
Borehole Diameter 8 1/4" (0.0-26.0')
Casing Stickup Height 1.92 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/4/95	7:30	10/4/95	11:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/4/95	12:00	10/4/95	12:10
Filter Placement:	10/4/95	12:10	10/4/95	13:05
Cementing:				
Development				
Bentonite Grout	10/4/95	14:45	10/4/95	14:55
Bentonite Seal	10/4/95	14:30	10/4/95	14:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.92	-	19.70	C1	469.12	-	447.50
19.70	-	24.50	S1	447.50	-	442.70
24.50	-	24.80	C2	442.70	-	442.40

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 18.0-26.0'

Filter Pack: 100 mesh Silica Sand 17.0-18.0'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-11.5'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 11.5-16.0'; Chips 16.0-17.0'

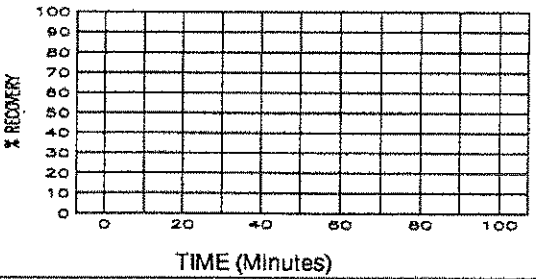
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Drilled to 26.0 ft. then collected split spoon sample from 26.0-28.0 ft.

Not to Scale

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name LR100

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145105	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-100
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
200' NORTHEAST OF SOUTH FENCE AND 380' NORTHWEST OF WESTERN MOST BUILDING AT SOUTH ENTRANCE OFF OLD ST CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 467.2
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 ° 45 ' 53 " LONG. 90 ° 26 ' 52 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC. PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 26 FT. | JOINTS ☐ MECHANICAL ☐ WELDED ☐ THREADED ☐ OTHER ____ | MATERIAL ☒ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. | TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 22.9 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☐ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 1.0 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE 16-35 | LENGTH OF FILTER PACK 8.0 FT. | METHOD OF INSTALLATION H.S.A. POUR

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE | GRAIN SIZE 100 | LENGTH OF FILTER PACK 1.0 FT. | METHOD OF INSTALLATION H.S.A. POUR

WELL SCREEN: LENGTH OF SCREEN 5 FT. | DIAMETER 2 IN. | SLOT SIZE 10 | WEIGHT OR SDR # SCH80 | MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP | DIAMETER OF SUMP | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO | MATERIAL USED | LENGTH OF BACK FILLED BORE HOLE

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3.0	0-6 Clayey silt
Depth to Base of Annular Seal:	16.0	6-25.5 Trash
Depth to Base of Bentonite Seal:	17.0	
Depth to Top of Primary Filter Pack:	18.0	
Depth to Top of the Screen:	21.0	
Depth to Bottom of the Screen:	26.0	25.5-28 Clay
Total Depth:	26.0	

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 469.12
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
DATE WELL DRILLING WAS COMPLETED 10-04-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT # Lomas V. Mahrt-Jr. DATE 11-15-95
SIGNATURE DRILLER/PERMIT # Lomas V. Mahrt-Jr. DATE 11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					LR-101
						SHEET 1 OF 4
	SAMPLING METHOD:					DRILLING
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)					START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					
	WATER LEVEL	DRY	51.0 FT.			TIME / TIME
	TIME	11:15	15:30			8:00 / 15:20
	DATE	10/10/95	10/10/95			DATE / DATE
	CASING DEPTH	35.0 FT.	55.0 FT.			10/10/95 / 10/10/95

DATUM NORTHING: 1068402.25 EASTING: 514718.41 ELEVATION 500.2

DRILL RIG CME 750 — SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	20 39 25 23	0.1'/1.0' (10%) 1.6'/2.0' (80%)			(0.0-1.0 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) (499.2) 1.0 (1.0-2.6 ft.) Crushed, LIMESTONE Gravel, (GP), (FILL) (497.6) 2.6	ST (1) SP (2)	
3	4 8 10 6	1.1'/2.0' (55%)			(2.6-5.0 ft.) Compact, olive gray (5Y 4/1), SILT, NR, dry, (ML), (FILL) (495.5) 4.7	SP (3)	
5	7 6 25 50/3	1.0'/2.0' (50%)			(4.7-12.4 ft.) WASTE, damp	SP (4)	
7	6 7 11 5	0.9'/2.0' (45%)				SP (5)	0.0 ppm PID
9	40 8 5 14	1.1'/2.0' (55%)			@ 10.0 ft., moist	SP (6)	
11	12 15 5 7	1.3'/2.0' (65%)			(487.8) 12.4	SP (7)	
13	8 16 10 15				(12.4-19.9 ft.) Compact, olive gray (5Y 4/1), SILT, with little waste, damp, (ML), (FILL) @ 14.5 ft., wet	SP (8)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR101

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068402.25
DATUM EASTING: 514718.41 ELEVATION 500.2

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-101

SHEET 2 OF 4

					DRILLING START	DRILLING FINISH
WATER LEVEL	DRY	51.0 FT.				
TIME	11:15	15:30			TIME 8:00	TIME 15:20
DATE	10/10/95	10/10/95			DATE 10/10/95	DATE 10/10/95
CASING DEPTH	35.0 FT.	55.0 FT.				

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER
SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN
LOGGED BY B. HARRINGTON
DATE 10/23/95 CHK'D BY B. TILTON
JOB NO.: 943-2848
FILENAME: LR101

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	6 13 20 50/5	1.7'/2.0' (85%)			(12.4-19.9 ft.) Compact, olive gray (5Y 4/1), SILT, with little waste, damp, (ML), (FILL)	SP 9	
17	22 18	0.6'/2.0' (30%)					0.0 ppm PID
18	18 16					SP 10	
19	5 8	0.9'/2.0' (45%)					
20	26 10				(480.3) 19.9 (19.9-51.5 ft.) WASTE, damp	SP 11	
21	4 7	0.9'/2.0' (45%)					
22	50 25				From 21.4-21.5 ft., layer of olive gray (5Y 4/1), SILT, with little waste, wet	SP 12	
23	29 18	1.4'/2.0' (70%)					0.0 ppm PID
24	25 50/4				From 23.5-24.0 ft., layer of olive gray (5Y 4/1), SILT, with little waste, wet, (ML) @ 24.0 ft., moist	SP 13	
25	27 19	0.5'/2.0' (25%)					
26	38 38				@ 26.0 ft., wet	SP 14	
27	8 15	0.8'/2.0' (40%)					0.0 ppm PID
28	50/6					SP 15	
29	50/1	0.1'/2.0' (5%)				SP 16	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

DATUM NORTHING: 1068402.25 EASTING: 514718.41 ELEVATION 500.2

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-101

SHEET 3 OF 4

					DRILLING START	DRILLING FINISH
WATER LEVEL	DRY	51.0 FT.			TIME	TIME
TIME	11:15	15:30			8:00	15:20
DATE	10/10/95	10/10/95			DATE 10/10/95	DATE 10/10/95
CASING DEPTH	35.0 FT.	55.0 FT.				

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR101

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	50/5	0.2'/2.0' (10%)			(19.5-51.5 ft.) WASTE, damp	SP (18)	Rods warm upon withdrawal from borehole.
32						SP (17)	
33	9	1.5'/2.0' (75%)					0.0 ppm PID
34	23 10 16					SP (18)	
35	9	1.8'/2.0' (90%)					@ 11:00 Rain
36	11 17 17				From 35.3-35.7 ft., layer of olive gray (5Y 4/1), SILT, moist, (ML)	SP (19)	
37	9				@ 37.0 ft., wet		
38	38 29 17					SP (20)	1.1 ppm PID 34% LEL, stop drilling temporarily
39	42	1.3'/2.0' (65%)					
40	45 36 17				@ 40.0 ft., moist	SP (21)	
41	11	1.1'/2.0' (55%)					
42	11 18 20					SP (22)	
43	12	1.6'/2.0' (80%)					6.1 ppm PID
44	18 40 50/1					SP (23)	

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					LR-101
						SHEET 4 OF 4
	SAMPLING METHOD:					
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)					DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
	WATER LEVEL	DRY	51.0 FT.			TIME / TIME
	TIME	11:15	15:30			8:00 / 15:20
	DATE	10/10/95	10/10/95			DATE / DATE
NORTHING: 1068402.25 DATUM EASTING: 514718.41 ELEVATION 500.2	CASING DEPTH	35.0 FT.	55.0 FT.			10/10/95 / 10/10/95

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL			SAMPLER TYPE	REMARKS
46	50/5	0.5'/2.0' (25%)			(19.5-51.5 ft.) WASTE, damp			SP (24)	Drill rods very warm upon withdrawal from borehole.
47	34	1.8'/2.0' (90%)			From 47.0-48.0 ft., ammonia odor			SP (25)	
48	15 25 33								
49	12	1.9'/2.0' (95%)						SP (26)	
50	11 14 16								Newsprint dated 1974-1976 0.3 ppm PID 34% LEL Temporarily stop drilling
51	5	2.0'/2.0' (100%)				(448.7)	51.5	SP (27)	
52	13 55 50/5				(51.5-52.1 ft.) Compact, olive gray (5Y 4/1), SILT, moist, (ML), (FILL)	(448.1)	52.1		
53	29	1.6'/2.0' (80%)			(52.1-54.7 ft.) Dense, black stained SILT and mixed WASTE, some Gravel (looks as if burned), damp to moist, (FILL)			SP (28)	0.0 ppm PID
54	25 6 10					(445.5)	54.7		
55	1	2.0'/2.0' (100%)			(54.7-57.0 ft.) Very loose, very light gray (NB), very fine SAND and thinly laminated lime, appears to be mine spoils, WR, wet, (FILL)			SP (29)	Water level began to rise rapidly after penetrating mine spoils.
56	1 1 3								
57						(443.2)	57.0		
58					End of Soil Borehole Log at 55.0 ft.				
59					At completion of drilling, borehole sealed to surface with cement/bentonite grout.				

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR101

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

REGISTRATION RECORD

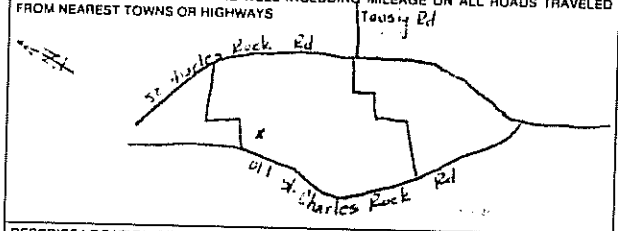
OFFICE USE ONLY	DATE RECEIVED
REF. NO. 131862	
ROUTE	P.W.S. NUMBER / CHECK NUMBER
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	CROSS REFERENCE NO.
APPROVED BY / DATE	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY OWNER

NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
ADDRESS: 138 N BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102
SITE NAME: LAIDLAW SANITARY LANDFILL
WELL NUMBER: LR-101
ADDRESS OF WELL SITE OR SITE NAME (IF DIFFERENT THAN ABOVE): ST. CHARLES ROCK RD
OWNER STATUS: ☐ BUILDER ☐ PRIVATE HOME OWNER ☐ DEVELOPER ☒ OTHER (SPECIFY) LANDFILL
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
PURPOSE OF REGISTRATION FORM: ☐ ABANDONED WELL ☐ MINERAL EXPLORATORY ☐ WELL RECONSTRUCTION ☐ TEST HOLE ☒ OTHER ABANDONED PIEZOMETER
VARIANCE ISSUED? ☐ YES ☒ NO
VARIANCE NUMBER:
WELL CERTIFICATION NUMBER:
DATE ORIGINALLY DRILLED: 10-6-15
SIGNATURE (WELL OWNER) DATE

INFORMATION SUPPLIED BY CONTRACTOR

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
QUAD ____ COUNTY ST. LOUIS
ELEV ____ AREA NO. ____
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N.RNG. 5S E OR W
LAT. 38 ° 46 · 02 " LONG. 90 ° 26 · 53 "

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL
775' NORTH OF SOUTHWEST FENCE CORNER AND 390' EAST OF FENCE
HOLE WAS DRILLED AND THEN ABANDONED BEFORE WELL WAS ACTUALLY SET

CONTRACTOR'S NAME: LANNE WESTERN CO, INC. PERMIT NUMBER 01258
DRILLERS NAME: DALE MAHURIN PERMIT NUMBER 01258 WPM

ABANDONMENT OF WELLS

FORMER USE OF WELL
☐ HAND DUG ☐ SOIL BORING
☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ PUBLIC WATER SUPPLY
☐ MULTI-FAMILY ☐ MINERAL EXPLORATORY TEST HOLE
☐ HEAT PUMP ☒ MONITORING
☐ IRRIGATION ☐ OTHER

ORIGINAL DRILLER (IF KNOWN): UNKNOWN
DATE ORIGINALLY DRILLED: 10-10-95
DATE PLUGGED: 10-10-15
STATIC WATER LEVEL: FT
PUMP REMOVED FROM WELL? ☐ YES N/A ☐ NO
DEPTH OF THE WELL: 35'
LENGTH OF CASING: N/A
CASING DIAMETER/WELL DIA: 8 1/4"
GROUT INSTALLATION METHOD: ☐ GRAVITY ☒ TREMIE
CASING CUT OFF THREE FEET BELOW SURFACE? ☒ YES ☐ NO N/A
TYPE OF CASING: ☐ STEEL ☐ PLASTIC ☐ OTHER N/A

GROUT MATERIAL USED
NEAT CEMENT: ☐ HI-EARLY ☒ PORTLAND TYPE 1 ☐ OTHER
☒ BENTONITE SLURRY ☐ OTHER
BENTONITE: ☒ POWDER ☐ GRANULAR ☐ CHIPS ☐ PELLETS
NUMBER OF BAGS OF GROUT USED: 20.5
POUNDS OF GROUT PER BAG: 47

IF NEAT CEMENT USED, HOW MANY GALLONS OF WATER MIXED PER BAG OF CEMENT: 5
TYPE OF FILL MATERIAL USED: CEMENT / BENTONITE GROUT
AMOUNT OF FILL MATERIAL USED: 0.75 CU. YDS.
DEPTH TO TOP OF FILL MATERIAL: 3'
WELL DISINFECTED BEFORE PLUGGING? ☐ YES ☒ NO
NUMBER USED FOR DISINFECTION: GALLONS OF CHLORINE ____ POUNDS OF CHLORINE ____ TABLETS OF CHLORINE ____
WAS THE WELL ABANDONED BECAUSE OF HOOKING UP TO A PUBLIC OR RURAL WATER SUPPLY DISTRICT? ☐ YES ☒ NO
IF YES, WHAT IS THE NAME OF THE WATER DISTRICT:

CHECK THE BOX WHICH APPLIES

☒ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS ABANDONED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE ABANDONMENT OF WELLS.

☐ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS REPAIRED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE REPAIR OF WELLS.

CONTRACTOR'S SIGNATURE: [signature] DATE: 11-15-15

WELL RECONSTRUCTION

TYPE OF REPAIR: ☐ RAISED CASING ☐ LINING OF WELL ☐ DEEPENING OF WELL ☐ OTHER
USE OF WELL: ☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ PUBLIC WATER SUPPLY ☐ MULTI-FAMILY ☐ MONITORING ☐ HEAT PUMP ☐ OTHER ☐ IRRIGATION
DIA. OF WELL CASING IN.
WAS WELL DISINFECTED AFTER RECONSTRUCTION? ☐ YES ☐ NO
DATE RECONSTRUCTION COMPLETED

RAISED CASING INFORMATION
LENGTH OF CASING ADDED FT.
MATERIAL: ☐ STEEL ☐ PLASTIC
METHOD OF ATTACHMENT: ☐ THREADED ☐ FUSED ☐ WELDED ☐ GLUED ☐ COUPLED

LINER DETAILS
PURPOSE OF LINER: ☐ USED ONLY TO HOLD BACK FORMATION ☐ USED TO SEAL OUT CONTAMINATION OR OTHER CONDITIONS
DIAMETER OF LINER IN.
WEIGHT OR SDR #
DEPTH TO THE TOP OF LINER FROM SURFACE FT.
MATERIAL: ☐ PLASTIC ☐ STEEL
AMOUNT OF LINER USED FT.
JOINTS: ☐ GLUED ☐ WELDED ☐ OTHER

LINER PACKER DETAILS
TYPE USED: ☐ NONE ☐ RUBBER BOOT
DEPTH(S) SET

LINER GROUT DETAILS
POSITION OF SEAL: ☐ FULL LENGTH ☐ BETWEEN PACKERS
MATERIAL: CEMENT: ☐ PORTLAND TYPE 1 ☐ HI EARLY BENTONITE: ☐ CHIPS ☐ PELLETS ☐ SLURRY ☐ GRANULAR
DEPTH PUMP WAS SET ____ FT. GPM ____
DEPTH FROM SURFACE TO TOP OF THE GROUT SEAL FT.
DEPTH FROM SURFACE TO BOTTOM OF THE GROUT SEAL FT.

DEEPENING OF WELL INFORMATION

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION	YIELD

MO 780-1414 (1-95)
DISTRIBUTION: WHITE/CONTRACTOR CANARY/DIVISION PINK/OWNER
MAIL CANARY COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65401 RECORD MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION DATE

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					LR-102
						SHEET
	SAMPLING METHOD:					1 OF 6
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)					DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
	WATER LEVEL	54.0 FT.				TIME / TIME
	TIME	10:15				11:55 / 14:30
	DATE	10/8/95				DATE / DATE
NORTHING: 1068937.21 DATUM EASTING: 514788.13 ELEVATION 512.0	CASING DEPTH	60.0 FT.				10/6/95 / 10/7/95

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1		1.5'/2.0' (75%)			(0.0-1.5 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL)	ST 1	
					(510.5) 1.5		
2	50/3	0.3'/2.0' (15%)			(1.5-19.5 ft.) WASTE, consisting of wood, asphalt, carpet and other demolition wastes intermixed with olive black composite soil	SP 2	Petroleum odor
3							
4	15 17 5 6	1.1'/2.0' (55%)				SP 3	0.0 ppm PID
5							
6	9 22 22 4	0.5'/2.0' (25%)				SP 4	
7							
8	3 50/6	0.8'/2.0' (40%)			From 8.4-8.8 ft, layer of dark gray SILT with gravel sized stones	SP 5	0.3 ppm PID
9							
10	11 50/3	0.7'/2.0' (35%)			@ 10.5 ft, asphalt	SP 6	
11							
12	50/6	0.5'/2.0' (25%)			From 12.0-14.2 ft, carpet	SP 7	0.9 ppm PID
13							
14	15 50/6	0.7'/2.0' (35%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068937.21
DATUM EASTING: 514788.13 ELEVATION 512.0

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-102

SHEET 2 OF 6

		DRILLING START	DRILLING FINISH
WATER LEVEL	54.0 FT.		
TIME	10:15	TIME 11:55	TIME 14:30
DATE	10/8/95	DATE 10/6/95	DATE 10/7/95
CASING DEPTH	60.0 FT.		

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER
SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN
LOGGED BY B. HARRINGTON
DATE 10/9/95 CHK'D BY B. TILTON
JOB NO.: 943-2848
FILENAME: LR102

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	50/4	0.0' / 2.0' (0%)			(1.5-19.5 ft.) Compacted, WASTE, consisting of wood, asphalt, carpet and other demolition wastes intermixed with olive black composite soil	SP 8	0.1 ppm PID
17						SP 9	
18	16 20 24	0.3' / 2.0' (15%)					
19	11				(492.5) 19.5	SP 10	
20	10 8 8 5	0.8' / 2.0' (40%)			(19.5-20.5 ft.) Compact, greenish gray (5GY 6/1), SILT, damp, (ML), (FILL) (491.5) 20.5		0.1 ppm PID
21					(20.5-36.0 ft.) WASTE, municipal intermixed with medium gray SILT, moist, strong leachate odor	SP 11	
22	0 0 13	0.2' / 2.0' (10%)			@ 22.0 ft., wet		
23	33					SP 12	
24	28 50/4	0.0' / 2.0' (0%)					0.7 ppm PID
25					@ 25.0 ft., moist	SP 13	
26	0 0 8	0.4' / 2.0' (20%)					
27	6					SP 14	
28	50/3	0.3' / 2.0' (15%)					0.0 ppm PID
29						SP 15	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

DATUM NORTHING: 1068937.21 EASTING: 514788.13 ELEVATION 512.0

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD: SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP); SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-102

SHEET 3 OF 6

					DRILLING START	DRILLING FINISH
WATER LEVEL	54.0 FT.				TIME 11:55	TIME 14:30
TIME	10:15					
DATE	10/8/95				DATE 10/6/95	DATE 10/7/95
CASING DEPTH	60.0 FT.					

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	14 50/5	0.0' 2.0' (0%)			(20.5-36.0 ft.) Compacted WASTE, municipal intermixed with medium gray SILT, moist, strong leachate odor	SP (16)	
32	32 33	0.0' 2.0' (0%)					1.2 ppm PID
33	20 12					SP (17)	
34	13 9	0.2' 2.0' (10%)					
35	10 50/4					SP (18)	
36	50/5	0.0' 2.0' (0%)			(36.0-48.4 ft.) WASTE, demolition and construction debris, aphalt, particle board, wood, corrugated cardboard, brick, etc., intermixed with black composite soil, moist		1.1 ppm PID
37						SP (19)	
38	41 50/3	0.4' 2.0' (20%)					
39						SP (20)	
40	20 50/1	0.2' 2.0' (10%)					0.2 ppm PID
41						SP (21)	
42	27 13	0.6' 2.0' (30%)					
43	25 24					SP (22)	
44	50/5	0.0' 2.0' (0%)				SP (23)	1.0 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068937.21
DATUM EASTING: 514788.13 ELEVATION 512.0

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	54.0 FT.				
TIME	10:15				
DATE	10/8/95				
CASING DEPTH	60.0 FT.				

BORING NO. LR-102

SHEET 4 OF 6

DRILLING: START TIME 11:55, DATE 10/6/95; FINISH TIME 14:30, DATE 10/7/95

DRILL RIG CME 750

SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR102

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	6 17 15 16	1.8'/2.0' (90%)			(36.0-48.4 ft.) Compacted WASTE, demolition and construction debris, asphalt, particle board, wood, corrugated cardboard, brick, etc., intermixed with black composite soil, moist from 45.0-45.5 ft., layer of compact, medium gray (N5), SILT, some Gravel, moist, (ML), (FILL)	SP (23)	
47						SP (24)	
48	7 18 27 17	2.0'/2.0' (100%)			(463.6) 48.4 (48.4-50.8 ft.) Dense, olive gray (5Y 4/1), SILT, with little waste and demolition debris, moist, (ML), (FILL)	SP (25)	1.1 ppm PID
49							
50	7 9 10 12	1.6'/2.0' (80%)			(461.2) 50.8 (50.8-58.0 ft.) WASTE, demolition debris, bricks, wood, etc., with little olive gray Silt, moist	SP (26)	
51							
52	8 11 50/5	1.5'/2.0' (75%)				SP (27)	
53					@ 53.0 ft., wet		
54	10 14 50/4	1.1'/2.0' (55%)				SP (28)	
55							
56	14 16 16 18	1.2'/2.0' (60%)				SP (29)	0.7 ppm PID
57							
58	3 50/6	0.6'/2.0' (30%)			(454.0) 58.0 (58.0-62.8 ft.) Compact, olive gray (5Y 4/1), SILT and GRAVEL, wet, (ML/GP), (FILL)	SP (30)	
59							0.2 ppm PID

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068937.21
DATUM EASTING: 514788.13 ELEVATION 512.0

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-102

SHEET 5 OF 6

					DRILLING START	DRILLING FINISH
WATER LEVEL	54.0 FT.					
TIME	10:15				TIME 11:55	TIME 14:30
DATE	10/8/95				DATE 10/6/95	DATE 10/7/95
CASING DEPTH	60.0 FT.					

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER

SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON
DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848
FILENAME: LR102

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
61	13 19 9 14	2.0'/2.0' (100%)			(58.0-62.8 ft.) Compact, olive gray (5Y 4/1), SILT and GRAVEL, wet, (ML/GP), (FILL)	SP (31)	
62	13 33 32	1.4'/2.0' (70%)			(449.2) 62.8	SP (32)	
63	35				(62.8-76.0 ft.) WASTE, demolition debris that appears to have been burned, wet to moist, with some olive gray Silt		
64	8 40 50/5	1.1'/2.0' (55%)			below 64.0 ft., waste becomes moist to damp	SP (33)	0.1 ppm PID
65							
66	65 49 25	0.5'/2.0' (25%)				SP (34)	
67	50/1						
68	8 29 21	0.4'/2.0' (20%)				SP (35)	0.0 ppm PID
69	12						
70	4 9 12	0.6'/2.0' (30%)				SP (36)	
71	27						
72	28 17 30	1.2'/2.0' (60%)				SP (37)	0.1 ppm PID
73	50/5						
74	50/2	0.0'/2.0' (0%)				SP (38)	0.7 ppm PID

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068937.21
DATUM EASTING: 514788.13 ELEVATION 512.0

DRILLING METHOD:
4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	54.0 FT.				
TIME	10:15				
DATE	10/8/95				
CASING DEPTH	60.0 FT.				

BORING NO. LR-102

SHEET 6 OF 6

DRILLING

START	FINISH
TIME 11:55	TIME 14:30
DATE 10/6/95	DATE 10/7/95

DRILL RIG CME 750

SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
76					(62.8-76.0 ft.) Compacted WASTE, demolition debris, moist to damp, with some olive gray Silt (436.0) 76.0	SP (38)		
					End of Soil Borehole Log at 76.0 ft.			
77								
78								
79								
80								
81								
82								
83								
84								
85								
86								
87								
88								
89								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR102

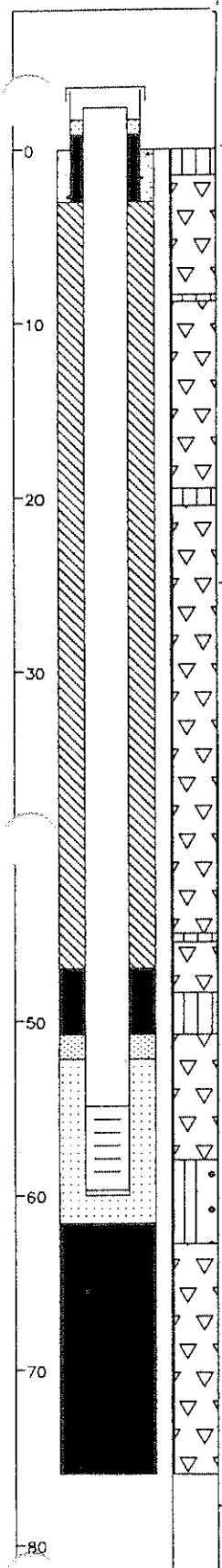
Well No. LR-102

Boring No. X-Ref: LR-102

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1068937 ft.
Easting: 514788 ft.

Elevation Ground Level 512.0 ft. NGVD
Top of PVC Casing 513.52 ft. NGVD



Drilling Summary:

Total Depth 76.0 ft.
Borehole Diameter 8 1/4" (0.0-76.0')
Casing Stickup Height 1.52 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/6/95	11:55	10/7/95	14:30
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/8/95	14:30	10/8/95	15:05
Filter Placement:	10/8/95	12:50	10/8/95	15:45
Cementing:				
Development				
Bentonite Grout	10/8/95	16:20	10/8/95	
Bentonite Seal	10/8/95	15:45	10/8/95	15:55

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.52	-	54.90	C1	513.52	-	457.10
54.90	-	59.70	S1	457.10	-	452.30
59.70	-	60.00	C2	452.30	-	452.00
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 52.2-61.6'

Filter Pack: Less than 50 mesh Silica Sand 50.8-52.2'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-47.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 47.0-50.8', Chips 61.6-76.0'

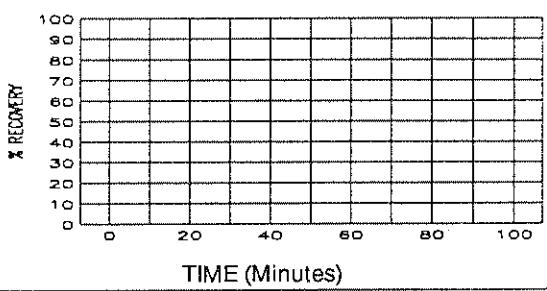
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name LR102

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145106	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-102
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
WEST SIDE OF SITE, 390' EAST OF FENCE LINE AND 1550' NORTH OF SOUTHWEST FENCE CORNER. (ON TOP OF HILL)

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 512.0
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38 ° 46 ' 09 " LONG. 90 ° 26 ' 53 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 76 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. | TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER ☒ NO ☐ YES LOCATED AT | MATERIAL ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS: LENGTH 56.5 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE ☐ CEMENT/BENTONITE SLURRY TYPE: BAGS OF CEMENT USED % BENTONITE USED WATER USED/BAG GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 3.8 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	9.4 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTUREO ☐ NONE	100	1.4 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-1.5 Clayey silt 1.5-76 Trash
WELL SCREEN	LENGTH OF SCREEN 5 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	47.0	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER			Depth to Base of Bentonite Seal:	50.8	
BACK FILL	WAS THE WELL BACK FILLED? ☒ YES ☐ NO	MATERIAL USED MED. BENT. CHIPS	LENGTH OF BACK FILLED BORE HOLE 14.4'			Depth to Top of Primary Filter Pack:	52.2	
						Depth to Top of the Screen:	55.0	
						Depth to Bottom of the Screen:	60.0	
						Total Depth:	76.0	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER
ELEVATION OF MEASURING POINT 513.52
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER
DATE WELL DRILLING WAS COMPLETED 10-08-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Leroy M. Mahurin Jr.
DATE: 11-15-95
SIGNATURE DRILLER/PERMIT #: Leroy M. Mahurin Jr.
DATE: 11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068527.38
DATUM EASTING: 515217.07 ELEVATION 460.1

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					DRILLING START	DRILLING FINISH
WATER LEVEL	26.74 FT					
TIME	9:16				TIME 14:00	TIME 9:00
DATE	10/20/95				DATE 10/19/95	DATE 10/20/95
CASING DEPTH	38.0 FT.					

BORING NO. LR-103

SHEET 1 OF 3

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR103

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 4 6 8	1.0'/2.0' (50%)			(0.0-2.5 Ft.) Stiff, moderate yellowish brown (10YR 5/4), CLAYEY SILT, trace fine Gravel, occasional cobbles, NR, dry, (CL-ML), (FILL)	SP ①	
2	17 12	1.3'/2.0'			(457.6) 2.5		
3	13 16	(65%)			(2.5-3.5 Ft.) Very stiff, medium gray (N5), SANDY SILT, little c-f Gravel, occasional cobbles, SR, damp, (ML), (FILL)	SP ②	
4	9 10 8 11	0.7'/2.0' (35%)			(3.5-7.5 Ft.) Very stiff, medium bluish gray (5B 5/1), SILT, little c-f Sand, WR, damp, (ML), (FILL)	SP ③	
6	3 8 5 4	1.2'/2.0' (60%)				SP ④	
8	3 5 4 4	1.1'/2.0' (55%)			(7.5-10.0 Ft.) Stiff, medium light gray (N6), SANDY SILT, little c-f Gravel, SR, damp, (ML), (FILL)	SP ⑤	
10	2 2 3 2	1.6'/2.0' (80%)			(10.0-19.3 Ft.) Firm, medium gray (N5), SILT, little fine Sand, trace iron staining, SR, damp, (ML), (LOESS)	SP ⑥	
12	1 2 3 3	1.4'/2.0' (70%)				SP ⑦	@ 12.0 Ft. Hole began making gas at low levels
14	2 2 3 4	2.0'/2.0' (100%)				SP ⑧	

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-103
		SHEET 2 OF 3
	SAMPLING METHOD:	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
	WATER LEVEL: 26.74 FT.	TIME: 14:00 / 9:00
	TIME: 9:16	
	DATE: 10/20/95	DATE: 10/19/95 / 10/20/95
	CASING DEPTH: 38.0 FT.	
NORTHING: 1068527.38 DATUM EASTING: 515217.07 ELEVATION 460.1		
DRILL RIG: CME 750	SURFACE CONDITIONS	
ANGLE: 90° BEARING: NA		
SAMPLE HAMMER		

DRILLING CONTR: LAYNE-WESTERN

LOGGED BY: M. SANDFORT DATE: 10/23/95 CHK'D BY: B. TILTON

JOB NO.: 943-2848 FILENAME: LR103

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	3 3 4 5	2.0' / 2.0' (100%)			(10.0-19.3 Ft.) Firm, medium gray (N5), SILT, little Fine Sand, trace iron staining, SR, damp, (ML), (LOESS)	SP (8)	
17						SP (9)	
18	1 2 2 4	2.0' / 2.0' (100%)			From 18.0-19.0 Ft, wet zone	SP (10)	
19					(440.8) 19.3		
20	2 4 6 7	2.0' / 2.0' (100%)			(19.3-24.2 Ft.) Firm, grayish black (N2), SILTY CLAY, NR, damp, (CL), (ALLUVIUM)	SH (11)	
21							
22	2 4 5 8	2.0' / 2.0' (100%)			@ 22.3 Ft, color changes to medium dark gray (N4)	SP (12)	
23							
24	6 12 17 15	2.0' / 2.0' (100%)			(435.9) 24.2 (24.2-38.0 Ft.) Compact, medium gray to medium dark gray (N5 to N4), Fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)	SP (13)	
25							
26	4 4 6 15	1.2' / 2.0' (60%)				SP (14)	@ 26.0 Ft, encountered water
27					From 27.2-27.5 Ft, CLAYEY SILT layer		
28	8 8 15 15	2.0' / 2.0' (100%)				SP (15)	
29							

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068527.38
DATUM EASTING: 515217.07 ELEVATION 460.1

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	26.74 FT.			
TIME	9:16			
DATE	10/20/95			
CASING DEPTH	38.0 FT.			

BORING NO. LR-103

SHEET 3 OF 3

DRILLING

START	FINISH
TIME 14:00	TIME 9:00
DATE 10/19/95	DATE 10/20/95

DRILL RIG CME 750

SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	4 4 7 10	1.5'/2.0' (75%)			(24.2-38.0 Ft.) Compact, medium gray to medium dark gray (N5 to N4), fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)	SP (16)	
32	5 11 14 27	1.3'/2.0' (65%)			From 32.3-32.5 Ft. layers of decayed vegetation	SP (17)	
33							
34	6 12 15 15					SP (18)	
35							
36	5 6 12 14				@ 37.0 Ft., SAND becomes medium to fine grained	SP (19)	
37					(422.1) 38.0		
38					End of Soil Borehole Log at 38.0 Ft.		
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR103

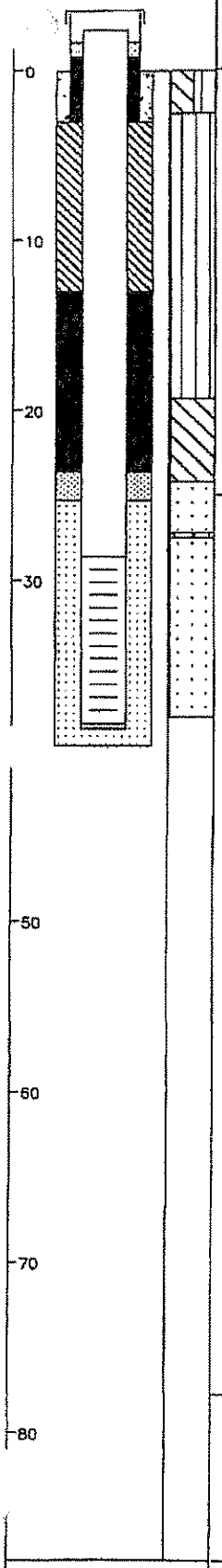
Well No. LR-103

Boring No. X-Ref: LR-103

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1068527 ft.
Easting: 515217 ft.

Elevation Ground Level 460.1 ft. NGVD
Top of PVC Casing 461.28 ft. NGVD



Drilling Summary:

Total Depth 40.0 ft.
Borehole Diameter 8 1/4" (0.0-40.0')
Casing Stickup Height 1.10 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID/8 1/4" O.D. Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	10/19/95	14:00	10/20/95	9:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/20/95	8:55	10/20/95	8:59
Filter Placement:	10/20/95	9:10	10/20/95	10:25
Cementing:				
Development				
Bentonite Grout	10/20/95	10:35	10/20/95	10:50
Bentonite Seal	10/20/95	10:28	10/20/95	10:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.10	-	28.60	C1	461.28	-	431.50
28.60	-	38.40	S1	431.50	-	421.70
38.40	-	38.70	C2	421.70	-	421.40
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 25.3-39.7'

Filter Pack: 100 mesh Silica Sand 23.6-25.3'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-13.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 13.0-23.6'

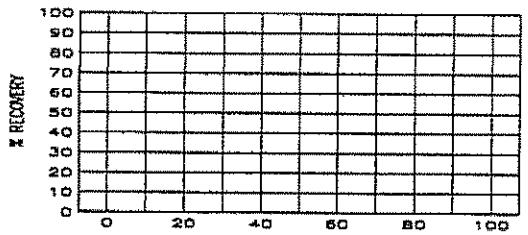
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by M. Sandfort
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name LR103

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145107	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-103
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
AT WEST BASE OF GRAVEL PILE FOR ASPHALT PLANT.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 460.1
SMALLEST ¼ ____ ¼ ____ ¼ LARGEST ¼ ____ ¼
SEC. ____ TWN. 47 N,RNG. 5 ☒ E ☐ W
LAT. 38 ° 46 ' 05 " LONG. 90 ° 26 ' 48 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188 | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 40 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. | TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT | DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 31.2 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE ☐ CEMENT/BENTONITE SLURRY TYPE: ____ BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 10.6 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	14.7 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.7 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seat:	3.0	0-7 Gravelly clay
WELL SCREEN	LENGTH OF SCREEN: 10 FT.	DIAMETER: 2 IN.	SLOT SIZE: 10	WEIGHT OR SDR #: SCH 80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	13.0	7-26 Silty clay
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER			Depth to Base of Bentonite Seal:	23.6	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE			Depth to Top of Primary Filter Pack:	25.3	
						Depth to Top of the Screen:	30.0	26-40 Silty sand
						Depth to Bottom of the Screen:	40.0	
						Total Depth:	40.0	

STATIC WATER LEVEL FEET FROM MEASURING POINT:
DATE OF STATIC WATER LEVEL:
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 461.28
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
DATE WELL DRILLING WAS COMPLETED: 10-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Thomas M. Mahurin
DATE: 11-15-95
SIGNATURE DRILLER/PERMIT #: Thomas M. Mahurin
DATE: 11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/HO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068078.63
DATUM EASTING: 515623.34 ELEVATION 458.0

DRILLING METHOD: 4.25 inch I.D.8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-104

SHEET 1 OF 3

					DRILLING START	DRILLING FINISH
WATER LEVEL	26.0 FT.	25.6 FT.			TIME 13:00	TIME 15:25
TIME	14:25	7:44				
DATE	10/17/95	10/18/95			DATE 10/17/95	DATE 10/17/95
CASING DEPTH	26.5 FT.	38.0 FT.				

DRILL RIG CME 750

SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1					(0.0-2.0 ft.) Dense, yellowish gray (5Y 8/1), LIMESTONE GRAVEL, little fines, SR, damp, (GP), (ROAD BASE)	NS	
(456.0) 2.0							
2	9 9 13 15	1.5' 2.0' (75%)			(2.0-4.0 ft.) Very stiff, light olive gray (5Y 6/1), CLAYEY SILT, little Gravel, trace brick pieces, SR, damp, (CL-ML), (FILL)	SP (1)	
3							
4	5 9 9 12	0.7' 2.0' (35%)			(4.0-10.0 ft.) Stiff, light olive gray (5Y 5/2), CLAYEY SILT, little Gravel, SR, damp, (CL-ML), (FILL)	SP (2)	
5							
6	5 5 6 8	0.8' 2.0' (40%)				SP (3)	
7							
8	5 8 10 11	0.5' 2.0' (25%)				SP (4)	
9							
(448.0) 10.0							
10	5 9 12 50/6	1.8' 2.0' (90%)			(10.0-18.0 ft.) Compact, light olive brown and light olive gray (5Y 5/6 and 5Y 5/2), SILT, trace Gravel, trace Fe staining, little decayed plant matter, SR, damp to moist, (ML), (ALLUVIUM)	SP (5)	
11							
12	9 3 3 4	1.5' 2.0' (75%)				SP (6)	
13					below 13.0 ft, color changes to grayish olive green (5GY 3/2), becomes moist		
14							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT CHK'D BY B. TILTON

DATE 10/17/95

JOB NO.: 943-2848

FILENAME: LR104

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068078.63
DATUM EASTING: 515623.34 ELEVATION 458.0

DRILLING METHOD: 4.25 inch I.D.8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	26.0 FT.	25.6 FT.		
TIME	14:25	7:44		
DATE	10/17/95	10/18/95		
CASING DEPTH	26.5 FT.	38.0 FT.		

BORING NO. LR-104

SHEET 2 OF 3

DRILLING START	DRILLING FINISH
TIME 13:00	TIME 15:25
DATE 10/17/95	DATE 10/17/95

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	3	1.2'/2.0' (60%)			(10.0-18.0 ft.) Compact, light olive brown and light olive gray (5Y 5/6 and 5Y 5/2), SILT, trace Gravel, trace Fe staining, little decayed plant matter, SR, damp to moist, (ML), (ALLUVIUM)		
17	5 6				From 16.5-17.0 ft, grayish olive green (5GY 3/2), SILTY SAND layer, moist, (SM)	SP (8)	
					(440.0) 18.0		
18	5	1.5'/2.0' (75%)			(18.0-26.2 ft.) Firm to stiff, dark gray (N3), SILTY CLAY, NR, damp, (CL), (ALLUVIUM)		
19	5 7 12					SP (9)	
20	1	1.6'/2.0' (80%)					
21	4 5 7					SP (10)	
22	2	2.0'/2.0' (100%)					
23	4 4 5				From 23.3-23.8 ft, wet Silt zone	SP (11)	
24	2	1.7'/2.0' (85%)					
25	3 6 6				From 25.0-26.2 ft, wet Silt zone	SP (12)	
26	2	1.2'/2.0' (60%)			(431.8) 26.2		@ 26.0 ft, first free water encountered
27	6 12 12				(26.2-37.3 ft.) Compact, dark gray (N3), Fine SAND, little Silt, occasional Silt layers, NR, wet, (SP), (ALLUVIUM)	SP (13)	
28	2	1.4'/2.0' (70%)					
29	5 6 7					SP (14)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT CHK'D BY B. TILTON

DATE 10/17/95

JOB NO.: 943-2848

FILENAME: LR104

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068078.63
DATUM EASTING: 515623.34 ELEVATION 458.0

DRILLING METHOD: 4.25 inch I.D.8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-104

SHEET 3 OF 3

					DRILLING START	DRILLING FINISH
WATER LEVEL	26.0 FT.	25.6 FT.				
TIME	14:25	7:44			TIME 13:00	TIME 15:25
DATE	10/17/95	10/18/95			DATE 10/17/95	DATE 10/17/95
CASING DEPTH	26.5 FT.	38.0 FT.				

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	5 7 8 11	1.6' 2.0' (80%)			(26.2-37.3 Ft.) Compact, dark gray (N3), fine SAND, little Silt, occasional Silt layers, NR, wet, (SP), (ALLUVIUM) @ 34.0 ft, color changes to medium dark gray (N4) from 35.5-36.0 ft, trace carbonized wood	SP (15)	Began injecting water to control heaving sands
32	2 3 5 6	1.4' 2.0' (70%)				SP (16)	
33							
34	2 3 4 5	1.6' 2.0' (80%)				SP (17)	
35							
36	0 1 2 4	1.5' 2.0' (75%)				SP (18)	
37					(420.7) 37.3		
38					(37.3-38.0 Ft.) Medium dark gray (N4), firm SILTY CLAY, NR, damp, (CL) (420.0) 38.0 End of Soil Borehole Log at 38.0 ft.		
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/17/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR104

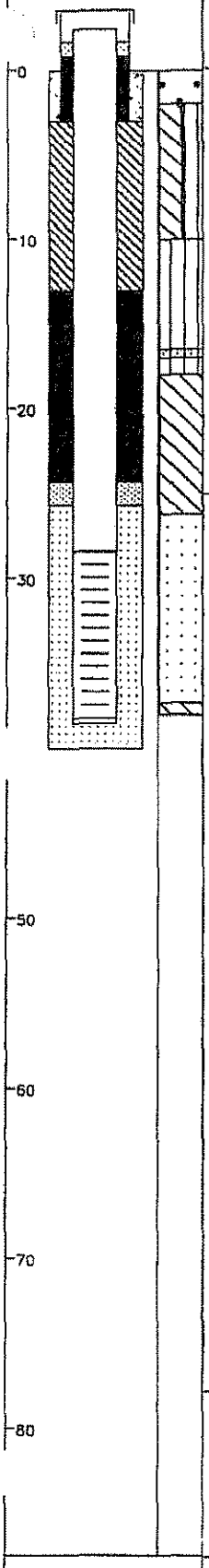
Well No. LR-104

Boring No. X-Ref: LR-104

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1068079 ft.
Easting: 515823 ft.

Elevation Ground Level 458.0 ft. NGVD
Top of PVC Casing 459.73 ft. NGVD



Drilling Summary:

Total Depth 40.0 ft.
Borehole Diameter 8 1/4" (0.0-40.0')
Casing Stickup Height 1.73 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/17/95	13:00	10/17/95	15:25
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/18/95	7:45	10/18/95	7:48
Filter Placement:	10/18/95	7:52	10/18/95	8:48
Cementing:				
Development				
Bentonite Grout	10/18/95	8:44	10/18/95	8:56
Bentonite Seal	10/18/95	8:56	10/18/95	11:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.73	-	28.40	C1	459.73	-	429.60
28.40	-	38.20	S1	429.60	-	419.80
38.20	-	38.50	C2	419.80	-	419.50

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 25.7-40.0'

Filter Pack: 100 mesh Silica Sand 24.3-25.7'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-13.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 13.0-24.3'

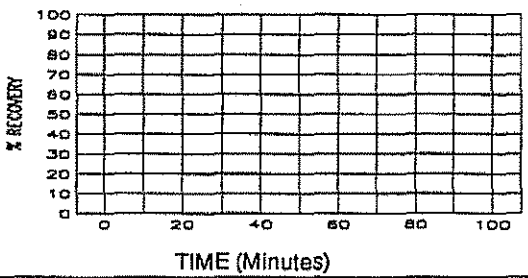
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by M. Sandfort
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name LR104

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145108	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-104
SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
SOUTH OF OVERHEAD CONVEYOR, MIDWAY BETWEEN ROAD AND BUILDING.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 458.0
SMALLEST ¼ ____ ¼ ____ ¼ LARGEST ¼ ____ ¼
SEC. ____ TWN. 47 N.RNG. 5 E OR W
LAT. 38 ° 46 ' 01 " LONG. 90 ° 26 ' 43 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8X8 IN. | WEIGHT OR SDR # 0.188 | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 40 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. | TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 30.2 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 11.3 VWM | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE 16-35 | LENGTH OF FILTER PACK 14.3 FT. | METHOD OF INSTALLATION H.S.A. POUR

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE | GRAIN SIZE 100 | LENGTH OF FILTER PACK 1.4 FT. | METHOD OF INSTALLATION H.S.A. POUR

WELL SCREEN: LENGTH OF SCREEN 10 FT. | DIAMETER 2 IN. | SLOT SIZE 10 | WEIGHT OR SDR # SCH80 | MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP | DIAMETER OF SUMP | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO | MATERIAL USED | LENGTH OF BACK FILLED BORE HOLE

Information in this column to be supplied in the Feet from Surface column

Depth to bottom of Protective Casing Seal:	FEET FROM SURFACE: 3.0	FORMATION DESCRIPTION: 0-2 Gravel
		2-10 Silty clay
Depth to Base of Annular Seal:	13.0	10-18 Silt
Depth to Base of Bentonite Seal:	24.3 VWM	18-26.5 Clay
Depth to Top of Primary Filter Pack:	25.7	
Depth to Top of the Screen:	28.5	26.5 39.3 Sand
Depth to Bottom of the Screen:	38.5	39.3-40 Clay
Total Depth:	40.0	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 459.73

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED 10-18-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT # Terran N. Mahurin Jr. | DATE 11-15-95
SIGNATURE DRILLER/PERMIT # Terran N. Mahurin Jr. | DATE 11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067709.56
DATUM EASTING: 514524.56 ELEVATION 484.2

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	21.3 FT.	32.0 FT.			
TIME	13:50	11:00			
DATE	10/03/95	10/04/95			
CASING DEPTH	28.0 FT.	36.0 FT.			

BORING NO. LR-105

SHEET 1 OF 3

DRILLING: START TIME 9:45 DATE 10/03/95; FINISH TIME 14:45 DATE 10/03/95

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR105

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	6 8 6 8	1.8'/2.0' (90%)			(0.0-2.2 Ft.) Compact, moderate yellowish brown (10YR 5/4), SILTY CLAY, NR, dry, (CL), (FILL) @ 1.3 ft, damp	SP (1)	
2					(482.0) 2.2		
2	4 3 7	1.3'/2.0' (65%)			(2.2-3.2 Ft.) Loose, light olive gray (5Y 5/2), SILT, NR, damp, (ML), (FILL)	SP (2)	
3	43				(481.0) 3.2 (3.2-29.2 Ft.) WASTE, damp		
4	4 3 2	0.4'/2.0' (20%)				SP (3)	0.0 ppm PID
5	4						
6	8 6	0.7'/2.0' (35%)				SP (4)	
7	10 5				@ 7.5 ft, moist		
8	1 2	0.4'/2.0' (20%)				SP (5)	
9	2 4				@ 9.6 ft, wet		
10	2 3	0.5'/2.0' (25%)				SP (6)	Faint petroleum odor
11	4 6						
12	6 3	0.5'/2.0' (25%)				SP (7)	
13	4 4						
14	22 5 50/4	0.4'/2.0' (20%)				SP (8)	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067709.56
DATUM EASTING: 514524.56 ELEVATION 484.2

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-105

SHEET 2 OF 3

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL	21.3 FT.	32.0 FT.			9:45	14:45
TIME	13:50	11:00				
DATE	10/03/95	10/04/95			DATE 10/03/95	DATE 10/03/95
CASING DEPTH	28.0 FT.	36.0 FT.				

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	9	0.9' 2.0' (45%)			(3.2-29.2 Ft.) WASTE, damp	SP 8	0.0 ppm PID
	3						
	5						
17	6					SP 9	
18	3	0.9' 2.0' (45%)					
	5						
	7					SP 10	
19	50/3						
20	50/5	0.4' 2.0' (20%)			From 19.9-23.8 Ft, some Limestone and granular soil intermixed with waste	SP 11	0.0 ppm PID
21							
22	7	1.0' 2.0' (50%)					
	13					SP 12	
	20						
23	12						
24	7	1.4' 2.0' (70%)					Landfill gas odor 0.0 ppm PID Lost shoe on Split Spoon
	8						
	19					SP 13	
25	17						
26	13	1.5' 2.0' (75%)					
	21						
	17					SP 14	
27	25						
28	9						0.0 ppm PID
	37						
	15					SP 15	
29	11				(29.2-30.0 Ft.) Compact, medium gray (N5), SILTY CLAY, NR, wet, (CL), (FILL) From 29.2-29.8 Ft, layer of LIMESTONE GRAVEL		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR105

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067709.56
DATUM EASTING: 514524.56 ELEVATION 484.2

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					START	FINISH
WATER LEVEL	21.3 FT.	32.0 FT.			TIME	TIME
TIME	13:50	11:00			9:45	14:45
DATE	10/03/95	10/04/95			DATE	DATE
CASING DEPTH	28.0 FT.	36.0 FT.			10/03/95	10/03/95

BORING NO. LR-105

SHEET 3 OF 3

DRILLING

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31		0.9' 2.0' (45%)			(30.0-36.0 ft.) WASTE, wet	ST (16)	@ 31.2 ft., chunk of limestone crushed end of Shelby Tube 0.0 ppm PID
32	10 11 50/3	0.4' 2.0' (20%)				SP (17)	
33							
34	37 29 24 30	0.2' 2.0' (10%)				SP (18)	
35							
36	1 2 3 4	1.8' 2.0' (90%)			(36.0-38.0 ft.) Loose, olive gray (5Y 4/1), SILT, little fine Sand, NR, moist, (ML), (LOESS) (448.2) 36.0	SP (19)	0.0 ppm PID
37							
38					(446.2) 38.0 End of Soil Borehole Log at 38.0 ft.		
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR105

Well No. LR-105

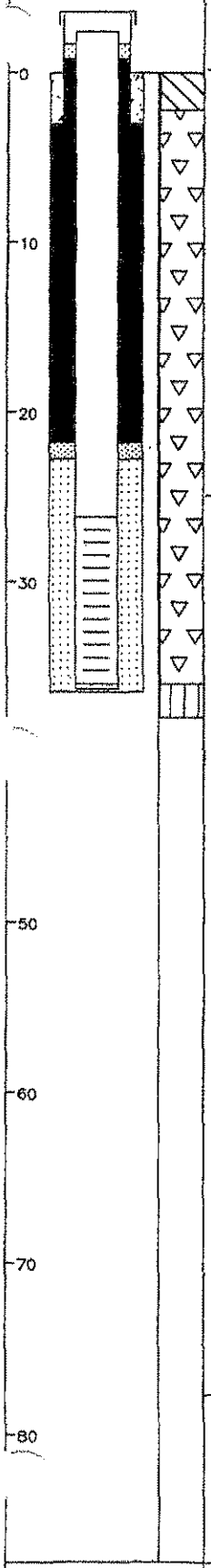
Boring No. X-Ref: LR-105

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067710 ft. Easting: 514525 ft.

Elevation Ground Level 484.2 ft. NGVD

Top of PVC Casing 486.79 ft. NGVD



Drilling Summary:

Total Depth 38.0 ft.

Borehole Diameter 8 1/4" (0.0-38.0')

Casing Stickup Height 2.59 ft.

Driller Layne-Western
St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling CME 750	10/3/95	9:45	10/3/95	14:45
Geophys.Logging:				
Casing: 2" I.D. PVC	10/3/95	15:00	10/3/95	15:05
Filter Placement:	10/3/95	15:10	10/3/95	16:00
Cementing:				
Development				
Bentonite Grout Bentonite Seal	10/3/95	15:00	10/3/95	16:40

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.59	-	26.20	C1	486.79	-	458.00
26.20	-	36.00	S1	458.00	-	448.20
36.00	-	36.30	C2	448.20	-	447.90
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 22.8-36.5'

Filter Pack: Less than 50 mesh Silica Sand 21.8-22.8'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Chips 3.0-21.8'

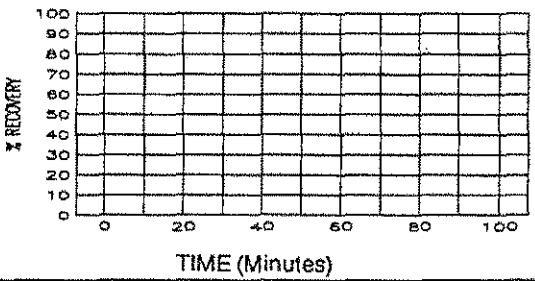
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Drilled to 36.0' and collected split spoon sample from 36.0-38.0'

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name LR105

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145109	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-105
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
90' EAST OF WEST FENICE LINE AND 320' NORTH OF SOUTHWEST FENICE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 424.2
SMALLEST ¼ ____ ¼ ____ ¼ LARGEST ¼ ____
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38 ° 45 ' 57 " LONG. 90 ° 26 ' 57 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001358 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001358 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8×8 IN. | WEIGHT OR SDR # 8.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 38 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS: LENGTH 28.9 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE ☐ CEMENT/BENTONITE SLURRY TYPE: BAGS OF CEMENT USED % BENTONITE USED WATER USED/BAG GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 18.8 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	15.2 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.0 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-2 Clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80 MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	21.8	2-36 Trash
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER		Depth to Base of Bentonite Seal:	21.8	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	22.8	
					Depth to Top of the Screen:	26.3	
					Depth to Bottom of the Screen:	36.3	36-38 Silt
					Total Depth:	38.0	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER
ELEVATION OF MEASURING POINT 426.74
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER
DATE WELL DRILLING WAS COMPLETED 10-03-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Lorman J. Mahurin Jr. DATE: 11-15-95
SIGNATURE DRILLER/PERMIT #: Lorman J. Mahurin Jr. DATE: 11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-1-SS**

TOTAL DEPTH: **150.9 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Turner Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/05/2015 to 08/06/2015**	LATITUDE/LONGITUDE:	**38 45'48.510" -90 26'26.666"**
		REL GROUND ELEV:	**484.98 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
0 to -100		sandy, clayey, silt Very fine sand with interbedded clay and silt layers Residuum- Very soft, weathered limestone gravels (St. Louis Limestone Residuum) Limestone- light gray/brown with interbedded shales. Very soft (St. Louis Limestone) Argillaceous Limestone- very soft, light gray to beige cuttings. Dry Argillaceous Limestone- very soft, nearly white/beige. Dry Argillaceous Limestone- light to medium gray. Dry Limestone- buff and light to medium gray, very fine grained- lithographic. Dry	▼	Water Encountered

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000047

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-1-SS**

TOTAL DEPTH: **150.9 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Turner Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/05/2015 to 08/06/2015**	LATITUDE/LONGITUDE:	**38 45'48.510" -90 26'26.666"**
		REL GROUND ELEV:	**484.98 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
-100 -105 -110 -115 -120 -125 -130 -135 -140 -145 -150		Limestone- medium to dark gray, medium to dark gray shale. Dry Limestone- medium to dark gray. Wet Limestone gravels- light gray clayey gravel. Wet Limestone gravels- light to dark gray with no clay and less fines. Wet Argillaceous Limestone- light to dark gray, litohgraphic, few fines. Wet		Water Encountered

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000048

Missouri Department of Natural Resources
Missouri Geological Survey

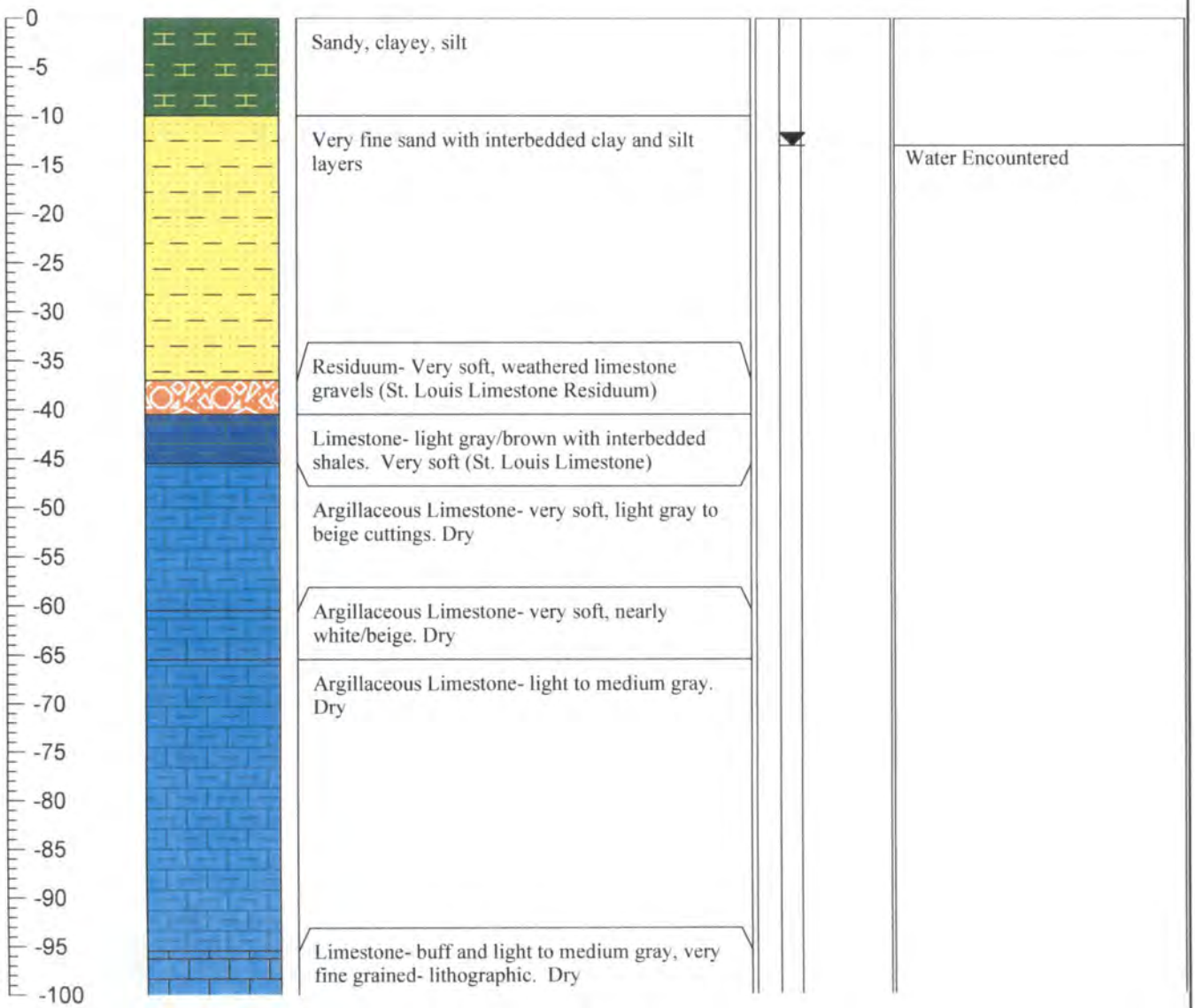
Boring Log

WELL NO.: **MO-1-SDR**

TOTAL DEPTH: **252.3 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Turner Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/03/2015 to 08/04/2015**	LATITUDE/LONGITUDE:	**38 45'48.574" -90 26'26.584"**
		REL GROUND ELEV:	**485.07 feet**

▼ Water level at time of drilling



NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000049

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-1-SDR**

TOTAL DEPTH: **252.3 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Turner Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/03/2015 to 08/04/2015**	LATITUDE/LONGITUDE:	**38 45'48.574" -90 26'26.584"**
		REL GROUND ELEV:	**485.07 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
-100 to -200		Limestone- medium to dark gray, medium to dark gray shale. Dry Limestone- medium to dark gray. Wet Limestone gravels- light gray clayey gravel. Wet Limestone gravels- light to dark gray with no clay and less fines. Wet Argillaceous Limestone- light to dark gray, litohgraphic, few fines. Wet Argillaceous Limestone- light to dark gray, lithographic, few fines. Wet. MnO staining (Salem Formation) Limestone with shale interbedded- light to dark gray, fine grained limestone with black shale. Wet.	▼	Water Encountered

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000050

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-1-SDR**

TOTAL DEPTH: **252.3 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Turner Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/03/2015 to 08/04/2015**	LATITUDE/LONGITUDE:	**38 45'48.574" -90 26'26.584"**
		REL GROUND ELEV:	**485.07 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
-200 -205 -210 -215 -220 -225 -230 -235 -240 -245 -250		Argillaceous Limestone- medium gray with dark gray/black mottling, weathered to highly weathered, MnO staining. Wet		Lost water around outside of augers at surface

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000051

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-2-SD**

TOTAL DEPTH: **250.4 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Turner Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Brenna McDonald**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/07/2015 to 08/08/2015**	LATITUDE/LONGITUDE:	**38 45'43.584" -90 26'32.225"**
		REL GROUND ELEV:	**490.69 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
0 to -40		sandy, clayey, silt		
-40 to -45		Very fine sand with interbedded clay and silt layers	▼	Water Encountered
-45 to -55		Residuum- Very soft, weathered limestone gravels, cherty (St. Louis Limestone Residuum)		
-55 to -60		Limestone- gray with some chert and clay (St. Louis Limestone)		
-60 to -85		Limestone- gray		
-85 to -90		Limestone- gray and red		
-90 to -110		Limestone- gray to dark gray		

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000052

Missouri Department of Natural Resources
Missouri Geological Survey

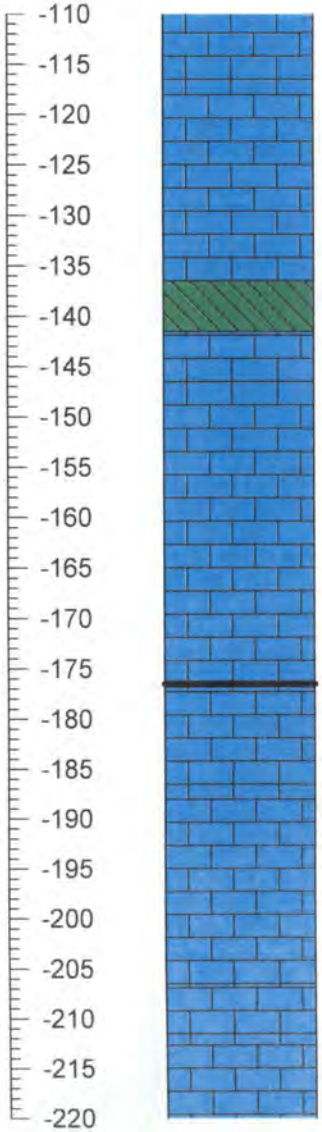
Boring Log

WELL NO.: **MO-2-SD**

TOTAL DEPTH: **250.4 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Turner Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Brenna McDonald**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/07/2015 to 08/08/2015**	LATITUDE/LONGITUDE:	**38 45'43.584" -90 26'32.225"**
		REL GROUND ELEV:	**490.69 feet**

▼ Water level at time of drilling



DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
-110 to -120		Limestone- weathered, clay infill, red-orange		Oily Sheen on discharged drilling water. Petroliferous odor present
-135 to -140		Clay- very little limestone		
-140 to -145		Limestone- mostly gray, little clay		
-145 to -175		Limestone- gray		
-175 to -180		Limestone- gray (most likely within the Salem Formation)		Oily Sheen on discharged drilling water
-180 to -205		Limestone- brown to buff to dark gray		
-205 to -210		Limestone- gray to dark gray to brown		Petroliferous odor present
-210 to -220		Limestone- gray to dark gray to brown		

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000053

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-2-SD**

TOTAL DEPTH: **250.4 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Turner Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Brenna McDonald**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/07/2015 to 08/08/2015**	LATITUDE/LONGITUDE:	**38 45'43.584" -90 26'32.225"**
		REL GROUND ELEV:	**490.69 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
-220 -225 -230 -235 -240 -245 -250		Limestone- dark gray Limestone- dark gray Limestone- medium to dark gray limestone, some red-orange limestone Limestone- medium to dark gray limestone, some red-orange limestone.		Orange foam emitting from top of drill stem after it is disconnected from the swivel Return water is foamy out of drilling discharge pipe

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000054

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-3-SS**

TOTAL DEPTH: **170.4 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Materialogic Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/11/2015 to 08/12/2015**	LATITUDE/LONGITUDE:	**38 45'45.416 -90 26'45.156"**
		REL GROUND ELEV:	**461.89 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
0 to -110		Sand and silt No sample Limestone- light gray to light brown, finely crystaline. Dry (St. Louis Limestone) Limestone- light gray to light tan, finely crystalline, weathered. Dry Limestone- light gray, weathered. Dry Limestone- light gray, weathered with some sandstone. Dry Limestone- light brown, weathered. Dry Limestone- light gray, soft, weathered with some sandstone. Dry Limestone- light to medium gray and brown. Dry Limestone- light gray with black weathered limestone. Moist Limestone- medium gray with black weathered limestone- speckled. Wet Limestone- varying amounts of light to medium brown, gray and white. Some black weathering. lithographic. Wet Limestone- light to medium gray with dark gray shale, lithographic. Wet	▼	Water Encountered

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000055

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-3-SS**

TOTAL DEPTH: **170.4 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Materialogic Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/11/2015 to 08/12/2015**	LATITUDE/LONGITUDE:	**38 45'45.416 -90 26'45.156"**
		REL GROUND ELEV:	**461.89 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
-110 -115 -120 -125 -130 -135 -140 -145 -150 -155 -160 -165 -170		Limestone- light to dark gray, lithographic. Wet No sample Limestone- light to dark gray, lithographic. Wet Limestone- light to dary gray, lithographic. Wet (most likely within the Salem Formation) Limestone- medium to dark gray, lithographic. Black weathered pieces of limestone and FeO pieces. Wet		

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000056

Missouri Department of Natural Resources
Missouri Geological Survey

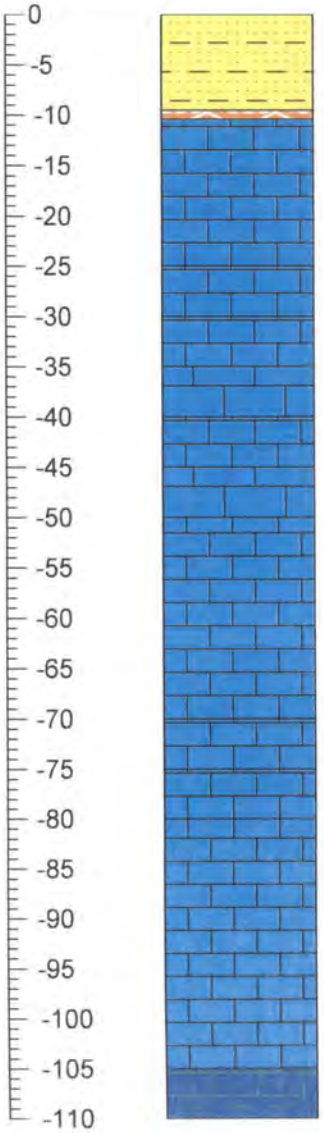
Boring Log

WELL NO.: **MO-3-SDR**

TOTAL DEPTH: **210.4 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Materialogic Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/13/2015 - 08/14/2015**	LATITUDE/LONGITUDE:	**38 45'45.517" -90 26'45.202"**
		REL GROUND ELEV:	**461.13 feet**

▼ Water level at time of drilling

DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
0 to -110		Sand and silt No sample Limestone- light gray to light brown, finely crystaline. Dry (St. Louis Limestone) Limestone- light gray to light tan, finely crystalline, weathered. Dry Limestone- light gray, weathered. Dry Limestone- light gray, weathered with some sandstone. Dry Limestone- light brown, weathered. Dry Limestone- light gray, soft, weathered with some sandstone. Dry Limestone- light to medium gray and brown. Dry Limestone- light gray with black weathered limestone. Moist Limestone- medium gray with black weathered limestone- speckled. Wet. Limestone- varying amounts of light to medium brown, gray and white. Some black weathering, lithographic. Wet Limestone- light to medium gray with dark gray shale, lithographic. Wet	▼	possible ammonia smell Water Encountered

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000057

Missouri Department of Natural Resources
Missouri Geological Survey

Boring Log

WELL NO.: **MO-3-SDR**

TOTAL DEPTH: **210.4 feet**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Bridgeton Landfill**	DRILLER:	**Steve Tapetti**
SITE LOCATION:	**Materialogic Property**		**Geotechnology Inc.**
CITY/COUNTY:	**Bridgeton/ St. Louis Co.**	RIG TYPE:	**CME ATV**
LOGGED BY:	**Fletcher Bone**	METHOD OF DRILLING:	**5 7/8in O.D. Air hammer**
DATES DRILLED:	**08/13/2015 - 08/14/2015**	LATITUDE/LONGITUDE:	**38 45'45.517" -90 26'45.202"**
		REL GROUND ELEV:	**461.13 feet**

▼ Water level at time of drilling

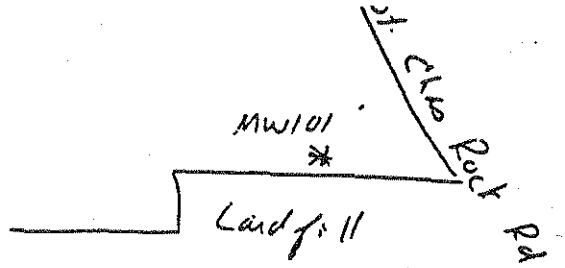
DEPTH (Feet)	LITHOLOGIC SYMBOLS	LITHOLOGIC DESC	WATER LEVEL	COMMENTS
-110 to -210		Limestone- light to dark gray, lithographic. Wet.		ammonia smell
-125		No sample		
-130 to -150		Limestone- light to dark gray, lithographic. Wet.		ammonia smell
-150 to -155		Limestone- light to dary gray, lithographic. Wet (most likely within the Salem Formation)		
-160 to -165		Limestone- medium to dark gray, lithographic. Black weathered pieces of limestone and FeO pieces. Wet		
-170 to -175		Limestone- light to dark gray, fine grained, some weathering. Wet		slight ammonia smell
-180		Limestone- light to dark gray, tan. Wet		
-185		Limestone- light to dark gray, tan, black. Wet		
-190 to -195		Limestone- light to dark gray, tan, black. Tan siltstone. Wet		black stain from FeO gravels in drilling discharge water
-200 to -210		Limestone- light to dark gray, tan, black. Abundant FeO gravels		nearly all FeO gravels with few limestone chips

NOTES:

State of MO v. Republic Services, Inc. et al
Price - 0000058

Table 1
State of Missouri Monitoring Well Information

Well Identification	Feet Below Top of Casing	Feet of Screen	Feet Above Mean Sea Level	
	Total Depth		Screen Elevation	TOC Elevation
MO-1-SS	153.37	20.00	354.08-334.08	487.45
MO-1-SDR	254.82	20.00	252.77-232.77	487.59
MO-2-SD	251.54	20.00	261.69-241.69	493.23
MO-3-SS	169.80	20.00	311.49-291.49	461.69
MO-3-SDR	209.80	20.00	271.05-251.05	460.85



(1405/100W Gamma Grid)

DATUM

ELEVATION

DRILLING METHOD:	BORING NO.
3 3/4" Hollow Stem Auger	MW101
ATV Mounted	SHEET
SAMPLING METHOD:	1 of 2
3" ID Continuous Sampler	DRILLING
5' Length	START / FINISH
WATER LEVEL: 16	TIME: 1:15
TIME	
DATE	DATE: 4-11-90
CASING DEPTH	

SURFACE CONDITIONS: Tilled. Topsoil

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
CS	60/42		1/0-5			0	
						1	
						2	
						3	
						4	
CS	60/30		2/5-10			05	
						6	
						7	
						8	
						9	
CS	60/24		3/10-15			10	
						1	
						2	
						3	
						4	
CS	60/24		4/15-20			15	
						6	
						7	
						8	
						9	
						20	

Tapsoil dark brown silt

Medium/fine lt/med brown sandy silt

Brown silt

Brown silty sand

Brown sand

Sandy silt w/ some clay

Fine silty sand - lt. brown

Fine sand

Fine/medium sand

Fine silty sand

DATE 4-11-90 CHK'D BY

100063.50

DRILLING METHOD:	BORING NO. MW101
	SHEET 2 of 2
SAMPLING METHOD:	DRILLING
	START / FINISH
WATER LEVEL	TIME / TIME
TIME	
DATE	DATE / DATE
CASING DEPTH	

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
CS	60/24		S/20-25			20		fine silt, sand
						1		
						2		
						3		
						4		
						25		
						6		COB 25'
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DATE 4-11-90 CHK'D BY

1000349

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

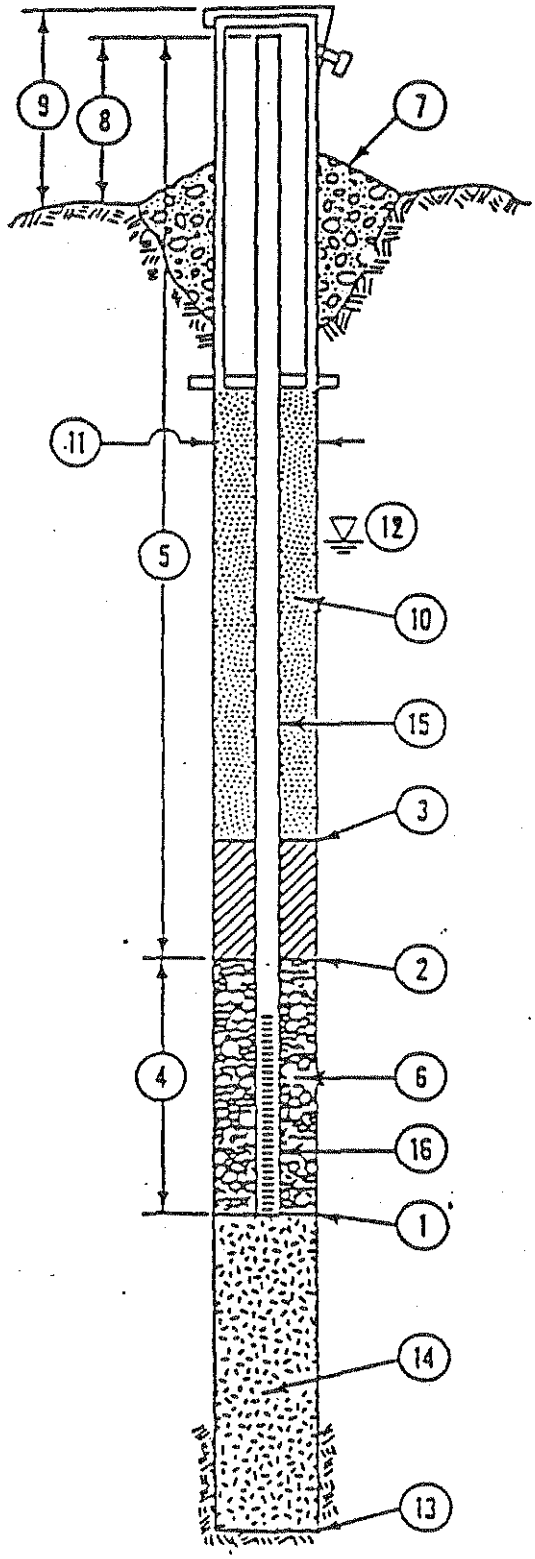
TOP OF WELL CASING ELEVATION 447.66

JOB NUMBER 19943-002

BORING NUMBER MW-101

DATE 4-11-90

LOCATION Earth City, MO



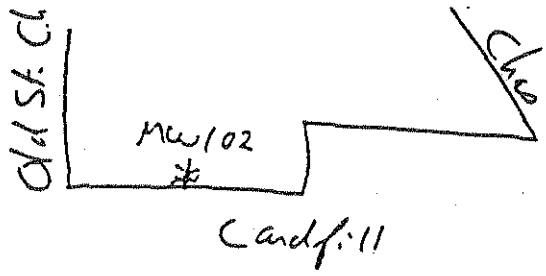
1. DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 25 FEET.*
2. DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 12.5 FEET.* Bentonite Pellets
3. DEPTH TO TOP OF SEAL (IF INSTALLED) 9.5 FEET.*
4. LENGTH OF WELL SCREEN 10 FEET. SLOT SIZE 0.010.
5. TOTAL LENGTH OF PIPE 17.3 FEET AT 2 INCH DIAMETER.
6. TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE SAND.
7. CONCRETE CAP. (YES) NO (CIRCLE ONE)
8. HEIGHT OF WELL CASING ABOVE GROUND 2.3 FEET.
9. PROTECTIVE CASING? (YES) NO (CIRCLE ONE)
   HEIGHT ABOVE GROUND _____ FEET.
   LOCKING CAP? (YES) NO (CIRCLE ONE)
10. TYPE OF UPPER BACKFILL Cement slurry
11. BOREHOLE DIAMETER 8 INCHES.
12. DEPTH TO GROUND WATER 16 FEET.*
13. TOTAL DEPTH OF BOREHOLE 25 FEET.*
14. TYPE OF LOWER BACKFILL N/A.
15. PIPE MATERIAL PVC.
16. SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006360

MONITOR WELL INSTALLATION DETAILS

Dames & Moore



DRILLING METHOD:					BORING NO.
3¼ ID Hollow Stem Auger					MW102
ATV Mounted					SHEET 1 of 2
SAMPLING METHOD:					DRILLING
3" ID Continuous Samplin					START / FINISH
5' long					
WATER LEVEL	19.5				TIME / TIME
TIME					10.00 /
DATE					DATE / DATE
CASING DEPTH					4-11-90 /

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
CS	60/36		1/0-5			00	
						1	
						2	
						3	
						4	
CS	60/30		2/5-10			05	
						6	
						7	
						8	
						9	
CS	60/24		3/10-15			10	
						1	
						2	
						3	
						4	
CS	60/18		4/15-20			15	
						6	
						7	
						8	
						9	
						20	

SURFACE CONDITIONS:

Filled Topsoil

dark brown silt

lt brown fine sandy silt

lt brown medium sand

Bottom 3" wet

MW0632

DATE CHK'D BY

DRILLING METHOD:	BORING NO. MCU102
	SHEET 2 of 2
SAMPLING METHOD:	DRILLING START TIME / FINISH TIME
WATER LEVEL	DRILLING START DATE / FINISH DATE
TIME	
DATE	
CASING DEPTH	

DATUM ELEVATION

SURFACE CONDITIONS:

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
CS	60 / 0					20	
						1	
						2	
						3	
						4	
						25	EOB
						6	25'
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

No retrieval

10066351

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

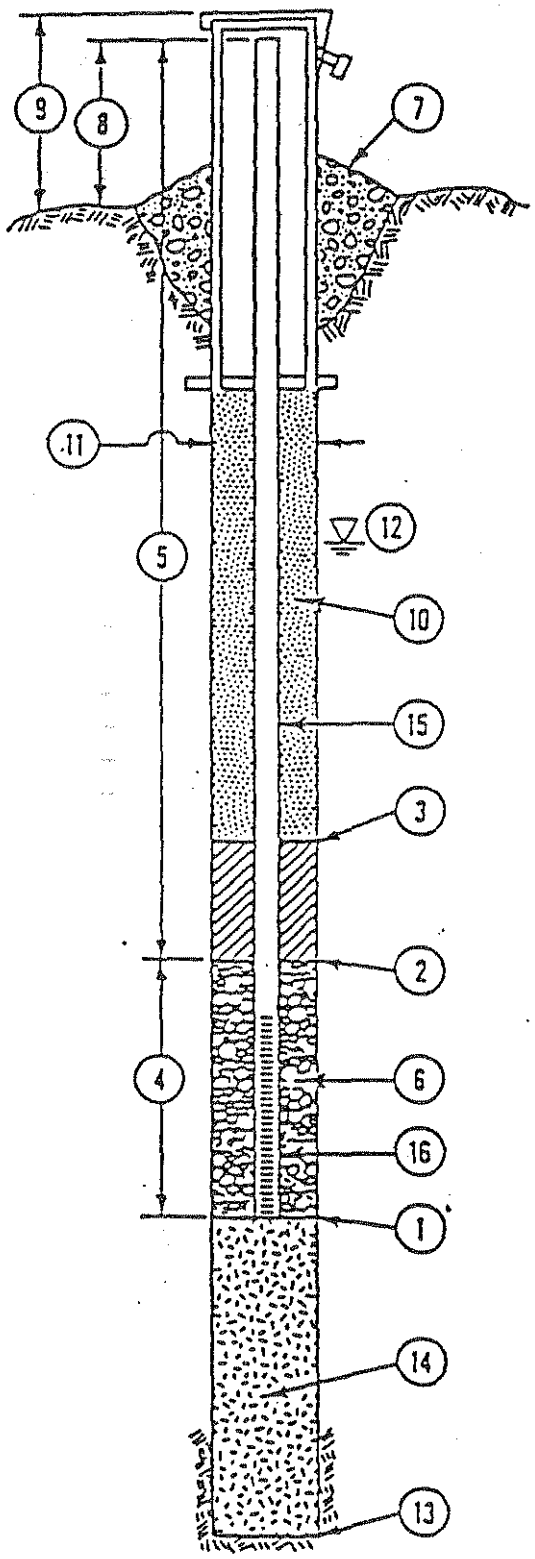
TOP OF WELL CASING ELEVATION 448.98

JOB NUMBER 19943-002

BORING NUMBER MW-102

DATE 4-11-90

LOCATION Earth City, MO



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 24.5 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 13 FEET.* Bentonite Pellets

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 9.5 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE 16.8 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE SAND.

(7) CONCRETE CAP. (YES) NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 2.3 FEET.

(9) PROTECTIVE CASING? (YES) NO (CIRCLE ONE)
HEIGHT ABOVE GROUND _____ FEET.
LOCKING CAP? (YES) NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL Cement slurry

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 20 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 25 FEET.*

(14) TYPE OF LOWER BACKFILL natural sand & silt

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006359

MONITOR WELL INSTALLATION DETAILS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL PLUGGING REGISTRATION RECORD

OFFICE USE ONLY	DATE RECEIVED	
REF NO. 514515		
C.R. NO.	CHECK NO.	TRANSMITTAL NO.
STATE WELL NUMBER	APPROVED BY	DATE APPROVED
ENTERED Ph1 Ph2 Ph3	ROUTE	

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME	TELEPHONE NUMBER			VARIANCE NUMBER (IF APPLICABLE)
ENGINEERING MGMT.SUPPORT INC. EMSI. PAUL ROSASCO				6023
OWNER ADDRESS	**CITY**	**STATE**	**ZIP CODE**	
7220 W. JEFFERSON AVE. SUITE 406	LAKEWOOD	CO	80235	
ADDRESS OF WELL SITE	**CITY**	**STATE**	**ZIP CODE**	**REFERENCE NUMBER OF ORIGINAL WELL (IF KNOWN)**
13570 ST. CHARLES ROCK ROAD	BRIDGETON	MO	63044	N/A
SITE NAME	**WELL NUMBER**		**DATE**	
WEST LAKE LANDFILL	MW - 102			

LOCATION OF WELL
LAT. 38 ° 46 ' 21.6 "
LONG. 90 ° 26 ' 57.8 "

DRILL AREA
AREA 1

COUNTY
ST. LOUIS

SMALLEST ____ ¼ ____ ¼ ____ ¼ LARGEST
Sec. ____ Township ____ North ____ Range ☐ East ☐ West

PLUGGING INFORMATION

ORIGINAL DRILLER (IF KNOWN)	DATE ORIGINALLY DRILLED	STATIC WATER LEVEL	DRILLER NOTES
N/A	N/A		

☑ **MONITORING WELL**

DEPTH OF WELL	LENGTH OF RISER
30 FT.	N/A FT. BGS

SCREEN/RISER DIAMETER	WELL SCREEN AND RISER REMOVED?
2 IN.	☑ Yes ☐ No

PUMP AND SAMPLING EQUIPMENT REMOVED?	CASING REMOVED?
☐ Yes ☑ N/A ☐ No	☑ Yes ☐ N/A ☐ No

☐ **SOIL BORING(S)** Boring Diameter: _____ IN.

QUANTITY	DEPTH
TOTAL ____ BORING(S)	TOTAL ____ FT.

TYPE OF FILL MATERIAL
☐ Gravel ☐ Sand ☐ Other

AMOUNT OF FILL USED
____ ☐ TONS ☐ CUBIC YARDS

DEPTH TO TOP OF FILL
____ FT.

GROUT INSTALLATION METHOD	GROUT MATERIAL USED	HOW MANY GALLONS OF WATER MIXED PER BAG OF CEMENT OR BENTONITE?	TOTAL NUMBER OF BAGS OF GROUT USED
☐ Gravity ☑ Tremie ☐ Excavation	Neat Cement Bentonite ☐ Hi-Early ☑ Slurry ☐ Granular ☐ Pellets ☐ Type 1 ☐ Chips ☐ Other _____	5 ☐ Hydrated to Saturation	2
			POUNDS OF GROUT PER BAG: 50

DATE 1ST WELL PLUGGED	DATE LAST WELL PLUGGED	FINISHED SURFACE MATERIAL	SURFACE MATERIAL LENGTH
04/13/2016	04/15/2016	☑ Soil ☐ Concrete ☐ Asphalt ☐ Other	____ FT. ____ IN.

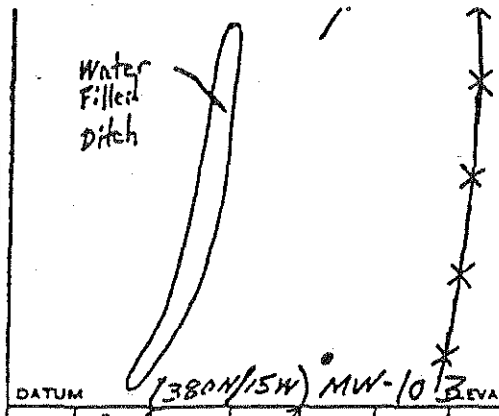
REMARKS	REASON FOR ABANDONMENT
(REDI JOB# 162075-AB)	

I hereby certify that the monitoring well herein described was plugged in accordance with the Department of Natural Resources requirements for the plugging of wells.

SIGNATURE (PRIMARY CONTRACTOR)		SIGNATURE (CONTRACTOR)	PERMIT NUMBER	DATE
PERMIT NUMBER 3368 - M	DATE 5/17/2016	SIGNATURE (APPRENTICE)	PERMIT NUMBER	DATE

MO-780-2161 (1-12)

REMIT TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY
WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165
ENCLOSE $50 FEE WITH REGISTRATION RECORD WITHIN 60 DAYS AFTER WELL PLUGGING OR WITHIN 180 DAYS AFTER THE PLUGGING OF TEMPORARY WELLS



DATUM

ELEVATION

DRILLING METHOD: 3¾" Hollow Stem Augers

SAMPLING METHOD: 3" I.D. Continuous Sampler

BORING NO. MW-103

SHEET 1 OF 2

					DRILLING START	DRILLING FINISH
WATER LEVEL	7'				TIME 11:30	TIME
TIME						
DATE					DATE 04/09	DATE 04/09
CASING DEPTH						

SURFACE CONDITIONS: Grassy Topsoil

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	HNU READINGS OF RINGS	DEPTH IN FEET	SOIL GRAPH	
CS	60" / 48"		1 / 0'		0	0	ML	Dark brown, med stiff, slightly moist clay silt, high organic content
						1		
						2		
						3		
						4		Gray, med stiff, fine silt with traces of clay
						5		
CS	60" / 20"		2 / 5'			6		
					0	7		Moist gray, med stiff to stiff, fine silt w/ traces of sand
						8		
						9		
						10		
CS	60" / 42"		3 / 10'			1	SM	Very moist, gray, fine sand with silt, very soft and runny
					0	2		
						3		
						4		
						5		
CS	36" / 36"		4 / 15'			6		
					0	7		
						8		
						9		
						20		

Steel Prot. Casing 0 to 2.7'

2" Dia. Pvc. 2.7' to 4.5'

Sand: WB-35

Well: 2" Dia PVC

Screen: #10 slot Size PVC

Bentonite Pellets

Grout

EOB-18'

10006354

(Ft. in Top of Cover) 1.8'

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

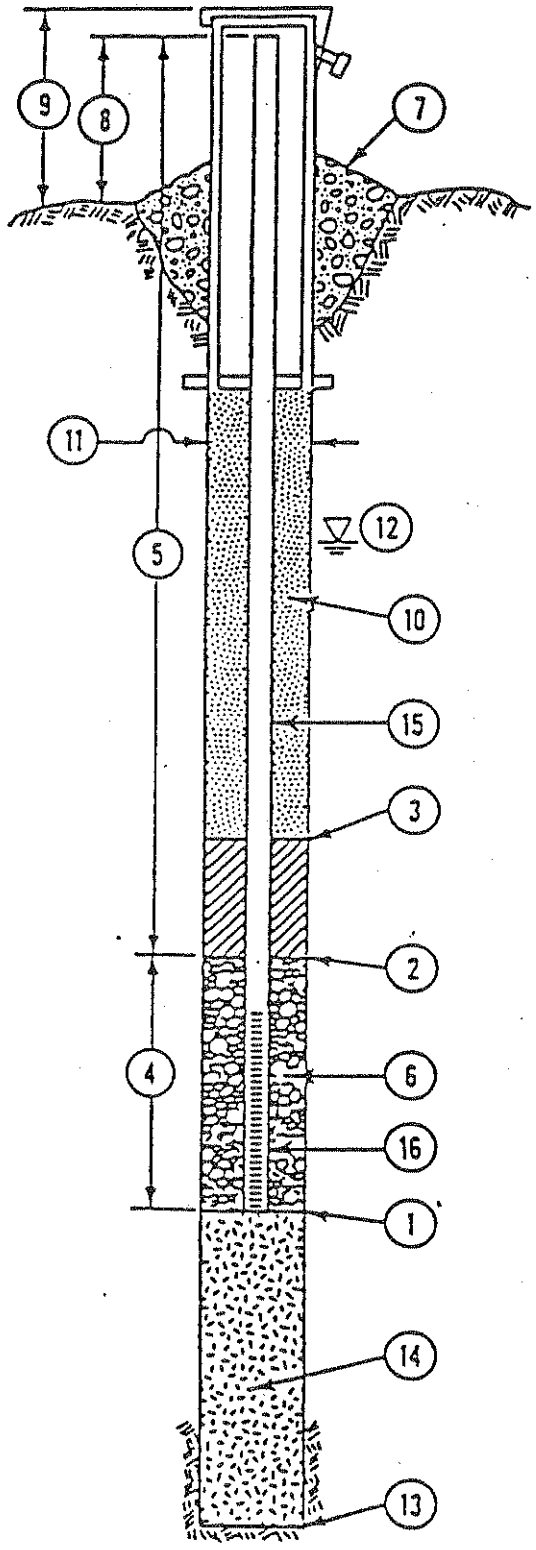
TOP OF WELL CASING ELEVATION 441.16

JOB NUMBER 19943-002

BORING NUMBER MW-103

DATE 04/09/90

LOCATION Earth City, MO



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15.7 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 4.5 FEET.* Bentonite Pellets

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 2.5 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE 8.4 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE sand.

(7) CONCRETE CAP. (YES) NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 2.7 FEET.

(9) PROTECTIVE CASING? (YES) NO (CIRCLE ONE)
HEIGHT ABOVE GROUND 2.8 FEET.
LOCKING CAP? (YES) NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL cement slurry

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 7 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 18 FEET.*

(14) TYPE OF LOWER BACKFILL Natural sand + silt

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006362

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

Landfill

Old St. Charles Rock Rd

culvert

MW104

ditch

(40N/15E)

DRILLING METHOD:	BORING NO.
3 3/4" ID Hollow Stem Auger	MW-104
	SHEET
SAMPLING METHOD:	1 of 1
3" ID Continuous Sampler	DRILLING
5' Length	START / FINISH
WATER LEVEL: 7'	TIME: 8:20 / 9:00
TIME	
DATE	DATE: 4-11-90
CASING DEPTH	

DATUM

ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
CS	60/48		1/0-5			0	
						1	
						2	
						3	
						4	
CS	60/48		2/5-10			5	
						6	
						7	
						8	
						9	
CS	60/12		3/10-15			10	
						1	
						2	
						3	
						4	
CS	24/30		4/15-17			15	
						6	
						17	EOB 17'
						8	
						9	
						0	

SURFACE CONDITIONS:

Grassy Topsoil

moist dark brown topsoil silt

sandy silt

Medium to light brown stiff fine silt

Medium brown to grey silt w/ black and rust particles

Medium brown stiff silty clay

Medium brown fine silt w/ rust stains

stiff Medium brown stiff silt

dark grey fine sand

1CC06353

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

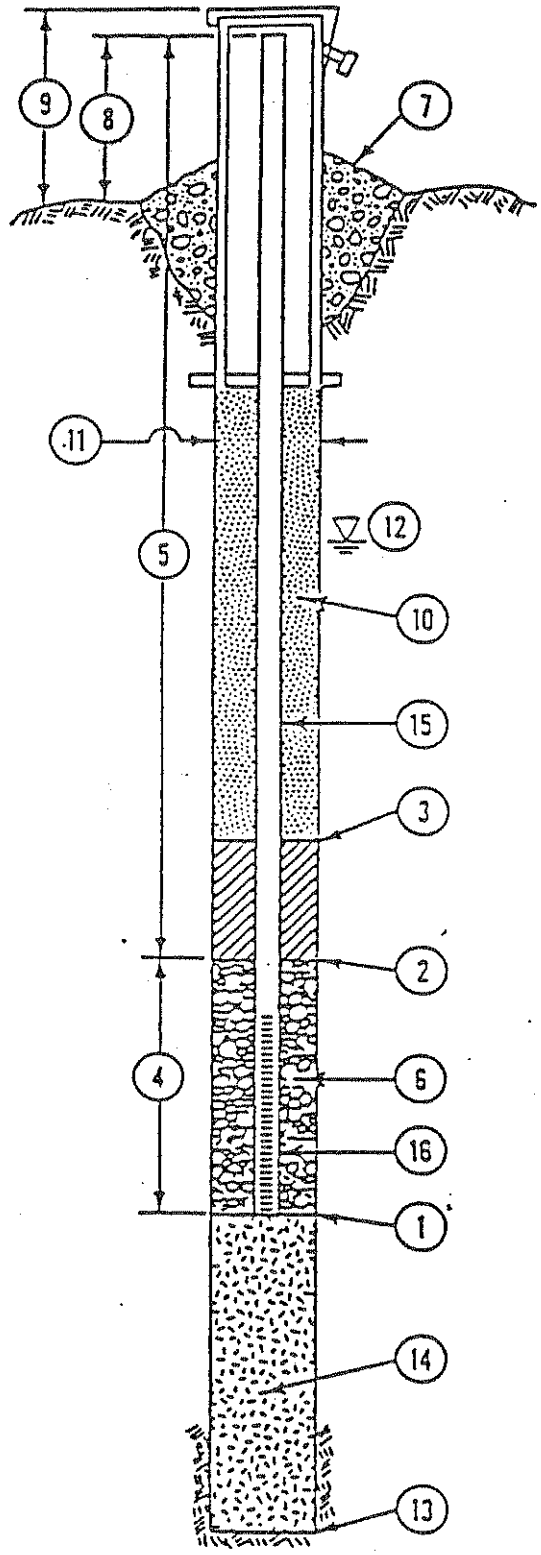
TOP OF WELL CASING ELEVATION 441.88

JOB NUMBER 19943-002

BORING NUMBER MW-104

DATE 4-11-90

LOCATION Earth City MO



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 17 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 5 FEET.* Bentanite Pellets

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 2.3 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE 9.9 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE SAND.

(7) CONCRETE CAP. (YES) NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 2.9 FEET.

(9) PROTECTIVE CASING? (YES) NO (CIRCLE ONE)
HEIGHT ABOVE GROUND _____ FEET.
LOCKING CAP? (YES) NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL Cement.

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 7 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 17 FEET.*

(14) TYPE OF LOWER BACKFILL N/A.

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006361

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

EXPEDITE

MW105 * TRop Line

DRILLING METHOD:	BORING NO.
3¼" ID Hollow Stem Auger - ATV Mounted	MW-105
SAMPLING METHOD:	SHEET
3" ID Continuous Sampler 5' Length	1 OF 1
WATER LEVEL 3 1/2	DRILLING START / FINISH
TIME	TIME 8:50 / 9:15
DATE	DATE 4-12-90
CASING DEPTH	

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								wooded, light brush cover, leaves & decaying matter
CS	60/48		1/0-5			00		stiff dark brown silt/clay organic
						1		mixed dark and light brown silt
						2		↓
						3		fine silty clay
						4		↓ wet sandy silt medium brown w/ dk brown material
CS	60/42		2/5-10			05		fine sandy silt
						6		brown/grey fine sandy silt w/ rust
						7		↓ grey silty clay, grey fine sand
						8		↓
						9		fine brown sand
CS	60/15		3/10-15			10		↓ medium to light brown
						1		
						2		
						3		
						4		
						15		GW @ 15'
						6		
						7		
						8		
						9		
						0		

DATE 4-12-90 CHK'D BY

10006256

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

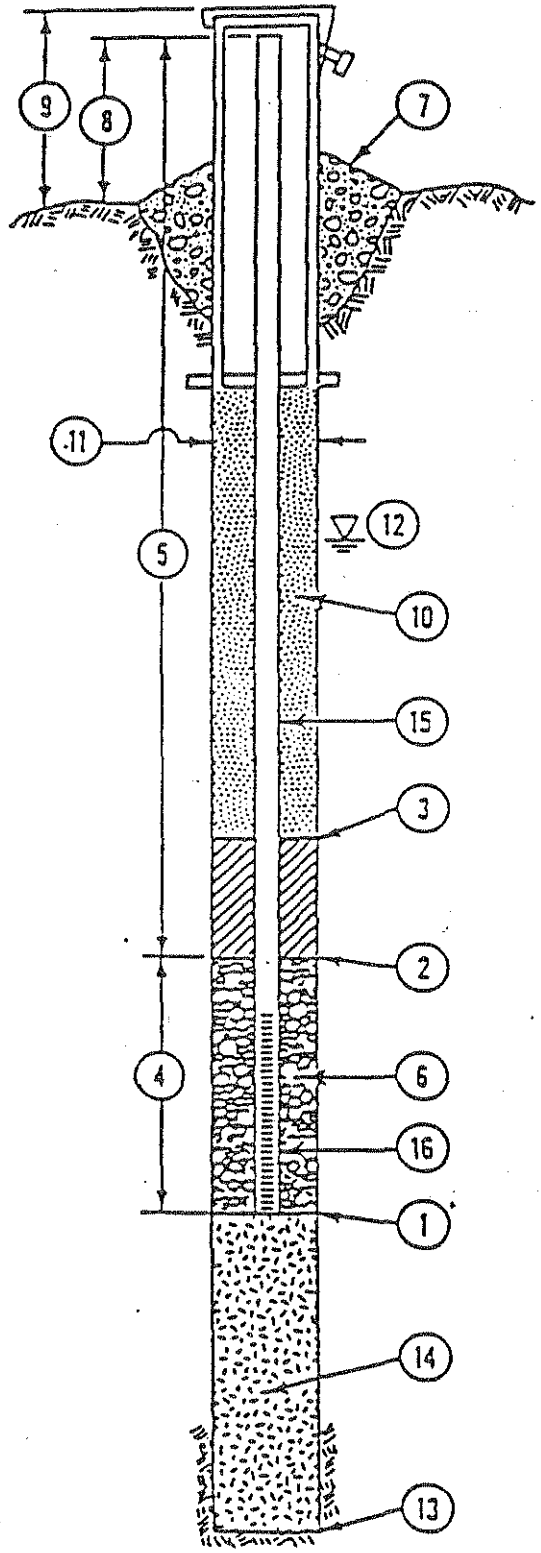
TOP OF WELL CASING ELEVATION 440.17

JOB NUMBER 19943-002

BORING NUMBER MW-105

DATE 4-12-90

LOCATION Earth City MO



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 3.5 FEET.* Bentonite Pellets

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 2 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE 23 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE SAND.

(7) CONCRETE CAP. (YES) NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 2.3 FEET.

(9) PROTECTIVE CASING? (YES) NO (CIRCLE ONE)
HEIGHT ABOVE GROUND _____ FEET.
LOCKING CAP? (YES) NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL Cement.

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 3 1/2 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 15 FEET.*

(14) TYPE OF LOWER BACKFILL N/A.

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006364

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

MW-106

shallow drainage channel

150'

1 450'

Prop Corner

DATUM

ELEVATION

DRILLING METHOD:	3¾" I.D Hollow Stem Auger ATV mounted
SAMPLING METHOD:	3" ID Continuous Sampler 5' Long Tb
WATER LEVEL	9'
TIME	
DATE	
CASING DEPTH	

BORING NO. MW-106

SHEET 1 OF 1

DRILLING

START	FINISH
TIME 10:15	TIME
DATE 4-12-90	DATE

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								wooded lt brush cover, leaves & decaying matter
CS	60/37		1/0-5			00		dark brown clay/silt w/ organic matter
						1		medium brown fine silt w/ rust spots
						2		↓ medium/dark brown fine silt
						3		↓ stiff dark brown silty/clay w/ rust
						4		↓ Medium brown silty sand
CS	60/45		2/5-10			05		↓ dk brown silty clay w/ rust
						6		
						7		
						8		
						9	?	↓ fine silty sand, tight and moist
CS	60/48		3/10-15			10		↓ very tight grey silty clay
						1		
						2		↓ brown/grey sandy silt w/ rust
						3		fine sand
						4		dk grey fine clay
						15		↓
						6		EOB 15'
						7		
						8		
						9		
						0		

10006355

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

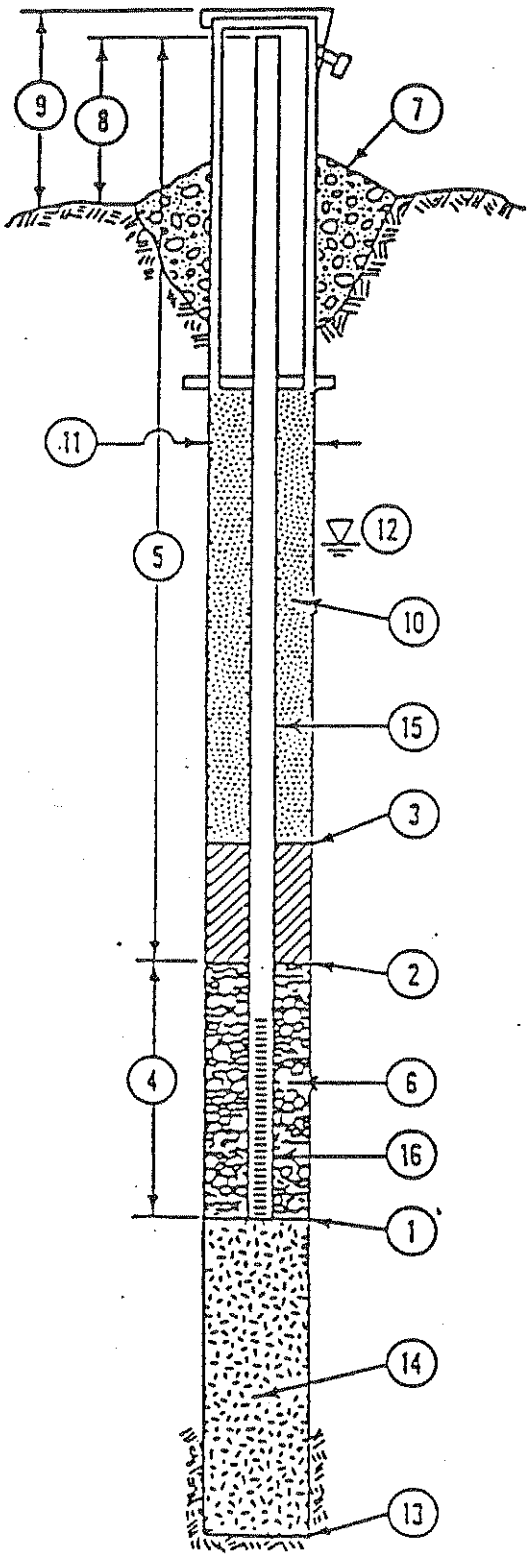
TOP OF WELL CASING ELEVATION 444.70

JOB NUMBER 19943-002

BORING NUMBER MW-106

DATE 4-12-90

LOCATION . Earth City, MO



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 3.5 FEET.* Bentonite Pellets

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 2 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE _____ FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE SAND.

(7) CONCRETE CAP. (YES) NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND _____ FEET.

(9) PROTECTIVE CASING? (YES) NO (CIRCLE ONE)
HEIGHT ABOVE GROUND _____ FEET.
LOCKING CAP? (YES) NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL cement.

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 9 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 15 FEET.*

(14) TYPE OF LOWER BACKFILL N/A.

(15) PIPE MATERIAL PVC.

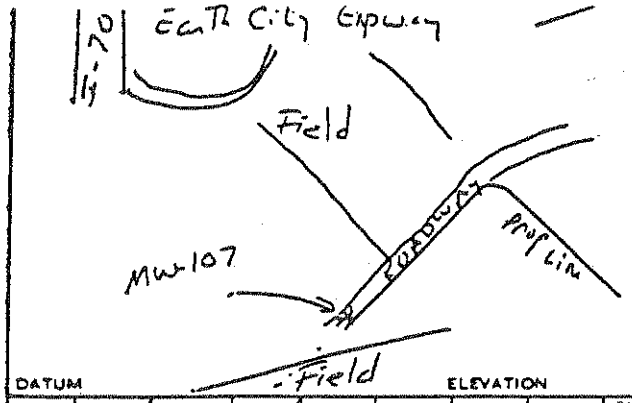
(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006363

MONITOR WELL INSTALLATION DETAILS

Dames & Moore



DRILLING METHOD: 3 3/4" I.D Hollow Stem Auger ATV mounted	BORING NO. MW-107
SAMPLING METHOD: 3" ID Continuous Sampler 5' Length	SHEET 1 OF 1
WATER LEVEL 5'	DRILLING START TIME 11:25
TIME	FINISH TIME 12:45
DATE	DATE 4-12-90
CASING DEPTH	

DATUM Field ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								Wooded lt brush cover, leaves & decaying matter
CS	60/30		1/0-5			0 0		organic matter
						1		medium brown fine silt
						2		med/lt brown fine silt
						3		
						4		
CS	60/60		2/5-10			0 5	7	dark grey silty clay, stiff
						6		
						7		
						8		
						9		
CS	60/60		3/10-15			1 0		
						1		
						2		
						3		
						4		
						1 5		dark grey fine sand w/ silt+clay
								EOB 15'
						6		
						7		Note: 2" diam. PVC well installed to 15'
						8		10' of #10 slot screen
								11-1/2' Sand pack
						9		1-1/2' of bentonite pellets
						0		locking protective steel casing

1000358

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION _____

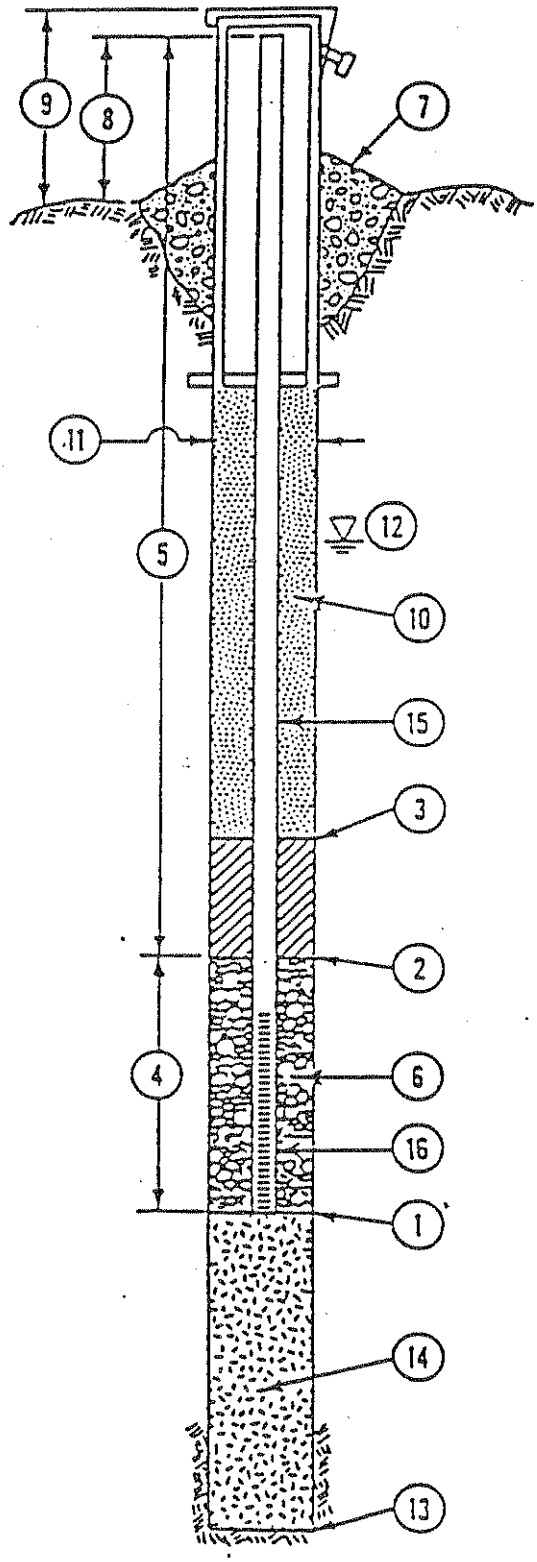
TOP OF WELL CASING ELEVATION 449.25

JOB NUMBER 19943-002

BORING NUMBER MW-107

DATE 4-12-90

LOCATION Earth City MO



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 3.5 FEET.*

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 2 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE _____ FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE SAND.

(7) CONCRETE CAP. (YES) NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND _____ FEET.

(9) PROTECTIVE CASING? (YES) NO (CIRCLE ONE)
HEIGHT ABOVE GROUND _____ FEET.
LOCKING CAP? (YES) NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL Cement.

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 5 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 15 FEET.*

(14) TYPE OF LOWER BACKFILL N/A.

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

10006366

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

(MODIFICATION TO EXISTING)

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122517	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

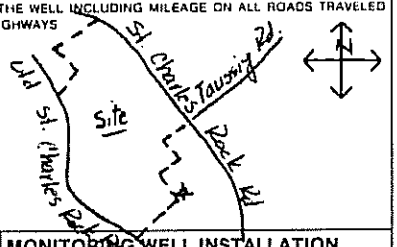
INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: MW-1301
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
ADDRESS: 1833 N. BROADWAY
CITY: ST. LOUIS
STATE: MO.
ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
ELEVATION: 432.41
AREA NO:
SMALLEST ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG 5 (E) OR W
LAT. 38 ° 45 ' 53 " LONG. 90 ° 26 ' 26 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
OPEN HOLE, ORIGINALLY DRILLED IN 1995 BY DRILLING SERVICE WAS GROUTED TO 149.5' AND MONITORING WELL MATERIALS WERE INSTALLED BY LAYNE WESTERN 7/95.

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
DRILLING SERVICE CO.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
432.42

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☐ AUGER TYPE
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
7-07-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE
001256 WM	7-07-95

SIGNATURE (DRILLING CONTRACTOR)

PERMIT NUMBER	DATE

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 432.42

LOCKING CAP - (Y) N (Circle one)
CAP VENT - Y (N) (Circle one)
PROTECTIVE CASING Type: STEEL Size: 8"x8"x 5'
Bore Hole Diameter:
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 430.44

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	130.0	
Depth to Base of Bentonite Seal:	133.5	
Depth to Base of Secondary Filter Pack:	135.5	
Depth to Top of the Screen:	137.7	
Depth to Bottom of the Screen:	147.7	
Plug Back Total Depth	148.5	
Original Total Depth	150.0	

PROTECTIVE CASING SEAL Type: ☒ Concrete ☐ Cement Slurry
RISER PIPE Length: 139.7' Diameter: 2" Type of Material: SCH 80 PVC
BOREHOLE DIAMETER: ____ In.
ANNULAR SEAL Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite
BENTONITE SEAL Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite Length of Seal: 13.5 Ft.
SECONDARY FILTER PACK (Optional) Type: ☒ Sand ☐ Manufactured Grain Size: <50 Length: 2.0'
PRIMARY FILTER PACK Type: ☒ Sand ☐ Manufactured Grain Size: 16-35 Length: 13'
WELL SCREEN Length: 10' Slot Size: 0.010 Type: SCH 80 PVC
SUMP DETAILS Length: 0.3Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: GROUT

DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK/OWNER

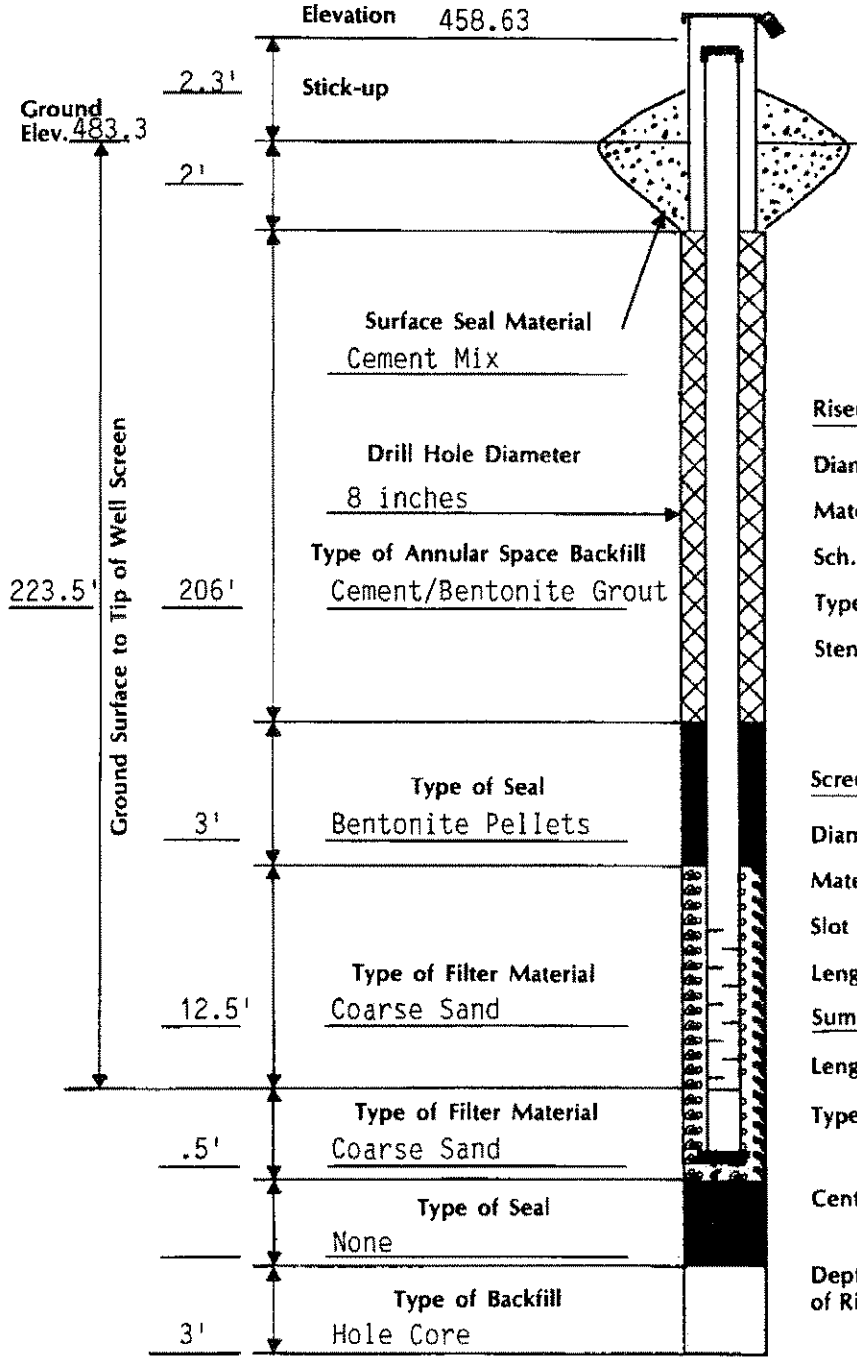
Foth & Van Dyke

Client: LAIDLAW WASTE SYSTEMS Scope I.D.: 89L46
Project: Bridgeton Monitor Wells Page: 1
Prepared by: RTB Date: 4/15/91
Checked by: RTB Date: 4/24/91

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: John Mathes and Associates, Inc. Well No.: 1204
Drilling Method: Air Rotary Date Installed: 4/5/91

Coordinates: 1,066,420.96N, 515,823.27E



Protector Pipe:
Size: 4 inch
Material: Steel
Lock No.: Master

Riser:
Diameter: 2 inch
Material: PVC
Sch.: 80
Type of Joints: Flush Threaded
Stenciled? Yes

Screen:
Diameter: 2 inch
Material: PVC
Slot Size: 0.010 inch
Length: 10 feet

Sump:
Length: None
Type of Cap: PVC Flush Threaded

Centralizer: Used ☐
Not Used ☒

Depth to Water From Top of Riser at Completion: Dry

NOTE: Not to Scale

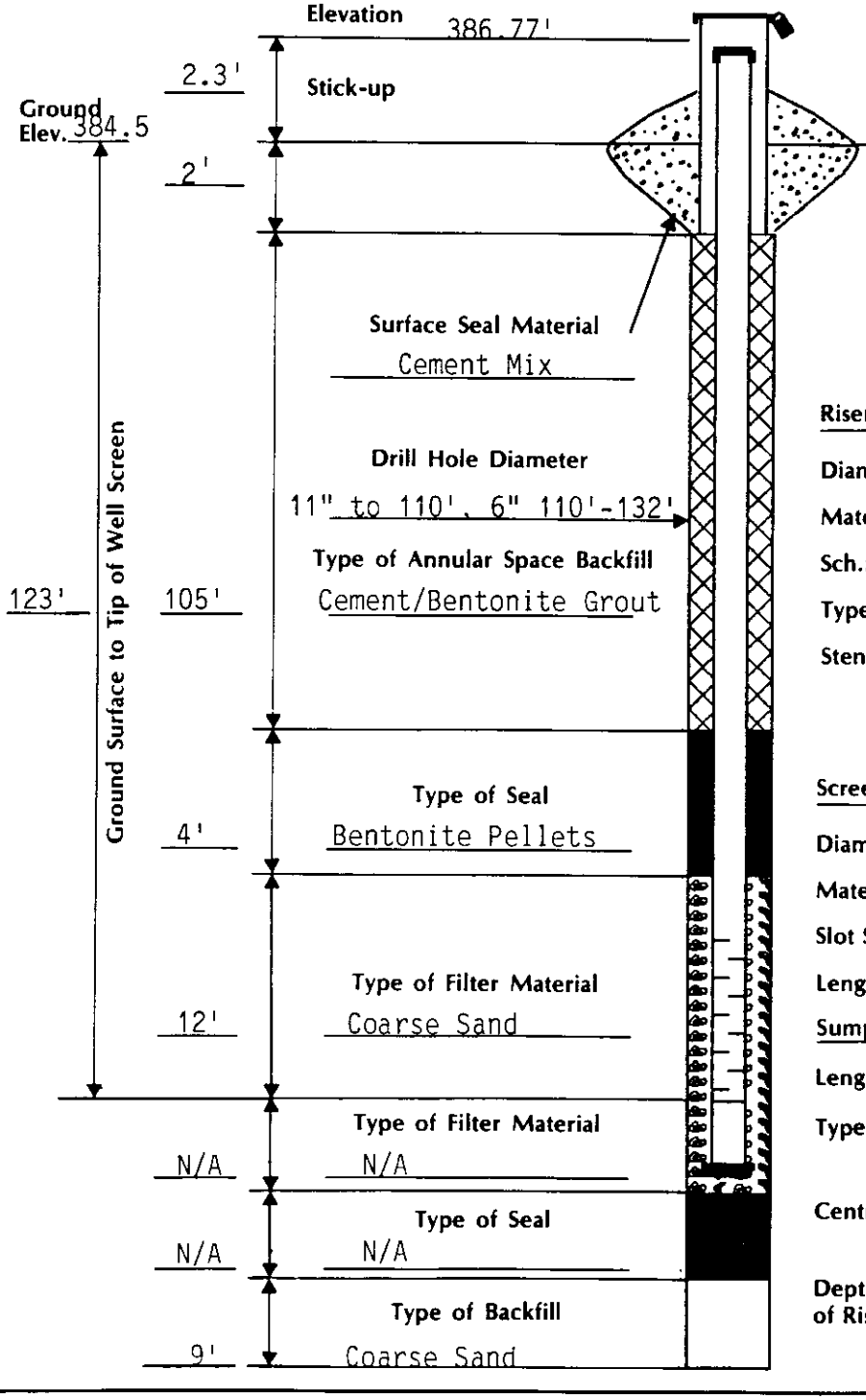
Foth & Van Dyke

Client: LAIDLAW WASTE SYSTEMS Scope I.D.: 89L46
Project: Bridgeton Monitor Wells Page: 1
Prepared by: CFN Date: 4/4/91
Checked by: RTB Date: 4/24/91

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: John Mathes and Associates, Inc. Well No.: 1205
Drilling Method: Air Rotary Date Installed: 4/2/91

Coordinates: 1,067,387.39N, 515,620.75E



Protector Pipe:
Size: 4 inch
Material: Steel
Lock No.: Master

Note: 6 5/8" OD WELDED STEEL CASING SET AND GROUTED TO 110'

Riser:
Diameter: 2 inch
Material: PVC
Sch.: 80
Type of Joints: Flush Threaded
Stenciled? Yes

Screen:
Diameter: 2 inch
Material: PVC Sch 80
Slot Size: 0.010 inch
Length: 10'

Sump:
Length: N/A
Type of Cap: PVC Flush Threaded

Centralizer: Used ☐
Not Used ☒

Depth to Water From Top of Riser at Completion: Dry

NOTE: Not to Scale

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

REGISTRATION RECORD

OFFICE USE ONLY		DATE RECEIVED	
REF NO 152609			
ROUTE		PWS NUMBER	CHECK NUMBER
STATE WELL NUMBER		TRANSMITTAL NO	
CHECKED BY		CROSS REFERENCE NO	
APPROVED BY	DATE	ENTERED Ph 1 Ph 2 Ph 3	

INFORMATION SUPPLIED BY OWNER

NAME: LAIDLAW WASTE SYSTEMS, INC. — TELEPHONE: 314-241-3710

ADDRESS: 1838 N. BROADWAY — CITY: ST. LOUIS — STATE: MO — ZIP CODE: 63102

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL 1205 — WELL NUMBER: — ADDRESS OF WELL SITE OR SITE NAME (IF DIFFERENT THAN ABOVE): ST. CHARLES ROCK RD.

OWNER STATUS: ☐ BUILDER ☐ PRIVATE HOME OWNER ☐ DEVELOPER ☒ OTHER (SPECIFY) LANDFILL — CITY: BRIDGETON — STATE: MO — ZIP CODE: 63044

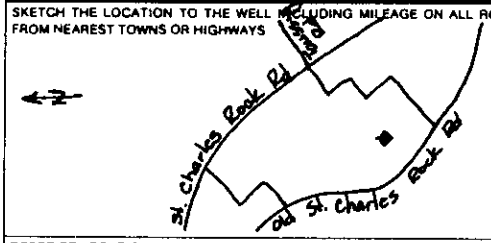
PURPOSE OF REGISTRATION FORM: ☒ ABANDONED WELL ☐ MINERAL EXPLORATORY ☐ WELL RECONSTRUCTION ☐ TEST HOLE ☐ OTHER

VARIANCE ISSUED? ☐ YES ☒ NO — VARIANCE NUMBER: — WELL CERTIFICATION NUMBER: — DATE ORIGINALLY DRILLED: 4-2-91

SIGNATURE (WELL OWNER): — DATE:

INFORMATION SUPPLIED BY CONTRACTOR

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



LOCATION OF WELL

SHOW LOCATION IN SECTION PLAT

QUAD ST. CHARLES COUNTY ST. LOUIS

ELEV 384.5 AREA NO.

SMALLEST ¼ — LARGEST ¼

¼ NW ¼ SE ¼ NW ¼

SEC. 3 TWN. 46 N.RNG. 5 (E) OR W

LAT. 38 ° 45 ' 54 " LONG. 90 ° 26 ' 43 "

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL

ON RIGHT SIDE OF GRAVEL ROAD/RAMP LEADING DOWN INTO FILL PIT, APPROX 3/3 DOWN RAMP.

CONTRACTOR'S NAME: LAYNE WESTERN CO, INC. — PERMIT NUMBER: 001255

DRILLERS NAME: TIMOTHY ELDERS — PERMIT NUMBER: 001255WPM

ABANDONMENT OF WELLS

FORMER USE OF WELL

☐ HAND DUG ☐ SOIL BORING
☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ PUBLIC WATER SUPPLY
☐ MULTI-FAMILY ☐ MINERAL EXPLORATORY TEST HOLE
☐ HEAT PUMP ☒ MONITORING
☐ IRRIGATION ☐ OTHER

ORIGINAL DRILLER (IF KNOWN): JOHN MATHES & ASSOC. — DATE ORIGINALLY DRILLED: 4-2-91

DATE PLUGGED: 5-3-96 — STATIC WATER LEVEL: 43.87 FT — PUMP REMOVED FROM WELL? ☐ YES ☐ N/A ☐ NO

DEPTH OF THE WELL: 132' — LENGTH OF CASING: 110' — CASING DIA.: 6" — HOLE DIA.: 0'-110'-11" 110'-132'-6"

GROUT INSTALLATION METHOD: ☐ GRAVITY ☒ TREMIE — CASING CUT OFF THREE FEET BELOW SURFACE? DRILLED OUT ☐ YES ☐ NO — TYPE OF CASING: ☒ STEEL ☐ PLASTIC ☐ OTHER

GROUT MATERIAL USED

NEAT CEMENT: ☐ HI-EARLY ☒ PORTLAND TYPE 1 ☐ OTHER
BENTONITE: ☐ SLURRY ☒ POWDER ☐ GRANULAR ☐ CHIPS ☐ PELLETS ☐ OTHER

NUMBER OF BAGS OF GROUT USED: 13 — POUNDS OF GROUT PER BAG: 50

HOW MANY GALLONS WATER MIXED PER BAG OF CEMENT OR BENTONITE? 4.5

TYPE OF FILL MATERIAL USED: CEMENT/BENTONITE GROUT

AMOUNT OF FILL MATERIAL USED: 1.1 — CIRCLE ONE: CU. YDS. / TONS

DEPTH TO TOP OF FILL MATERIAL FROM SURFACE: 0

WELL DISINFECTED BEFORE PLUGGING? ☐ YES ☒ NO

NUMBER USED FOR DISINFECTION: GALLONS OF CHLORINE — POUNDS OF CHLORINE — TABLETS OF CHLORINE

WAS THE WELL ABANDONED BECAUSE OF HOOKING UP TO A PUBLIC OR RURAL WATER SUPPLY DISTRICT? ☐ YES ☒ NO

IF YES, WHAT IS THE NAME OF THE WATER DISTRICT

CHECK THE BOX WHICH APPLIES

☒ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS ABANDONED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE ABANDONMENT OF WELLS.

☐ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS REPAIRED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE REPAIR OF WELLS.

CONTRACTOR'S SIGNATURE: Timothy D. Elders — DATE: 5-16-96

WELL RECONSTRUCTION

TYPE OF REPAIR

☐ RAISED CASING ☐ LINING OF WELL
☐ DEEPENING OF WELL ☐ OTHER

USE OF WELL

☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ PUBLIC WATER SUPPLY
☐ MULTI-FAMILY ☐ MONITORING
☐ HEAT PUMP ☐ OTHER
☐ IRRIGATION

DIA. OF WELL CASING IN. — WAS WELL DISINFECTED AFTER RECONSTRUCTION ☐ YES ☐ NO — DATE RECONSTRUCTION COMPLETED

RAISED CASING INFORMATION

LENGTH OF CASING ADDED FT.

MATERIAL: ☐ STEEL ☐ PLASTIC

METHOD OF ATTACHMENT: ☐ THREADED ☐ FUSED ☐ WELDED ☐ GLUED ☐ COUPLED

LINER DETAILS

PURPOSE OF LINER: ☐ USED ONLY TO HOLD BACK FORMATION ☐ USED TO SEAL OUT CONTAMINATION OR OTHER CONDITIONS

DIAMETER OF LINER IN. — WEIGHT OR SDR #

DEPTH TO THE TOP OF LINER FROM SURFACE FT. — MATERIAL: ☐ PLASTIC ☐ STEEL

AMOUNT OF LINER USED FT. — JOINTS: ☐ GLUED ☐ WELDED ☐ OTHER

LINER PACKER DETAILS

TYPE USED: ☐ NONE ☐ RUBBER BOOT — DEPTH(S) SET

LINER GROUT DETAILS

POSITION OF SEAL: ☐ FULL LENGTH ☐ BETWEEN PACKERS

MATERIAL: CEMENT ☐ PORTLAND TYPE I ☐ HI EARLY; BENTONITE ☐ CHIPS ☐ PELLETS ☐ SLURRY ☐ GRANULAR

DEPTH PUMP WAS SET FT — GPM

DEPTH FROM SURFACE TO TOP OF THE GROUT SEAL FT.

DEPTH FROM SURFACE TO BOTTOM OF THE GROUT SEAL FT.

DEEPENING OF WELL INFORMATION

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION	YIELD

MO 780-1414 (11-90)

DISTRIBUTION: WHITE/CONTRACTOR CANARY/DIVISION PINK/OWNER

MAIL CANARY COPY TO DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402 RECORD MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION DATE

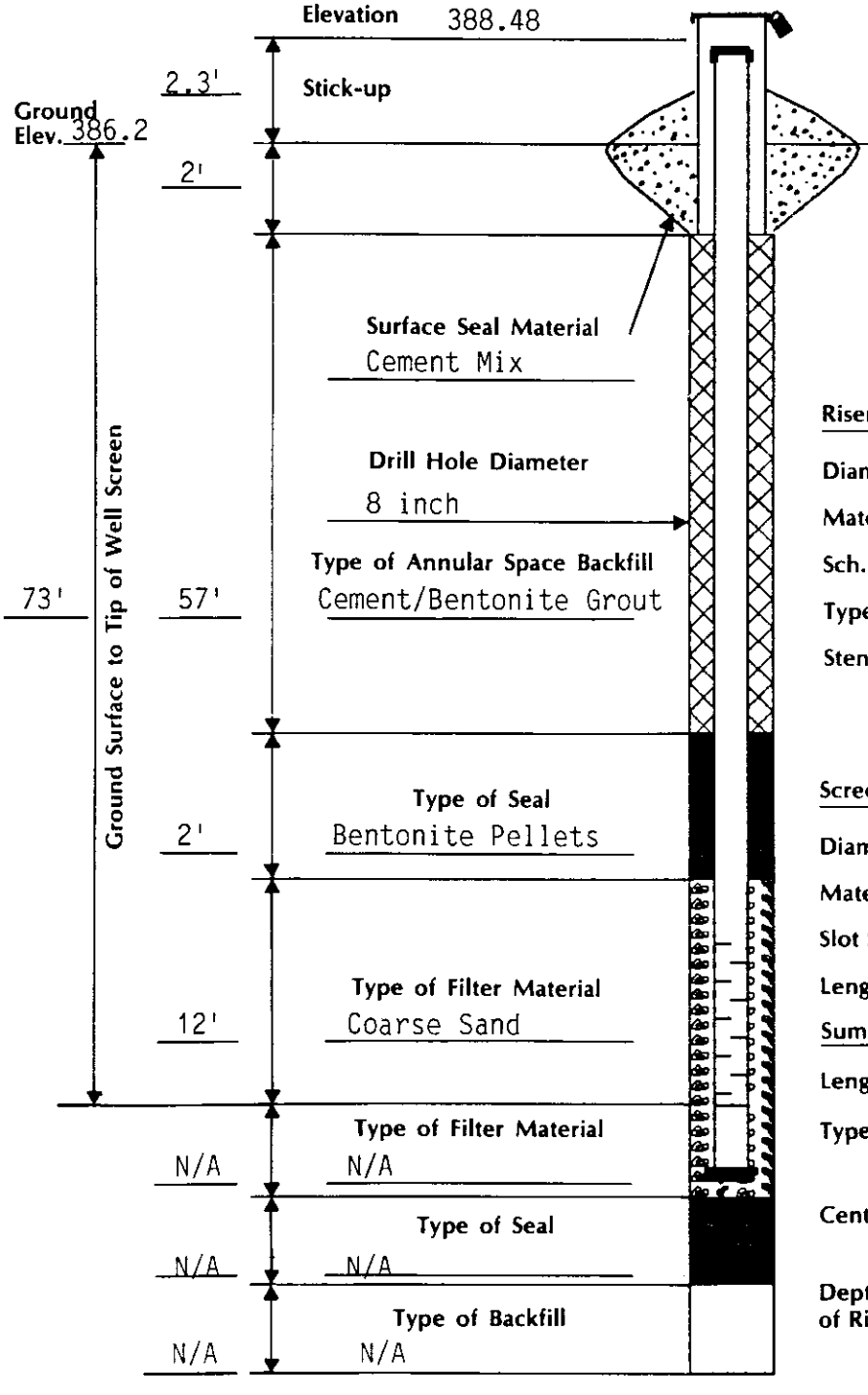
Foth & Van Dyke

Client: LAIDLAW WASTE SYSTEMS Scope I.D.: 89L46
Project: Bridgeton Monitor Wells Page: 1
Prepared by: CFN Date: 4/4/91
Checked by: RTB Date: 4/17/91

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: John Mathes and Associates, Inc. Well No.: 1206
Drilling Method: Air Rotary Date Installed: 3/26/91

Coordinates: 1,067,396.27N, 515,624.37E



Protector Pipe:
Size: 4 inch
Material: Steel
Lock No.: Master

Riser:
Diameter: 2 inch
Material: PVC
Sch.: 80
Type of Joints: Flush Threaded
Stenciled? Yes

Screen:
Diameter: 2 inch
Material: Sch 80 PVC
Slot Size: 0.010 inch
Length: 10'

Sump:
Length: N/A
Type of Cap: PVC Flush Threaded

Centralizer: Used ☐
Not Used ☒

Depth to Water From Top of Riser at Completion: 51.6' @ T=12 hr.

NOTE: Not to Scale

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

REGISTRATION RECORD

OFFICE USE ONLY		DATE REC	
REF NO 15,010			
ROUTE		P W S NUMBER	CHECK NUMBER
STATE WELL NUMBER		TRANSMITTAL NO	
CHECKED BY		CROSS REFERENCE NO	
APPROVED BY	DATE	ENTERED Ph 1 Ph 2 Ph 3	

INFORMATION SUPPLIED BY OWNER

NAME: LAIDLAW WASTE SYSTEMS, INC. — TELEPHONE: 314-241-3710

ADDRESS: 1838 N. BROADWAY — CITY: ST. LOUIS — STATE: MO — ZIP CODE: 63102

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL — WELL NUMBER: 1206 — ADDRESS OF WELL SITE OR SITE NAME (IF DIFFERENT THAN ABOVE): ST. CHARLES ROCK RD

OWNER STATUS: ☐ BUILDER ☐ PRIVATE HOME OWNER ☐ DEVELOPER ☒ OTHER (SPECIFY) LANDFILL — CITY: BRIDGETON — STATE: MO — ZIP CODE: 63044

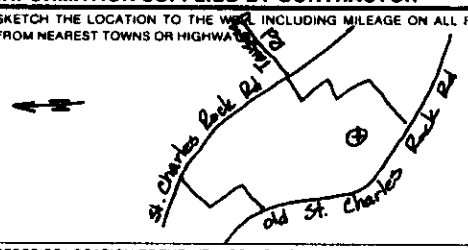
PURPOSE OF REGISTRATION FORM: ☒ ABANDONED WELL ☐ MINERAL EXPLORATORY ☐ WELL RECONSTRUCTION ☐ TEST HOLE ☐ OTHER

VARIANCE ISSUED? ☐ YES ☒ NO — VARIANCE NUMBER — WELL CERTIFICATION NUMBER — DATE ORIGINALLY DRILLED: 3-26-91

SIGNATURE (WELL OWNER) — DATE

INFORMATION SUPPLIED BY CONTRACTOR

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



LOCATION OF WELL

SHOW LOCATION IN SECTION PLAT

QUAD: St. CHARLES — COUNTY: ST. LOUIS — ELEV: 386.2 — AREA NO.

SMALLEST ¼: ____ ¼ NW ¼ SE ¼ — LARGEST ¼: NW ¼

SEC. 3 — TWN. 46 — N,RNG. 5 (E OR W)

LAT. 38 ° 45 ' 54 " — LONG. 90 ° 26 ' 43 "

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL

ON RIGHT SIDE OF GRAVEL ROAD/RAMP LEADING DOWN INTO FILL PIT, APPROX 2/3 DOWN RAMP.

CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. — PERMIT NUMBER: 001255

DRILLERS NAME: TIMOTHY ELDERS — PERMIT NUMBER: 001255WPM

ABANDONMENT OF WELLS

FORMER USE OF WELL
☐ HAND DUG ☐ SOIL BORING
☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ PUBLIC WATER SUPPLY
☐ MULTI-FAMILY ☐ MINERAL EXPLORATORY TEST HOLE
☐ HEAT PUMP ☒ MONITORING
☐ IRRIGATION ☐ OTHER

ORIGINAL DRILLER (IF KNOWN): JOHN MATHES & ASSOC. — DATE ORIGINALLY DRILLED: 3-26-91

DATE PLUGGED	STATIC WATER LEVEL	PUMP REMOVED FROM WELL?	
4-23-96	29.2 FT	☐ YES ☐ NO	

DEPTH OF THE WELL	LENGTH OF CASING	CASING DIA.	HOLE DIA
73'	73'	2"	8"

GROUT INSTALLATION METHOD: ☐ GRAVITY ☒ TREMIE

CASING CUT OFF THREE FEET BELOW SURFACE? DRILLED OUT ☐ YES ☐ NO

TYPE OF CASING: ☐ STEEL ☒ PLASTIC ☐ OTHER

GROUT MATERIAL USED
NEAT CEMENT: ☐ HI-EARLY ☒ PORTLAND TYPE I ☐ OTHER
☐ BENTONITE SLURRY ☐ OTHER
BENTONITE: ☒ POWDER ☐ GRANULAR ☐ CHIPS ☐ PELLETS

NUMBER OF BAGS OF GROUT USED: 7

POUNDS OF GROUT PER BAG: 50

HOW MANY GALLONS WATER MIXED PER BAG OF CEMENT OR BENTONITE? 4.5

TYPE OF FILL MATERIAL USED: CEMENT/BENTONITE GROUT

AMOUNT OF FILL MATERIAL USED: 0.6 (CIRCLE ONE: CU. YDS / TONS)

DEPTH TO TOP OF FILL MATERIAL FROM SURFACE: 0

WELL DISINFECTED BEFORE PLUGGING? ☐ YES ☒ NO

NUMBER USED FOR DISINFECTION: GALLONS OF CHLORINE ____ POUNDS OF CHLORINE ____ TABLETS OF CHLORINE ____

WAS THE WELL ABANDONED BECAUSE OF HOOKING UP TO A PUBLIC OR RURAL WATER SUPPLY DISTRICT? ☐ YES ☒ NO

IF YES, WHAT IS THE NAME OF THE WATER DISTRICT

CHECK THE BOX WHICH APPLIES

☒ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS ABANDONED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE ABANDONMENT OF WELLS.

☐ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS REPAIRED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE REPAIR OF WELLS

CONTRACTOR'S SIGNATURE: Geoff D. Elder — DATE: 5-16-96

WELL RECONSTRUCTION

TYPE OF REPAIR
☐ RAISED CASING ☐ LINING OF WELL
☐ DEEPENING OF WELL ☐ OTHER

USE OF WELL
☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ PUBLIC WATER SUPPLY
☐ MULTI-FAMILY ☐ MONITORING
☐ HEAT PUMP ☐ OTHER
☐ IRRIGATION

DIA. OF WELL CASING IN.	WAS WELL DISINFECTED AFTER RECONSTRUCTION ☐ YES ☐ NO	DATE RECONSTRUCTION COMPLETED

RAISED CASING INFORMATION

LENGTH OF CASING ADDED FT.

MATERIAL: ☐ STEEL ☐ PLASTIC

METHOD OF ATTACHMENT: ☐ THREADED ☐ FUSED ☐ WELDED ☐ GLUED ☐ COUPLED

LINER DETAILS

PURPOSE OF LINER: ☐ USED ONLY TO HOLD BACK FORMATION ☐ USED TO SEAL OUT CONTAMINATION OR OTHER CONDITIONS

DIAMETER OF LINER IN.

WEIGHT OR SDR #

DEPTH TO THE TOP OF LINER FROM SURFACE FT.

MATERIAL: ☐ PLASTIC ☐ STEEL

AMOUNT OF LINER USED FT.

JOINTS: ☐ GLUED ☐ WELDED ☐ OTHER

LINER PACKER DETAILS

TYPE USED: ☐ NONE ☐ RUBBER BOOT

DEPTH(S) SET

LINER GROUT DETAILS

POSITION OF SEAL: ☐ FULL LENGTH ☐ BETWEEN PACKERS

MATERIAL: CEMENT ☐ PORTLAND TYPE I ☐ HI EARLY; BENTONITE ☐ CHIPS ☐ PELLETS ☐ SLURRY ☐ GRANULAR

DEPTH PUMP WAS SET FT. GPM	DEPTH FROM SURFACE TO TOP OF THE GROUT SEAL FT.	DEPTH FROM SURFACE TO BOTTOM OF THE GROUT SEAL FT.

DEEPENING OF WELL INFORMATION

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION	YIELD

MO 780-1414 (11-95) DISTRIBUTION: WHITE/CONTRACTOR CANARY/DIVISION PINK/OWNER

MAIL CANARY COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402 RECORD MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION DATE

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION: LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	BORING NO. PZ-100-KS SHEET 1 OF 3

						DRILLING START	DRILLING FINISH
WATER LEVEL						TIME 13:20	TIME 17:42
TIME							
DATE						DATE 1/25/95	DATE 1/25/95
CASING DEPTH							

NORTHING: 1068842.03
DATUM EASTING: 517211.63 ELEVATION 483.8

DRILL RIG: CME 75 - TRUCK MOUNT
SURFACE CONDITIONS:
ANGLE: BEARING:
SAMPLE HAMMER:

DRILLING CONTR: LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	6 3 4 6	1.6'/2.0' (80%)			(0.0-7.2 ft.) Firm, dusky yellowish brown (10YR 2/2), SILTY CLAY, little organics, NR, moist, (CL), (LOESS)	SP ①	
2 3	4 6 7 8	1.8'/2.0' (90%)				SP ②	
4 5	2 5 5 5	1.7'/2.0' (85%)			@ 4.0 ft., color changes to moderate yellowish brown (10YR 5/4)	SP ③	
6 7	2 2 2 3	1.8'/2.0' (90%)			(7.2-11.6 ft.) Firm, moderate yellowish brown (10YR 5/4), mottled SILTY CLAY, NR, moist, (CL), (LOESS)	SP ④	
8 9	3 4 5 5	1.7'/2.0' (85%)				SP ⑤	
10 11	4 4 5 5	1.4'/2.0' (70%)			(472.2) 11.6	SP ⑥	
12 13	3 4 3 3	2.0'/2.0' (100%)			(11.6-19.2 ft.) Loose, moderate yellowish brown (10YR 5/4), mottled CLAYEY SILT, NR, moist, (ML), (LOESS)	SP ⑦	
14	1 3 6 7	1.8'/2.0' (90%)				SP ⑧	

LOGGED BY: J. MILLER
DATE: 1/25/95
CHK'D BY: W. HERST

JOB NO.: 943-2848
FILENAME: PZ100KS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
	6.25 inch I.D. Hollow Stem Auger					PZ-100-KS	
						SHEET	
	SAMPLING METHOD:					2 OF 3	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					13:20	17:42
	DATE					DATE	DATE
NORTHING: 1068842.03 DATUM EASTING: 517211.63 ELEVATION 483.8	CASING DEPTH					1/25/95	1/25/95
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS						
ANGLE BEARING							
SAMPLE HAMMER							

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
16	3 4 7 10	1.2' 2.0' (60%)			(11.6-19.2 ft.) Loose, moderate yellowish brown (10YR 5/4), mottled CLAYEY SILT, NR, moist, (ML), (LOESS)	SP	8	
17						SP	9	
18	3 4 5 7	1.9' 2.0' (95%)				SP	10	
19								
20	5 6 7 8	1.5' 2.0' (75%)			(19.2-22.4 ft.) Loose, light olive gray (5Y 6/1), CLAYEY SILT, NR, moist, (ML), (LOESS)	SP	11	
21								
22	2 7 9 10	1.2' 2.0' (60%)			(461.4) 22.4 (22.4-28.2 ft.) Compact light olive gray (5Y 6/1), fine SANDY SILT, NR, dry, (SM), (ALLUVIAL)	SP	12	
23								
24	5 10 9 14	1.7' 2.0' (85%)				SP	13	
25					@ 25.4 ft., partings of light olive gray (5Y 6/1), CLAYEY SILT			
26	3 9 14 15	1.4' 2.0' (70%)				SP	14	
27								
28	3 5 7 11	0.0' 2.0' (0%)			(455.6) 28.2 (28.2-32.1 ft.) Compact, light olive gray (5Y 6/1), mottled CLAYEY SILT, organics wet at 29.0 ft., NR, moist-wet, (ML), (ALLUVIAL)	SP	15	
29								

LOGGED BY J. MILLER
DATE 1/25/95 CHK'D BY W. HERST

JOB NO.: 943-2848
FILENAME: P2100KS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-100-KS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 3 OF 3
NORTHING: 1068842.03 DATUM EASTING: 517211.63 ELEVATION 483.8	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START: TIME 13:20, DATE 1/25/95; FINISH: TIME 17:42, DATE 1/25/95
DRILL RIG: CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE: BEARING:		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL		SAMPLER TYPE	REMARKS
31	4 9 10 19	1.5'/2.0' (75%)			(28.2-32.1 Ft.) Compact light olive gray (5Y 6/1), mottled CLAYEY SILT, NR, moist-wet, (ML), (ALLUVIAL)		SP (16)	
32	15 14 12 14	1.1'/2.0' (55%)			@ 31.6 ft, ~1 inch of fine SAND (32.1-33.9 Ft.) Compact, brownish gray, (5YR 4/1), fine SAND, NR, wet, (SM), (ALLUVIAL)	(451.7) 32.1	SP (17)	
33								
34	50/6"	0.6'/2.0' (30%)			(33.9 Ft.) Loose, light gray (5Y 6/1), CLAYEY SILT, NR, moist, (ALLUVIAL)	(449.3) 34.5	SP (18)	Augers chatter, spoon refusal, hit bedrock at 34.5 ft.
35					End of Soil Borehole Log at 34.5 ft. See PZ-100-KS Record of Drillhole for rock descriptions			
36								
37								
38								
39								
40								
41								
42								
43								
44								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 1/25/95

JOB NO.: 943-2848

FILENAME: PZ100KS

RECORD OF DRILLHOLE PZ-100-KS

Sheet 1 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2946
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): RT 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-34.0 ft. See Soil Borehole Log PZ-100-KS		449.80												0.0-34.0 ft. Drilling conducted with 6.25 inch ID hollow stem augers
34	34.0-52.3 ft. Slightly weathered, very thickly bedded, very light gray (N8), medium crystalline, weak, LIMESTONE, (ST. LOUIS FORMATION) 1 mm. iron concretions common, thin calcite vein (1 cm.), irregular joints, stylolitic		34.00						J,ST,R J,I,R J,I,R (2) J,PL,R J,C,R J,I,R J,PL,R						1/27/95 Began coring
36				1	100 %				J,I,R J,I,R-CL						
38									J,I,R J,PL,R						
			444.30												
40			39.50						J,I,R J,PL,R						
42	42.9 ft. 1 in. thick clay seam								J,I,R J,C,R J,I,R J,C,R J,PL,SM-CL (2)						
44				2	100 %				J,C,R J,C,R J,ST,R J,ST,R						
46									J,PL,R J,PL,R						
48									J,PL,R J,C,R						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 2 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 3

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	34.0-52.3 ft. Slightly weathered, very thickly bedded, very light gray (N8), medium crystalline, weak, LIMESTONE, (ST. LOUIS FORMATION), 1 mm. iron concretions common, thin calcite vein (1 cm.), irregular joints, stylolitic			2	100				J,PL,R J,PL,R J,PL,R J,ST,R						
			434.30 49.50												
50									J,PL,R J,ST,R J,C,R J,PL,R (3)						
52									J,PL,R (2)						
	52.3-62.5 ft. Fresh, medium bedded, light gray (N7), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, numerous clay filled discontinuities, some iron oxide staining			3	100				J,PL,R J,C,R						
54															
56									J,I,R						
58									J,C,R J,U,R						
			424.30 59.50												
60									J,P,S (2) J,I,R J,PL,R-CL (2)						1/27/95 @ 17:15 Measured water level in hole at 34.49 ft. below ground surface 1/28/95 @ 8:18 Measured water level in hole at 36.6 ft. below ground surface
62				4	100				J,I,R (2)						
	62.5-67.5 ft. Fresh, medium bedded, medium light gray (N6), crypto-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,C,R (2)						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/8/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 3 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.6
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	62.5-37.5 ft. Fresh, medium bedded, medium light gray (N6), crypto-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		418.70	4	100%				J,I,R						
			65.10						J,C,R						1/27/95 @ 17:15 Quit drilling for the day @ 65.1 ft.
	1-2 in. chert nodules common														
66									J,PL,SM						
									J,I,R-CL (2)						
	67.5-76.0 ft. Slightly weathered, medium bedded, olive gray (5Y 4/1), m-c grained, medium strong rock, CLASTIC LIMESTONE (ST. LOUIS FORMATION)														
68									J,I,R						
									J,C,R						
70				5	99%				J,I,R (2)						
									J,C,R						
									J,I,R						
									J,C,R						
	Shaley partings common, fossiliferous								J,I,R (2)						
72									J,PL,R						
									J,ST,R						
74															
			408.70												
			75.10						J,PL,SM-CL (2)						
									J,C,R (2)						
76	76.0-88.5 ft. Slightly weathered, medium to thickly bedded, medium gray (N5) to light gray (N7), coarse grained, medium strong, CLASTIC LIMESTONE, (ST. LOUIS FORMATION)								J,PL,R-CL						
				6	99%										
78									J,C,R-CL						
									J,ST,R						
80	Stylolitic, shaley partings, sandy, more porous than above														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 4 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1300, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	76.0-88.5 ft. Slightly weathered, medium to thickly bedded, medium gray (N5) to light grat (N7), coarse grained, medium strong, CLASTIC LIMESTONE, (ST. LOUIS FORMATION)							30	J,C,SM						
82								30	J,PL,SM-CL						
				8	99%			30	J,PL,SM (2)						
84								30	J,I,R-CL						
			398.70					30	J,I,VR (2)						
			85.10												
86								30	J,I,R						
				7	100 %			60	J,PL,R						
88			395.30												
	88.5-94.0 ft. Slightly weathered, thickly laminated to thinly bedded, medium gray (N5), fine grained, extremely weak to very weak, SILTY CLAYSTONE and SILTSTONE, (ST. LOUIS FORMATION) Pyrite in claystone, cross-bedded, fine sandy siltstone interbeds		88.50					30	J,I,R						
								30	J,I,R-CL						
90								30	J,PL,SM						
			393.40												
			90.40					30	J,I,R (3)						
									J,I,R						
								30	J,I,R (3)						
				9	72%			30	J,I,R (2)						
92								30	J,ST,SM						
								30	J,I,SM						92.7-93.3 ft. Core Loss
			390.50												
			93.30					30	J,I,R						
								30	J,I,R						
			389.80					30	J,C,R						
94	94.0-98.0 ft. Slightly weathered, thickly bedded, very light gray (N8), fine grained, medium strong, DOLOMITE (ST. LOUIS FORMATION)		94.00					30	J,ST,R (2)						
				9	98%			30	J,I,R						
								30	J,PL,R-CH						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	94.0-98.0 ft. Slightly weathered, thickly bedded, very light gray (N8), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Vuggy, highly silicified, bioturbated								J,I,R-CL		SW FR MW HW CW	R6 R5 R4 R3 R2 R1	R1 10 R2 50 R3 300 R4 800 R5 1500 R6		
98	98.0-116.4 ft. Slightly weathered, very thickly bedded, light brownish gray (5Y 6/1), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)														
100				9	98%										
	Laminae, vuggy in places, clay infilling, some silicification														
	101.0-103.0 ft. Vuggy														
102									J,C,S-CL						
			380.50												
			103.30												
104									J,PL,R						
	104.5-106.4 ft. Vuggy, some silicification in veins, clay partings														
									J,PL,R						
106									J,PL,R						
				10	99%										
108															
110									J,I,R						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 R2 30, R3 150, R4 300, R5 600, R6 1500	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	98.0-116.4 ft. Slightly weathered, very thickly bedded, light brownish gray (5Y 6/1), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)			10	99%										
			370.40 / 113.40						J,I,VR						
114															
116															
	116.4-119.6 ft. Fresh, thickly bedded, medium light gray (N6), medium crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION)			11	100 %										
118															
			364.20 / 119.60												
120	119.6-120.7 ft. Fresh, thinly bedded, medium gray (N5), finely crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,PL,R-CL						
			363.10 / 120.70												
	Bioturbated, calcite infilling														
122	120.7-123.7 ft. Fresh, thickly bedded, medium light gray (N6), f-m crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION)														
			360.30 / 123.50												
124	123.7-147.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Stylolitic								J,I,R J,I,R J,I,R						1/28/95 @ 17:32 Finish drilling for the day at 123.5 ft., we blow out hole and measure water level at 72.77 ft. below ground surface
126				12	100 %										
	126.9 ft. 1 in. clay seam, fractures at ~124.5 and 127.6 ft.								J,C,R J,I,R						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIOLAW/RI-FS
PROJECT NO: 843-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	123.7-147.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Stylolitic								J,I,R-CL,CH						
130				12	100 %				J,C,SM						
132			351.60 / 132.20						J,ST,R						
134									J,PL,R-CL						
136									J,I,R						
138				13	100 %				J,PL,S-CL						Note: rock breaks along stylolites and clay partings
140									J,PL,S						
142			341.60 / 142.20												
144				14	100 %										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/rt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: FR, SW, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1900, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	123.7-147.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION)														
148	338.30 / 147.50														
	147.5-159.5 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), m-c crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) 147.5 ft. 1 in. clay partings			14	100 %			0	J,C,R-CL						
								0	J,C,SM-CL						148.1-149.0 ft. 1 in. clay filled vertical fracture
150															
152			331.60 / 152.20					0	J,I,R						1/29/95 @ 16:06 Drillers quit drilling for the day, they blew out the hole, measured water level @ 80.4 ft. below ground surface, drilled to 152.2 ft.,
	Stylolitic							0	J,I,R						
154								0	J,I,R						1/30/95 @ 9:38 Measured water level in hole @ 48.3 ft. 1/30/95 @ 9:51 Begin Run 15
								0	J,I,R						
156	Brecciated, glauconitic, clay and silt sized infilling			15	100 %			0	J,I,VR						
								30	J,I,R-CL						
158								0	J,I,R						
	159.5-165.5 ft. Fresh, thickly bedded, greenish gray (5GY 6/1), coarsely crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION) 324.30 / 159.50							0	J,PL,R						
160								0	J,I,R						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.6
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	159.5-165.5 ft. Fresh, thickly bedded, greenish gray (5GY 6/1), coarsely crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION)			15	100 %				J,I,VR						
162			321.50 / 162.30												
	Some dark gray organic laminae														
164															
			318.30 / 165.50												
166	165.5-173.0 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), f-m grained, strong, LIMESTONE, (SALEM FORMATION)								J,C,R						@ 165.5 ft. Inferred contact between ST. LOUIS FORMATION and SALEM FORMATION
	167.3-169.6 ft. Brecciated, glauconite and gray clay infilling, stylolitic, some calcite filled veins			16	100 %										
168									J,C,R						
170															
172			311.50 / 172.30												
	173.0-181.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)			17	100 %										
174															
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
176	173.0-181.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)														
178				17	100 %										
180															
182	181.2-183.0 ft. Thickly bedded, pale yellowish brown (10YR 6/2), coarse grained, strong, (SALEM FORMATION)		301.60												
			182.20												
184	183.0-190.5 ft. Fresh, thinly laminated, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE (SALEM FORMATION)			18	100 %				J,I,R-CL						
186	185.9-186.7 ft. Clay rich horizons, becoming silitier 186.7 ft. Chert nodules, stylolitic														
188									J,I,R						
			295.30												
			188.50												
190				19	100 %				J,PL,S						
	190.5-205.5 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), medium grained, strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)		292.80												1/31/95 @ 8:00 Measure water level in hole at 38.05 ft. @ 8:10 resume coring on Run 20
			191.00												
192				20	100 %				J,I,VR						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.6
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6–R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	190.5-205.5 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), medium grained, strong, ARENACEOUS LIMESTONE, (SALEM FORMATION) Silty, fine sand, fossil fragments, organic laminae, some clayey laminae, cherty, bioturbated								J,I,S						
194															
196				20	100 %										
198															
200			283.90 / 199.90												
202	202.0 ft. Silicified horizons			21	100 %										
204			279.70 / 205.10												
206	205.5-210.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION) 206.0-206.3 ft. Clay interbed Silty, cherty, some clay horizons, silicified, coarse grained interbeds			22	100 %				J,I,R-CL J,I,R (2) J,I,R J,I,R-CL						1/31/95 @ 17:15 Finish coring @ 205.1 ft., driller tried 1/2 day to get past the chert at this depth and failed
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.6
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, SW HW, HW RF, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R6 1500, R5 600, R4 300, R3 150, R2 75, R1 30	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
208	205.5-210.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARENACEOUS LIMESTONE. (SALEM FORMATION)			22	100 %										
	Silty, cherty, some clay horizons, silicified, coarse grained interbeds 273.80		273.70												
210	210.0-220.7 ft. 210.00 Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE (SALEM FORMATION)		210.10												
212															
214															
				23	91%										
216															
218															
									Core Loss						
220			263.70												
			220.10												
	263.10														
	220.7-222.5 ft. 220.70 Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, medium strong, ARENACEOUS DOLOMITE, (SALEM FORMATION) shell debris in lower .5 ft., coarser downward, organic laminae 261.30														
222				24	100 %										
	222.5-233.8 ft. 222.50 Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (SALEM FORMATION)								J,PL,SM						
224															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 13 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2548
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.6
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/t CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224	222.5-233.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (SALEM FORMATION) Chert nodules common, bioturbated, organic laminae, some texture laminae								J,I,SM						
228				24	100 %										
230			253.50												
			230.30						J,C,SM						
232									J,PL,SM						
	233.7 ft. Organic clay lense			25	100 %										
	250.00								J,I,R-CL						
234	233.8-241.4 ft. Fresh, thickly bedded, light gray (N7), coarse grained, medium strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION)	233.80							J,PL,R						
238			247.60												
			236.20												2/1/95 End drilling @ 16:30, 2/6/95 @ 8:26 Measure water level at 80.8 ft. below ground surface 2/6/95 @ 9:50 Begin coring Run 26
				26	100 %				J,PL,R						
	Stylolitic, sandy, dark gray laminae		246.20												
238			237.60						J,PL,R						
				27	75%										
									J,PL,S						
240	239.8 ft. Medium sand, 1 cm. thick layer														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.6
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	233.8-241.4 ft. Fresh, thickly bedded, light gray (N7), coarse grained, medium strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION)														
									J,I,R						
242	241.4-245.6 ft. Fresh, thickly bedded, light gray (N7) to dark gray (N3), coarse grained, medium strong, ARENACEOUS LIMESTONE (SALEM FORMATION)			27	75%				J,I,R						
	242.8 ft. Silty sand, fossiliferous, 1 in. thick clayey horizon														Core loss occurred due to barrel falling down hole
									Core Loss						
244			239.20												
			244.60												
			238.20												
	245.6-249.8 ft. Fresh, thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)		245.60												
246															
248				28	81%										Run 28 recovery poor, because core barrel fell in hole and core was lost after Run 27. Run 28 core is broken up due to damage during its retrieval. Contacts @ 245.6 and 249.8 ft. are approximate because of core loss
			234.00												
	249.8-254.5 ft. Fresh, thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, CLAYSTONE, (WARSAW FORMATION) Grades to siltstone near base		249.80												
250															
									Core Loss						
252			231.20												
			252.60												
254															
			229.30	29	96%										
	254.5-256.4 ft. Fresh, thickly bedded, medium dark gray (N4), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)		254.50												
256															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 15 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R5 R6, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (HT 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
256	ROCK TYPE														
			227.40												
	256.4-261.3 ft. 258.40 Fresh, thickly bedded, olive black (5Y 6/1), fine grained, medium strong, SILTSTONE, (WARSAW FORMATION) Black organic laminae, slightly pitted, dolomitic			29	96%										
258															
			224.10						Minor Core Loss						2/6/95 @ 16:50 Quit for the day 2/7/95 @ 8:30 Start coring Run 30
			258.70												
260									J,I,SM						
			222.50												
	261.3-264.8 ft. 261.30 Fresh, thickly bedded, olive gray (5Y 4/1), medium crystalline, medium strong, DOLOMITE, (WARSAW FORMATION)														
262															
264			219.00												
	264.8-276.7 ft. 264.80 Fresh, thickly bedded, dark gray (N3), microcrystalline, medium strong, LIMESTONE, (WARSAW FORMATION)			30	100%										
266															
268															
	Packstone, fossiliferous		213.90												
270			269.90												
				31	100%				J,PL,VR						
272															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 16 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
272	264.8-276.7 ft. Fresh, thickly bedded, dark gray (N3), microcrystalline, medium strong, LIMESTONE, (WARSAW FORMATION)														
274															
276				31	100 %										
	207.10														
	276.7-278.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE (WARSAW FORMATION)														
278	205.30														
	278.5-287.2 ft. Fresh, thickly bedded, medium light gray (N6), coarsely crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)														
			203.90												
280			279.90												
282									J,I,VR						
284				32	100 %										
286															
288	287.2-301.0 ft. Fresh, thickly bedded, olive black (5Y 2/1), coarse crystalline, medium strong, LIMESTONE, (WARSAW FORMATION)														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
288	287.2-301.0 ft. Fresh, thickly bedded, olive black (5Y 2/1), coarse crystalline, medium strong, LIMESTONE, (WARSAW FORMATION)			32	100 %				J,PL,VR-Calcite mineralization						Possible water producer
			283.90												
290			289.90												2/7/95 @ 15:07 Start Run 33
	Stylolitic common, fossiliferous								J,I,VR-Calcite mineralization						
292															
									J,PL,VR-Calcite mineralization						
294				33	100 %										
	295.4-295.7 ft. Vuggy porosity														
296															
298															
			184.50												
			299.30						J,I,R						2/7/95 @ 16:30 Quit drilling @ 299.3 ft. after Run 33 2/8/95 @ 9:10 Start coring Run 34, measured water level @ 18.8 ft. below ground surface
300									J,I,R						
									J,I,R						
	182.80														
	301.0-304.3 ft. 301.00 Fresh, thickly bedded, olive black (5Y 2/1), medium grained, medium strong, DOLOMITE, (WARSAW FORMATION) Argillaceous, vuggy			34	99%										
302	301.0-304.3 ft. Vuggy porosity														
304															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2548
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, B-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
304			179.50												
	304.3-306.1 ft. 304.30 Fresh, thickly bedded, medium dark gray (N4), coarsely crystalline, medium strong, LIMESTONE, (WARSAW LIMESTONE)														
306			177.70												
	306.1-313.0 ft. 306.10 Fresh, thinly bedded, grayish black (N2), fine grained, weak, CLAYEY SILTSTONE, (WARSAW FORMATION) Pyrite crystals, calcite mineralization			34	99%										
308									J,I,SM						
			174.60												
			309.20												
310															
312									J,PL,R						312.5-313.5 ft. 90 and 50 degree fractures are not open 314.5-315.5 ft. Second fracture not open
									J,I,VR						
	313.0-316.5 ft. 313.00 Fresh, thickly bedded, dark greenish gray (5GY 4/1), medium crystalline, medium strong, ARENACEOUS DOLOMITE, (WARSAW FORMATION), glauconitic, stylolitic, vuggy, silty shale interbeds			35	100				J,PL,SM-CL (2)						
314															2/8/95 Finish in Run 36, break down due to hydraulic leaks
									J,PL,R						
316			167.30												
	316.5-341.0 ft. 316.50 Fresh, thinly bedded, olive black (5Y 2/1), fine grained, weak, CLAYEY SILTSTONE, (WARSAW FORMATION)														
318															
			164.70												
			319.10												
				36	100										2/9/95 @ 7:40 Resume coring Run 36
320															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 19 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1, R2, R3, R4, R5, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
320	316.5-341.0 ft. Fresh, thinly bedded, olive black (5Y 2/1), fine grained, weak, CLAYEY SILTSTONE, (WARSAW FORMATION)														
	321.1-322.1 ft. 1-2 in. thick limey and dolomite interbeds														
322									J,PL,SM						
									J,I,SM						
									J,PL,SM						
									J,C,SM						
324									J,PL,SM						
				36	100 %										
326															
328															
	Very fine pyrite crystals, calcite infilled veins, thin (0.2-0.3 in.) dolomite interbeds		154.60												
			329.20												
330									J,ST,SM-CL						
332				37	98%										
334															4 drill induced fractures in Run 37, especially at point core was lost
			146.40												
			335.40												
336				38	99%										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 20 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (RT 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
336	316.5-341.0 ft. Fresh, thinly bedded, olive black (5Y 2/1), fine grained, weak, CLAYEY SILTSTONE, (WARSAW FORMATION)														
338															5 drill induced fractures in upper 5 ft. of Run 38
340				38	99%				J,PL,SM						
	142.60														
	341.0-344.6 ft. 341.00 Fresh, medium bedded, greenish black (5GY 2/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION)								J,PL,SM						
342															
344	Black organic laminae, calcite filled vugs		139.50												
	139.20		344.30												
	344.6-348.8 ft. 344.60 Fresh, thinly bedded, olive black (5Y 2/1), fine grained, weak, SILTY CLAYSTONE, (WARSAW FORMATION)														Two drilling induced fractures in upper 2 ft. of Run 39
346															
	Calcite filled vugs														
348				39	100 %										
	135.00														
	348.8-352.8 ft. 348.80 Fresh, medium bedded, olive gray (5Y 4/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION)														
350	Vuggy, fossil fragments														
352															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

Sheet 21 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.6
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1, R2 30, R3 150, R4 300, R5 600, R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
352															
	131.00														
	352.8-357.6 ft. 352.80 Fresh, medium bedded, olive gray (5Y 4/1), medium grained, medium strong, LIMESTONE, some fossils, race thin chert layers (<1 in.), (WARSAW FORMATION)			39	100 %										2/9/95 @ 15:15 Finish Run 39, quit work on the hole 2/11/95 @ 13:15 Corehole reamed out with 6 in. bit using Schramm Rotadrill to 354.5 ft.
354			129.60 354.20 129.30 354.50												
	354.8-355.0 ft. and 355.4-355.7 ft. Thinly bedded, medium dark gray (N4), Claystone layers														
356									J,I,R						
	126.20														
	357.6-386.6 ft. 357.60 Fresh, thin to medium bedded, medium light gray (N6), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (KEOKUK FORMATION) Predominantly argillaceous, shaley partings common, numerous light bluish gray (5B 7/1) chert layers (1-2 in. thick), chert nodules (1-10 mm.)			40	100 %				J,I,R J,I,R						@ 357.6 ft. Inferred top of KEOKUK FORMATION
358															
360									J,I,R						
			121.80 362.00												
362															363.0-372.0 ft. Numerous drilling induced fractures (2-3 per foot)
364				41	100 %										
366															
368															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.6
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
368	357.6-386.6 ft. Fresh, thin to medium bedded, medium light gray (N6), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE. (KEOKUK FORMATION) Predominantly argillaceous, shaley partings common, numerous light bluish gray (5B 7/1) chert layers (1-2 in. thick), chert nodules (1-10 mm.)														
370				41	100 %										
372			111.80 / 372.00												
374			109.60 / 374.20												
	374.2-375.2 ft. Moderately weathered, medium bedded, light olive gray (5Y 6/1), medium strong, ARENACEOUS DOLOMITE layer, (KEOKUK FORMATION)		108.60 / 375.20	42	100 %				J,I,S,CL						
									B,I,R						
376									B,I,R (2)						
			106.60 / 377.20						J,I,R						
378									B,C,R,CL						
									J,R,R						
380									B,PL,S						
	380.7-381.0 ft. Thinly laminated, dark greenish gray (5G 4/1), SILTY CLAYSTONE layer			43	100 %				B,PL,R						
382									B,U,CL						
384															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068642.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 R2 10 R3 150 R4 300 R5 600 R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
384	357.6-386.6 ft. Fresh, thin to medium bedded, medium light gray (N6), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (KEOKUK FORMATION) Predominantly argillaceous, shaley partings common, numerous light bluish gray (5B 7/1) chert layers (1-2 in. thick), chert nodules (1-10 mm.)								B,PL,CL						
				43	100 %										
386									B,I,VR						
									J,I,VR						
	386.6-391.2 ft. Slightly weathered, thinly bedded, light gray (N7), coarse grained, medium strong to strong, ARENACEOUS LIMESTONE, (KEOKUK FORMATION), Thin dolomite layers layers (<6 in.), argillaceous in some zones, stylolitic, chert nodules (<1 in.), silicified zones (<6 in.), some joints highly weathered, fossiliferous @ 389.0 ft. Open vug with calcite crystals (1/2 in. dia.)		96.80						J,I,R						
			387.00						B,I,R						2/12/95 @ 16:00 Complete Run 43 2/13/95 @ 9:00 Resume coring Run 44
388									B,I,R						
									J,I,VR						
				44	100 %										
									J,I,VR						
390									J,I,R						
									J,I,R						
	92.60		92.60												
	End of Record of Drillhole at 391.2 ft. 391.20		391.20												
392															
394															
396															
398															
400															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

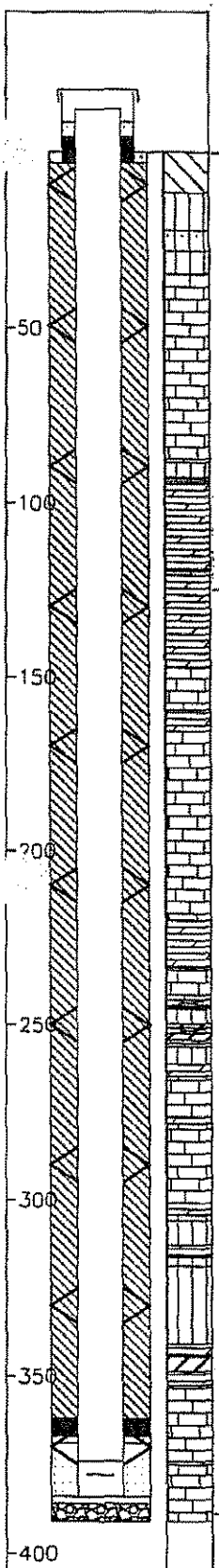
LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

Well No. PZ-100-KS

Boring No. X-Ref: PZ-100-KS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068842 ft. Easting: 517212 ft.

Elevation Ground Level 483.8 ft. NGVD

Top of PVC Casing 485.64 ft. NGVD

Drilling Summary:

Total Depth 390.0 ft.

Borehole Diameter 10 1/4 in. (0.0–34.0 ft.) 5 7/8 in. (34.0–391.0 ft.)

Casing Stickup Height 1.88 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger–None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	1/25/95	13:20	2/9/95	15:15
Schramm Rotary	2/11/95	11:00	2/13/95	15:30
Geophys.Logging:	2/9/95	16:15	2/9/95	18:15
Casing:	2/17/95	7:55	2/17/95	11:00
Filter Placement:	2/17/95	11:00	2/17/95	13:30
Cementing:				
Development				
Bentonite Grout	2/20/95	7:30	2/20/95	11:30
Bentonite Seal	2/17/95	13:30	2/17/95	13:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.88	–	374.00	C1	485.64	–	109.76
374.00	–	383.80	S1	109.76	–	99.96
383.80	–	384.13	C2	99.96	–	99.63

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16–35 mesh Silica Sand, 369.0–384.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 367.0–369.0 ft. and 384.0–386.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0–362.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 362.0–367.0 ft.

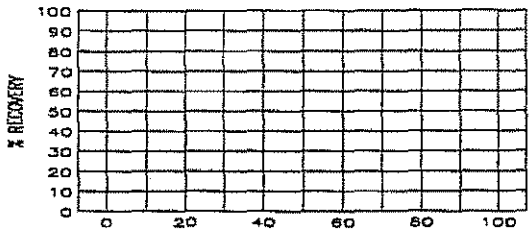
Concrete: 0.0–3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Prior to well installation, there was about 4 ft. of slough at base of borehole which could not be removed.

Supervised by W. Herst

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ100KS

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 115080	DATE RECEIVED
ROUTE	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	CROSS REFERENCE NO.
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LANDFILL BRIDGETON SANITARY LANDFILL	PZ-100-KS

SITE ADDRESS	CITY	STATE	ZIP CODE
St Charles Rock Road	BRIDGETON	MO	63044

NAME	TELEPHONE
LANDFILL WASTE SYSTEMS, INC	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1832 N BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

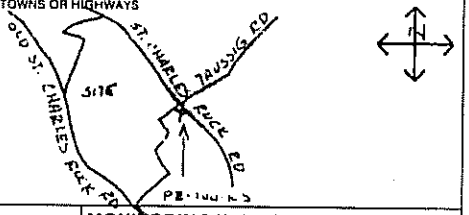
COUNTY ST. LOUIS
ELEVATION 493.76
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ LARGEST ¼ ____ ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38 ° 46 ' 09 " LONG. 90 ° 26 ' 33 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
495.64

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ HSA
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 8 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P Vogt

PERMIT NUMBER	DATE
UC1256WMA	4-11-95

SIGNATURE (DRILLING CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE
UC1256WMA	4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 495.64

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10.25"

WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 493.76 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-13 clay
Depth to bottom of Protective Casing Seal:	3	
		13-36 silt
		36-88 Limestone
		88-94 Shale
		94-143 Dolomite
		143-154 Limestone
		154-165 Dolomite
		165-210 Limestone
		210-234 Dolomite
Depth to Base of Annular Seal:	360	234-246 Limestone
		246-262 Shale
		262-367 Dolomite
Depth to Base of Bentonite Seal:	367	367-368 Limestone
Depth to Base of Secondary Filter Pack:	369	368-367 Dolomite
		367-314 Shale
Depth to Top of the Screen:	374	314-317 Dolomite
		317-343 Shale
		343-346 Dolomite
		346-351 Shale
		351-354 Dolomite
		354-371 Limestone
Depth to Bottom of the Screen:	394.4	
Plug Back Total Depth		
Original Total Depth:	411.0	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 375.88'
Diameter: 2"
Type of Material: PVC SCH.80

BOREHOLE DIAMETER: 5⅞ In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 5 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: 30/65
Length: 2'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 15'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.2Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND/SLURRY

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

RECORD OF DRILLHOLE PZ-100-SD

Sheet 1 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2548
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/22/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1068851.6
AZIMUTH: 0

COLLAR ELEV: 484.3
E: 517185.4
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (RT 10, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224	0.0-235.0 ft. No sampling conducted See Record of Drillhole for PZ-100-KS														0.0-34.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers 34.0-235.0 ft. Borehole drilled with 5 7/8 in. bit using compressed air
228															
232															
234			248.00												
236	235.3-237.3 ft. 235.30 Fresh, thinly bedded, very light gray (N8) to light gray (N7), coarse grained, medium strong, ARENACEOUS LIMESTONE (SALEM FORMATION)		235.30												
238	237.3-242.4 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION)			1	97%										
	238.7-238.8 ft. Very light gray (N8), coarse grained Dolomite layer								B,PL,SM						
40															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-SD

Sheet 2 of 2

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/22/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1066851.8
AZIMUTH: 0

COLLAR ELEV: 484.3
E: 517195.4
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, HW, MW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	237.3-242.4 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION)								J,I,SM						
242	240.9-214.3 ft. Fossiliferous, stylolitic 241.3-241.7 ft. Thinly laminated 242.1-242.4 ft. Thinly laminated			1	97%										
244	242.4-245.3 ft. Fresh, thickly bedded, light gray (N7), very coarse grained, medium strong, ARENACEOUS LIMESTONE (SALEM FORMATION)		238.00						J,U,R						
246	245.3-246.0 ft. Fresh, thickly bedded, olive gray (5Y 4/1), very fine grained, medium strong, (WARSAW FORMATION) 238.30 248.00		245.30 238.30	2	100 %										
248	End of Record of Drillhole at 246.0 ft.		248.00												
250															
252															
254															
258															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

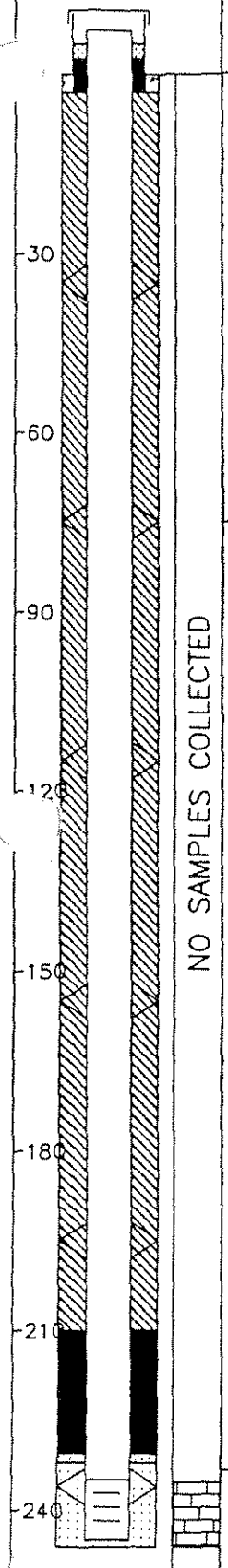
Well No. PZ-100-SD

Boring No. X-Ref: PZ-100-SD

PIEZOMETER WELL CONSTRUCTION SUMMARY

Survey Coords: Northing: 1088852 ft.
Easting: 517195 ft.

Elevation Ground Level 484.4 ft. NGVD
Top of PVC Casing 485.82 ft. NGVD



Drilling Summary:

Total Depth 246.0 ft.
Borehole Diameter 10 1/4 in. (0.0-51.0 ft.) 5 7/8 in. (51.0-246.0 ft.)
Casing Stickup Height 1.47 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	1/25/95	14:00	1/25/95	14:45
Schramm Rotary	2/21/95	8:30	2/22/95	15:00
Geophys.Logging:				
Casing:	2/23/95	9:50	2/23/95	10:15
Filter Placement:	2/23/95	10:35	2/23/95	11:40
Cementing:				
Development				
Bentonite Grout	2/23/95	13:45	2/23/95	15:30
Bentonite Seal	2/23/95	13:15	2/23/95	13:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.47	-	234.80	C1	485.82	-	249.55
234.80	-	244.60	S1	249.55	-	239.75
244.60	-	244.93	C2	239.75	-	239.42
	-				-	
	-				-	
	-				-	

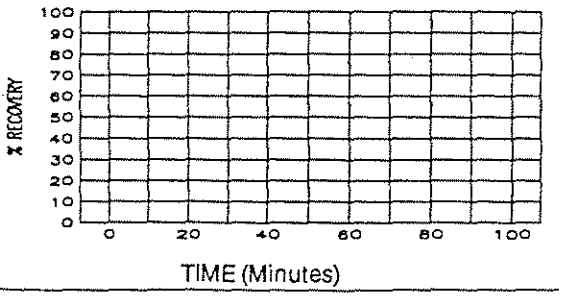
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 232.0-246. ft.
Filter Pack: Less than 50 mesh Silica Sand, 230.5-232.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-210.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 210.0-230.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Tilton
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ100SD

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 15081	DATE RECEIVED
ROUTE	CHECK NO
STATE WELL NUMBER	TRANSMITTAL NO
CHECKED BY	CROSS REFERENCE NO
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-100-SD

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1138 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

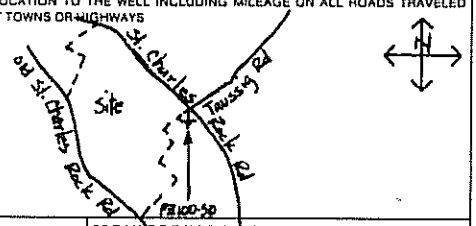
COUNTY ST. LOUIS
ELEVATION 484.35
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38° 46' 09" LONG. 90° 26' 23"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 5 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
2-28-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE
001256 WIM	4-11-95

SIGNATURE (DRILLING CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE
001256 WIM	4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 485.82

LOCKING CAP - (Y) N (Circle one)
CAP VENT (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 484.35 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-13 Clay
Depth to bottom of Protective Casing Seal:	3	
		13-36 Silt
		36-88 Limestone
		88-94 Shale
		94-143 Dolomite
		143-159 Limestone
		159-165 Dolomite
		165-210 Limestone
Depth to Base of Annular Seal:	210.0	
		210-234 Dolomite
Depth to Base of Bentonite Seal:	230.5	
Depth to Base of Secondary Filter Pack:	232.0	
Depth to Top of the Screen:	234.8	
		234-246 Limestone
Depth to Bottom of the Screen:	344.8	
Plug Back Total Depth:		
Original Total Depth:	346.0	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 236.27'
Diameter: 2"
Type of Material: SCH80 PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 20.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR
Length: 1.5'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 2440
Length: 14'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH.80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

RECORD OF DRILLHOLE PZ-100-SS

Sheet 1 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/24/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1068867.81
AZIMUTH: 0

COLLAR ELEV: 484.35
E: 517175.03
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FT)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (FR SW HWV HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (RT 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	0.0-78.9 ft. No sampling conducted See Record of Drillhole for PZ-100-KS														0.0-51.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem auger, then borehole advanced to 78.9 ft. with 5 7/8 in. air rotary bit
66															
68															
70															
72															
74															
76															
78															
	405.45 78.9-81.8 ft. 78.90 Moderately weathered, medium bedded, light brownish gray (5Y 6/1), fine grained, strong, ARENACEOUS DOLOMITE, open vugs (<1/2 mm), (ST. LOUIS FORMATION)		405.45 78.90	1	100 %										
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/24/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1088887.81
AZIMUTH: 0

COLLAR ELEV: 484.35
E: 517175.03
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE	DISCONTINUITY DATA: AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: FR, SW, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): HT, R3, R2, R1	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.9-81.8 ft. Moderately weathered, medium bedded, light brownish gray (5Y 6/1), fine grained, strong, ARENACEOUS DOLOMITE, open vugs (<1/2 mm.), (ST. LOUIS FORMATION)															
			402.55													
82	81.8-90.6 ft. Slightly weathered, thickly bedded, light olive gray (5Y 6/1), very finely crystalline, strong ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		81.80	1	100%											
	Below 82.3 ft. Stylolites common									J,I,SM						
84	@ 83.9 and 84.5 ft. Chert zones (<2 in.)									J,P,SM						
	84.4-84.7 ft. Silicified and finely disseminated pyrite									J,P,SM						
			399.65													
	84.7-84.9 ft. Medium gray chert zone		84.70													
			399.25													
	85.1-85.5 ft. Olive gray (5Y 3/2), DOLOMITIC LIMESTONE layer, low porosity, vugs (<1/4 mm)		85.10													
			398.85													
86			85.50							J,C,SM,CL						
										J,C,SM						
				2	86%					J,I,R						
88																
			395.35							Core Loss						
			89.00													
90																
	90.6-94.0 ft. Moderately weathered, thickly bedded, light brownish gray (5Y 6/1), f-m grained, medium strong BIOCLASTIC LIMESTONE, (ST. LOUIS FORMATION)															
				3	100%					J,I,R						
92																
										J,I,R,CL						
			390.35													
94	End of Record of Drillhole at 94.0 ft.		94.00													2/25/95 @ 11:15 Completed drilling
			390.35													
96			94.00													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

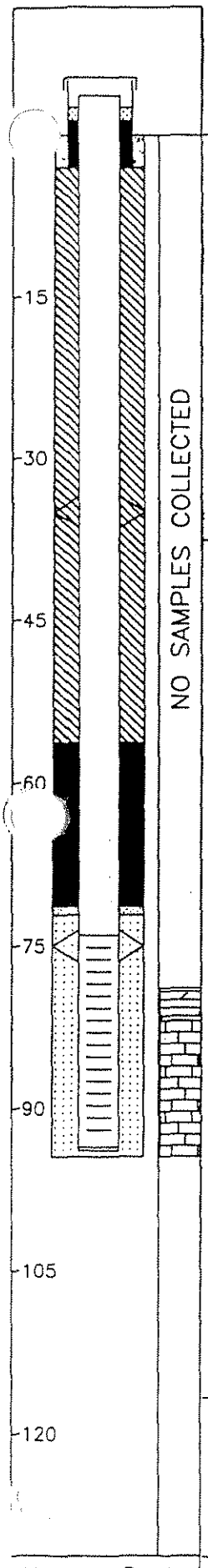
LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

Well No. PZ-100-SS

Boring No. X-Ref: PZ-100-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068868 ft. Easting: 517175 ft.

Elevation Ground Level 484.4 ft. NGVD

Top of PVC Casing 485.84 ft. NGVD

Drilling Summary:

Total Depth 94.5 ft.

Borehole Diameter 10 1/4 in. (0.0-51.0 ft.) 5 7/8 in. (51.0-94.5 ft.)

Casing Stickup Height 1.49 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/20/95	16:00	2/20/95	16:40
Schramm Rotary	2/24/95	7:30	2/25/95	11:30
Geophys.Logging:				
Casing:	2/25/95	11:30	2/25/95	11:45
Filter Placement:	2/25/95	11:45	2/25/95	12:30
Cementing:				
Development				
Bentonite Grout	2/25/95	12:50	2/25/95	14:00
Bentonite Seal	2/25/95	12:30	2/25/95	12:50

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.49	-	73.96	C1	485.84	-	410.39
73.96	-	93.60	S1	410.39	-	390.75
93.60	-	93.93	C2	390.75	-	390.42
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 72.1-94.5 ft.

Filter Pack: Less than 50 mesh Silica Sand, 71.3-72.1 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-56.3 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 56.3-71.3 ft.

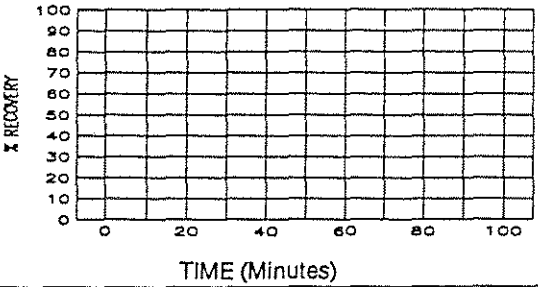
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ100SS

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115082	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-100-55

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO.	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-344-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO.	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

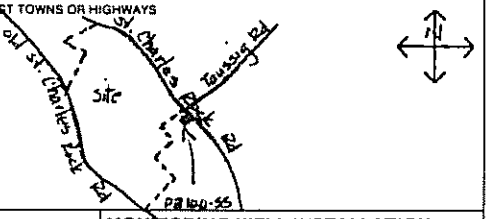
COUNTY ST. LOUIS
ELEVATION 434.35
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38 ° 46 ' 09 " LONG. 90 ° 30 ' 29 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☐ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

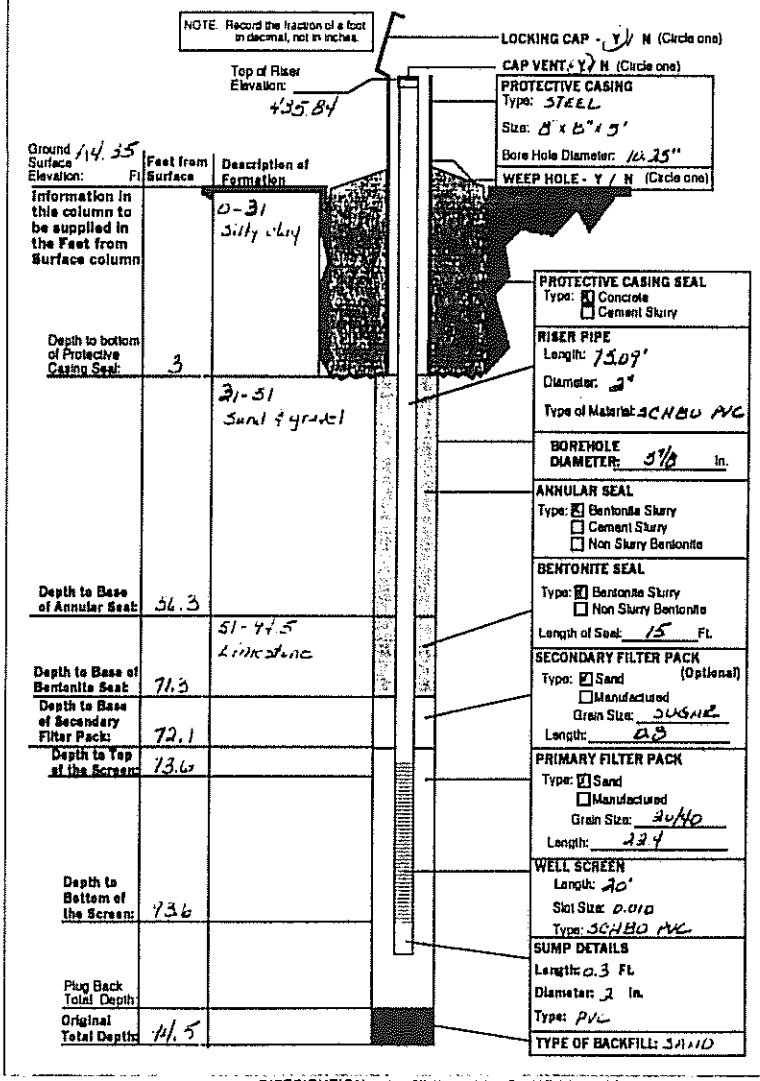
MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
2-25-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael J. Vogl
PERMIT NUMBER 001256 WIIA DATE 4-11-95

SIGNATURE (DRILLING CONTRACTOR) Michael J. Vogl
PERMIT NUMBER 001256 WIIA DATE 4-11-95



MO 780-1415 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-101-SS
		SHEET 1 OF 1
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
NORTHING: 1068472.89 DATUM EASTING: 516622.94 ELEVATION 474.9	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 13:35 / TIME 14:30 DATE 2/23/95 / DATE 2/23/95
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 3 3	1.1'/2.0' (55%)			(0.0-0.2 ft.) Firm, olive gray (5Y 4/1), SILT, trace clay, NR, damp, (CL-ML), (LOESS) (0.2-2.7 Ft.) Firm, mottled dark yellowish brown (10YR 4/2), CLAYEY SILT, some roots, NR, damp, (CL-ML), (LOESS)	SP 1	
2							
3	5 4 5 4	1.6'/2.0' (80%)			(2.7-8.0 ft.) Firm, stiff, olive gray (5Y 3/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 2	
4							
5	1 1 3 5	1.7'/2.0' (85%)				SP 3	
6		1.7'/2.0' (85%)					
7						SH 4	
8	1 3 6	1.7'/2.0' (85%)			(8.0-8.9 ft.) Stiff, mottled olive gray (5Y 3/2) and dark yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 5	Iron oxide staining from 8.0-14.0 ft.
9	6				(8.9-10.3 ft.) Stiff, mottled moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)		
10	3	1.7'/2.0' (85%)			(10.3-13.2 ft.) Stiff, mottled light olive gray (5Y 5/2) and moderate yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 6	
11	5 5 5						
12	1 1 2	1.6'/2.0' (80%)					
13	6				(13.2-14.0 ft.) Soft, dark greenish gray (5GY 4/1), CLAYEY SILT, NR, damp, (CL-ML), (LOESS) (460.9) 14.0	SP 7	
14					End of Soil Borehole Log at 14 ft. See PZ-101-SS Record of Drillhole for rock descriptions		Auger refusal at 14.0 ft.

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT

DATE 2/23/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ101SS

RECORD OF DRILLHOLE PZ-101-SS

Sheet 1 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066472.9
AZIMUTH: 0

COLLAR ELEV: 474.6
E: 518822.9
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 360, R4 800, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
0	0.0-14.0 ft. See Soil Borehole Log PZ-101-SS														
2															
4															
6															
8															
10															
12															
14	460.80 14.0-27.6 ft. 14.00 Slightly weathered to fresh, medium bedded, very light gray (N8), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Brachiopod fossils, iron staining, 1 in. thick clay filled joint at 15.4 ft.		460.80 14.00	1	55%				Broken Zone Broken Zone						
16															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.6
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR HW CW)	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	14.0-27.6 ft. Slightly weathered to fresh, medium bedded, very light gray (N8), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic			1	55%				Core Loss						Core loss due to highly fractured rock
			456.80												
18			18.00						J,I,R,Fe (2)						
									J,I,R,Fe (2)						
									J,I,R,Fe (2)						
									J,I,R (2)						
									J,I,R						
									J,I,R						
									J,I,R						
									J,I,R (2)						
20									J,I,R						
									J,I,R						
									J,I,R,CL (3)						
				2	100				J,I,R,CL (2)						
									J,I,R,CL (2)						
22									J,I,R,CL (2)						
									J,I,R,CL						
									J,I,R						
									J,I,SM						
									J,I,R,CL						
24									J,I,R,CL						
			450.30												
			24.50						J,ST,R,Fe						
									J,I,R,CL (3)						
26									J,I,R,CL (2)						
									J,I,SM,CL (3)						
				3	96%				J,I,SM,CL						
									J,U,SM,CL						
	27.6-40.5 ft. Fresh, medium bedded, very light gray (N8), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some braciopod fossils								J,I,R,CL						
28									J,PL,SM,CL (2)						
									J,I,R,CL						
									J,I,SM,CL (2)						
									J,I,SM,CL (2)						
			445.30												
			29.50												
30									J,I,SM (2)						
									J,U,SM						
				4	98%				J,I,R						
									J,I,R,chert						
									J,PL,SM						
									J,I,R,CL (2)						
32									J,I,R (2)						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101-SS

Sheet 3 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516622.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R5 R6, R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	27.6-40.5 ft. Fresh, medium bedded, very light gray (N8), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM,CL						
	32.7 ft. Calcite and pyrite crystals								J,PL,R (2)						
	33.8 ft. Chert nodule								J,PL,SM						
34	34.1 ft. Crinoid fossils								J,PL,SM						
	35.0-35.6 ft. Moderately weathered														
				4	98%				J,PL,SM,CL						
36	36.1 ft. Stylolitic														
	37.7-40.5 ft. Large chert nodules								J,I,R (2)						
38									J,U,SM,CL						
									J,I,SM						
			435.30						J,I,SM						
			39.50												
40	40.3-40.5 ft. Joints intersecting large chert nodules, some pyrite								J,I,R (2)						
	40.5-50.2 ft. Fresh, medium bedded, very light gray (N8) to light gray (N7), m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,R						
42	42.2-45.1 ft. Stylolitic														
				5	100 %				J,I,R						
44									J,I,R						
									J,I,R (2)						
									J,I,R (3)						
46									J,PL,R (4)						
									J,PL,R (2)						
	47.5-49.3 ft. Stylolitic														
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101-SS

Sheet 4 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 515822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
FL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW, FR, MW, HW, CW	STRENGTH INDEX: R5, R4, R3, R2, R1, R0	POINT LOAD INDEX (psi): RT, R2, R3, R4, R5, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	40.5-50.2 ft. Fresh, medium bedded, very light gray (N8) to light gray (N7), m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			5	100 %				J,I,R (2)						
	49.1 ft. Brachiopoda fossil		425.30						J,U,R						
			48.50						J,PL,R						
50	50.2-52.7 ft. Fresh, very thinly to medium bedded, medium light gray (N6) to medium gray (N5), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R (3)						
	51.2-52.2 ft. Numerous calcite veins at 20 degrees to core axis in healed fractures														
52	52.7-54.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM						
									J,PL,SM						
									J,I,R						
54			420.30												
	54.5-58.0 ft. Slightly weathered, medium light olive gray (5Y 6/1), fine to medium grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)		54.50	6	98%				J,I,R						
56	Very porous/vuggy, vugs <1 mm. in diameter														
58	58.0-61.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)								J,I,SM						
			415.30												
	59.7-60.0 ft. Weathered, crumbly chert		59.50						J,I,R (2)						
60	60.0-61.9 ft. Porous/vuggy (vugs < 1 mm.)								J,I,R						
	61.4 ft. Calcite filled (healed) fracture		412.90												
	61.9-66.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)		61.90	7	100 %				J,PL,SM,CL						
62									J,PL,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101-SS

Sheet 5 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516622.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planer, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	61.9-66.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)		410.30 / 64.50	7	100 %				J,U,SM,CL						
66									J,I,R,CL						
									J,ST,R,CL						
	66.3-72.7 ft. Slightly weathered, medium to thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Very stylolitic, numerous chert nodules, slightly porous/vuggy (vugs <1 mm. in diameter)								J,I,R						
68															
70				8	100 %				J,I,R,CL						
72			402.10												
	72.7-78.9 ft. Slightly weathered, medium bedded, pinkish gray (5YR 8/1) to light brownish gray (5YR 6/1), coarse grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)		72.70						J,I,R,CL						
74	74.0-74.3 ft. Crumbly texture, porous, limestone								J,PL,SM,CL						
	74.4 ft. Cross bedding		400.30 / 74.50						J,I,SM						
76									J,PL,SM,CL						
	76.4-76.8 ft. Crystalline Limestone layer			9	100 %										
78			395.90												
	78.9-83.2 ft. Fresh, medium bedded, light brownish gray (5YR 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic to 80.1 ft.		78.90						J,U,SM						
									J,U,SM						
80									J,I,R						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101-SS

Sheet 6 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: FR, SW, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.9-83.2 ft. Fresh, medium bedded, light brownish gray (5YR 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 80.1-80.5 ft. Dolomite								J,PL,R,CL						
82				9	100 %										
	391.60														
	83.2-92.0 ft. Slightly weathered, thickly bedded, yellowish gray (5Y 7/2) to light olive gray (5Y 5/2), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy (vugs <1 mm.)		83.20												
84			390.30												
			84.50												
86															
88															
	89.7-91.3 ft. Stylolitic 89.9-90.9 ft. Limestone (crystalline)			10	99%				J,PL,R J,PL,R J,ST,SM J,PL,R						
90															
92	382.80														
	92.0-94.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		92.00												
94	93.9-94.1 ft. Thickly laminated														
			380.30						J,PL,SM,CL						
	94.5-101.0 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), coarse to very coarse grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		94.50												
				11	100 %										
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2546
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 518622.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	94.5-101.0 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), coarse to very coarse grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)							90	J,PL,SM						
	96.3 ft. Calcite crystals							90	J,PL,SM,CL						
98	97.1-97.3 ft. Moderately weahtered zone, thickly laminated							90	J,PL,SM						
	98.8-99.0 ft. Chert nodules														
100				11	100 %			90	J,PL,SM						
	100.7 ft. Calcite crystals							90	J,I,R						
	101.0-119.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)							90	J,I,SM						
102	101.7-103.0 ft. Stylolitic							90	J,PL,SM						
								90	J,PL,SM						
104	104.1-104.8 ft. Slightly weathered dolomite layer, porous/vuggy		370.30 / 104.50					90	J,PL,SM						
	104.8-106.2 ft. Stylolitic							90	J,I,R						
								90	J,I,R						
106															
	106.7-109.2 ft. Some arenaceous zones							90	J,PL,R						
	107.8-108.3 ft. Bioturbated zone, some calcite crystallization			12	100 %										
108								90	J,PL,SM						
								90	J,I,R						
110	110.1-111.5 ft. Slightly to moderately weathered dolomite, porous/vuggy														
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (RT 30, R2 150, R3 303, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	101.0-119.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)														
	112.9-113.1 ft. Thinly laminated		361.20												
	113.1-113.2 ft. Bioturbated, calcite crystallization		113.60												
114	113.6-115.3 ft. Slightly to moderately weathered, dolomite, porous/vuggy		360.30	12	100 %				J,I,R,CL						
			114.50												
			359.50												
			115.30												
116	116.5 ft. Becoming fine to medium grained														
	116.6-117.7 ft. Some arenaceous laminae								J,PL,SM						
118	118.3-118.7 ft. Stylolitic								J,PL,SM						
				13	100 %										
			354.90												
120	119.9-121.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy (<1 mm. in diameter)		119.90												
	121.7-125.0 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, strong, DOLOMITE, (ST. LOUIS FORMATION)														
122															
124									J,I,R,CL						
			350.30												
			124.50												
			349.80												
	125.0-128.3 ft. Fresh, thinly bedded, light olive gray (5Y 6/1) to olive gray (5Y 4/1), interbedded microcrystalline and m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		125.00												
126				14	99%				J,I,SM						
									J,PL,SM,CL (2)						
									J,ST,SM						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1088472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R5 R6, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1, R2 30, R3 150, R4 300, R5 600, R6 1500	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128			346.50						J,PL,SM,CL						
	128.3-130.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)		128.30												
	129.3-130.3 ft. Porous/vuggy								J,I,R						
130			344.30												
	130.5-140.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		130.50	14	99%				J,I,SM,CL						
132															
	133.5-133.9 ft. Stylolitic, bioturbated, calcite crystals								J,PL,SM						
134	133.9-135.3 ft. Microcrystalline		340.30												
	134.9-135.2 ft. Small pyrite crystals		134.50												
	135.0-135.1 ft. Large chert nodules														
	135.7-137.1 ft. Slightly weathered, some calcite crystals and stylolites								J,I,R,CL						
136									J,I,R,CL						
	137.1-138.9 ft. Stylolites														
	137.4-138.5 ft. Microcrystalline, arenaceous, thickly laminated			15	100 %				J,I,SM						
138									J,PL,R						
140			334.30												
	End of Record of Drillhole at 140.5 ft.		140.50												
142															
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

Well No. PZ-101-SS

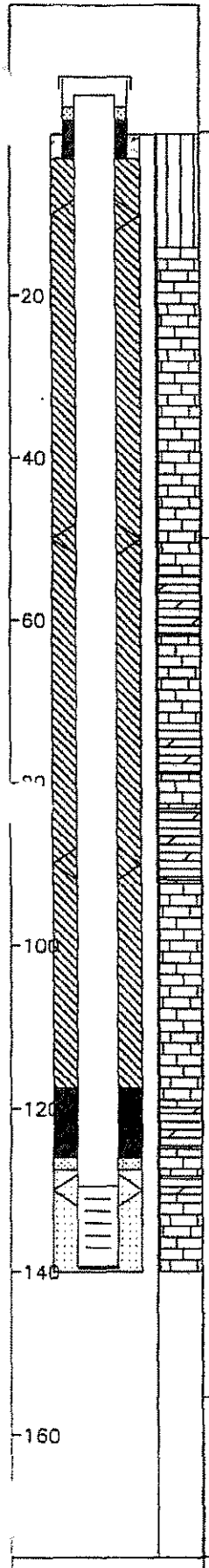
Boring No. X-Ref: PZ-101-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1068473 ft. Easting: 516823 ft.

Elevation Ground Level 474.9 ft. NGVD

Top of PVC Casing 476.68 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 140.0 ft.

Borehole Diameter 10 1/4 in. (0.0–14.0 ft.) 5 7/8 in. (14.0–140.0 ft.)

Casing Stickup Height 1.79 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger–None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/23/95	13:35	2/23/95	14:30
Schramm Rotary	3/6/95	8:15	3/6/95	9:45
Geophys.Logging:				
Casing:	3/6/95	9:50	3/6/95	10:10
Filter Placement:	3/6/95	10:20	3/6/95	10:50
Cementing:				
Development				
Bentonite Grout	3/6/95	11:30	3/6/95	12:30
Bentonite Seal	3/6/95	10:50	3/6/95	11:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.79	–	129.48	C1	476.68	–	345.41
129.48	–	139.28	S1	345.41	–	335.61
139.28	–	139.61	C2	335.61	–	335.28
	–				–	
	–				–	
	–				–	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16–35 mesh Silica Sand, 127.5–140.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 126.0–127.5 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0–117.5 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 117.5–126.0 ft.

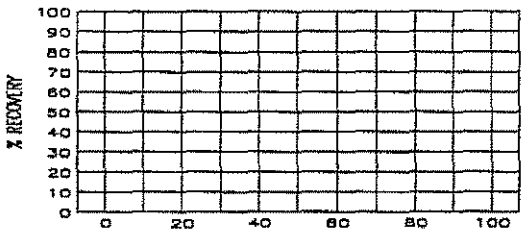
Concrete: 0.0–3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ101SS

66574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 15086	DATE RECEIVED
ROUTE	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	CROSS REFERENCE NO.
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-101-SS
SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-344-3710
ADDRESS: 1337 N. LACLEDE WAY
CITY: ST LOUIS
STATE: MO
ZIP CODE: 63132

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

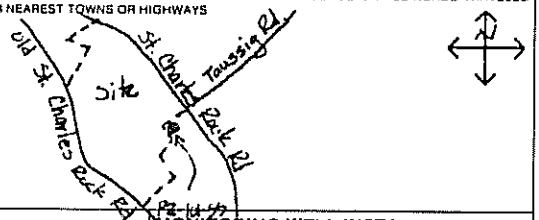
COUNTY: ST. LOUIS
ELEVATION: 474.1
AREA NO:

SMALLEST ¼ ____ ¼ ____ ¼ ____ LARGEST ¼

SEC. ____ TWN 47 N,RNG 5 E OR W

LAT. 38° 46' 06" LONG. 90° 16' 30"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 477.4

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10.25"

WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 474.1 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-14 Silt
Depth to bottom of Protective Casing Seal:	3	
		14-55 Limestone
		55-62 Dolomite
		62-73 Limestone
		73-77 Dolomite
Depth to Base of Annular Seal:	117.5	77-84 Limestone
		84-73 Dolomite
Depth to Base of Bentonite Seal:	124	73-120 Limestone
Depth to Base of Secondary Filter Pack:	127.5	120-125 Dolomite
Depth to Top of the Screen:	127.5	
		125-142 Limestone
Depth to Bottom of the Screen:	137.5	
Plug Back Total Depth:		
Original Total Depth:	142	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 132
Diameter: 2
Type of Material: SCH80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 8.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: SUGAR
Length: 1.5

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 12.5

WELL SCREEN
Length: 10'
Slot Size: .010"
Type: SCH80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
[ ] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 4 TOTAL
[ ] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS

SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER OWI256WIAA | DATE 4-11-95

SIGNATURE (DRILLING CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER OWI256WIAA | DATE 4-11-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-102-SS
		SHEET 1 OF 3
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
NORTHING: 1068087.67 DATUM EASTING: 516887.97 ELEVATION 482.1	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 15:21 / TIME 17:33 DATE 2/13/95 / DATE 2/13/95
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/13/95

JOB NO.: 943-2848

FILENAME: PZ102SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 2 2 3	1.3' / 2.0' (65%)			(0.0-2.6 ft.) Firm, dark yellowish brown (10YR 4/2), homogenous, CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP ①	2/13/95 - 15:21 Begin drilling PZ-102-SS Air monitoring 15:27 21% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
2	2 2 2 4	1.4' / 2.0' (70%)			(479.5) 2.6		
3					(2.6-5.0 ft.) Firm, moderate yellowish brown (10YR 5/4), homogenous, SILTY CLAY, NR, damp, (CL), (LOESS)	SP ②	
4		2.3' / 2.0' (115%)					
5					(477.1) 5.0	SH ③	
6	1 2 3 4	1.6' / 2.0' (80%)			(5.0-13.0 ft.) Firm, moderate yellowish brown (10YR 5/4), trace light gray (N7), homogenous, CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP ④	15:43 @ 6 ft. 21.1% O2 0.0 ppm H2S 0% LEL 0.3 ppm PID
7							
8	1 3 3 5	1.9' / 2.0' (95%)				SP ⑤	
9							
10		1.9' / 2.0' (95%)					15:49 @ 10 ft. 21% O2 1.0 ppm H2S 0% LEL 0.3 ppm PID
11						SH ⑥	
12	3 4 5 6	1.6' / 2.0' (80%)					
13					(469.1) 13.0	SP ⑦	
					(13.0-15.0 ft.) Compact, dark yellowish orange (10YR 6/6), homogenous, fine SAND, trace Silt, NR, dry, (SP), (ALLUVIUM)		
14	5 5 7 7	1.5' / 2.0' (75%)				SP ⑧	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION: LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	BORING NO. PZ-102-SS SHEET 2 OF 3

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL						
TIME					15:21	17:33
DATE					DATE	DATE
CASING DEPTH					2/13/95	2/13/95

DATUM NORTHING: 1068087.67 EASTING: 516887.97 ELEVATION 482.1

DRILL RIG: CME 75 - TRUCK MOUNT — SURFACE CONDITIONS:

ANGLE: BEARING:

SAMPLE HAMMER:

DRILLING CONTR: LAYNE-WESTERN

LOGGED BY: J. MILLER DATE: 2/13/95 CHK'D BY: W. HERST

JOB NO.: 943-2848 FILENAME: PZ102SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	4 4 6 7	1.3' 2.0' (65%)			(15.0-23.6 Ft.) Loose to compact, pale yellowish brown (10YR 6/2), homogenous, fine SAND, NR, dry, (SP), (ALLUVIUM)	SP (8)	16:03 @ 16 ft. 21.1% O2 1.0 ppm H2S 0% LEL 0.0 ppm PID
17						SP (9)	
18	4 4 5 5	1.4' 2.0' (70%)				SP (10)	
19							
20	3 3 4 6	1.6' 2.0' (80%)				SP (11)	
21							
22	6 5 4 8	1.5' 2.0' (75%)				SP (12)	
23					(458.5) 23.6		
24	5 6 7 10	1.5' 2.0' (75%)			(23.6-25.6 Ft.) Stiff, light gray (N7) to light brown (5YR 5/6), laminated CLAYEY SILT, trace fine Sand, some rootlets, NR, moist, (CL-ML), (ALLUVIUM)	SP (13)	16:20 @ 24 ft. 21% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
25							
26	5 7 10 11	1.6' 2.0' (80%)			(25.6-28.1 Ft.) Very stiff, medium gray (N5), stratified, CLAYEY SILT, some fine SAND, thin organic rootlet beds (<1 cm.), NR, moist, (CL-ML), (ALLUVIUM)	SP (14)	
27							
28	4 5 5 7	1.7' 2.0' (85%)			(28.1-29.9 Ft.) Stiff, medium gray (N5), stratified, CLAYEY SILT and fine SAND, 1-15 cm. beds, NR, moist, (CL-ML), (ALLUVIUM)	SP (15)	16:40 @ 28 ft. 21.1% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
29					(452.2) 29.9 (29.9-34.5 Ft.) Hard, light olive gray (5Y 6/1), fractured LIMESTONE, SR, (WEATHERED BEDROCK)		

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger		BORING NO. PZ-102-SS
			SHEET 3 OF 3
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		DRILLING START / FINISH
NORTHING: 1068087.67 DATUM EASTING: 516887.97 ELEVATION 482.1	WATER LEVEL / TIME / DATE / CASING DEPTH		TIME: 15:21 / 17:33 DATE: 2/13/95 / 2/13/95
DRILL RIG: CME 75 - TRUCK MOUNT	SURFACE CONDITIONS		
ANGLE: BEARING:			
SAMPLE HAMMER			

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	5 5 5 20	1.7'/2.0' (85%)			(29.9-34.5 Ft.) Hard, light olive gray (5Y 6/1), fractured LIMESTONE, SR, (WEATHERED BEDROCK) @ 30.2 ft., wood fragments	SP 16	
32							
33	13 23 55 31	1.1'/2.0' (55%)				SP 17	
34					(447.6) 34.5		
35	12 18 21 18	0.5'/2.0' (25%)			(34.5-37.0 Ft.) Hard, dark greenish gray (5GY 4/1), SILTY CLAY, trace to little fine sand, little fine gravel, NR, moist, (CL), (WEATHERED BEDROCK)	SP 18	17:07 @ 35 ft. 21.3% O2 2.0 ppm H2S 0% LEL 0.0 ppm PID
36							
37					(445.1) 37.0 End of Soil Borehole Log at 37.0 ft. See PZ-102-SS Record of Drillhole for rock descriptions		
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/13/95

JOB NO.: 943-2848

FILENAME: PZ102SS

RECORD OF DRILLHOLE PZ-102-SS

Sheet 1 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1088087.7
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.9
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, X-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-Fe Oxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 360, R4 800, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-37.0 ft. See Soil Borehole Log PZ-102-SS 37.0-37.8 ft. No samples collected														
34															
36															
			444.30												
38	37.8-41.0 ft. Highly weathered, thickly bedded, dark yellowish orange (10YR 6/6), fine grained, extremely weak, SANDSTONE, (ST. LOUIS FORMATION)		37.80					90	J,PL,SM-GRF						2/14/95 @ 8:09 Began coring Run 1
								30	J,I,SM-CL						
								90	J,PL,SM-CL (2)						
40								30	J,I,SM-GRF						
								90	J,PL,SM-Intact						
								90	J,PL,SM-GRF						
	41.0-44.6 ft. Moderately weathered, dark yellowish orange (10YR 6/6), fine grained, weak, SANDSTONE, (ST. LOUIS FORMATION)			1	91%			90	J,PL,SM-Intact						Fractures in upper portion of Run 1, are mapped in highly weathered sandstone, very clayey, likely drilling induced
42								90	J,I,SM						
								30	J,I,SM						
								30	J,I,SM (2)						
								90	J,I,R (2)						
			438.10												
44			44.00						Core Loss						Core loss due to weak rock
			437.50												
	44.6-59.6 ft. Slightly to moderately weathered, thickly bedded, light olive gray, micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		44.60					30	J,I,SM						
								90	J,I,R-CL						Fractures in Run 2, along contacts between lithologies of clay and limestone
46								60	J,I,R-CL						
				2	70%			90	J,I,R-CL (2)						
			435.10												
	@ 47.0 ft. Solutioned, in-filled with unlithified sandy clay, in Run 2, approximately 50% competent rock		47.00						Core Loss						
			434.20												
48			47.90	3	85%										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-102-SS

Sheet 2 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068087.7
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FT)	DESCRIPTION	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	44.6-59.6 ft. Slightly to moderately weathered, thickly bedded, light olive gray, micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)						J,I,R-CL					Core loss in Run 2 due to problem with barrel
							J,I,R-CL					
							J,PL,SM (2)					
							J,PL,SM					
	48.8-49.0 ft. Glauconitic clay and limestone fragment infilled collapse zone, stylolitic						J,I,R					
50							J,PL,SM					
							J,I,R					
							J,PL,R					
		3	85%				J,I,R					
							J,PL,SM-CL-intact					
	51.8-52.2 ft. Infilled zone						J,ST,R-Fe					
52	52.0-52.9 ft. Breciated, collapsed, infilled with limestone fragments, sand and clay						J,PL,R-solutioned					
							Core Loss					Core loss due to fractures/lugging of bit, some rock recovered in this interval, but broken up
54		426.00										
		54.10					J,PL,R					
							J,PL,R-Fe					
							J,C,SM-CL-intact					
							J,PL,R					
							J,I,R-Fe					
							J,PL,R					
56							J,ST,R					
							J,I,R-CL					
							J,I,SM					
	56.9-56.9 ft. Collapse, infilling clay						J,PL,SM-CL					Numerous intact, very small, clay filled, irregular fractures 54.7-60.3 ft. Not mapped on graphic log
							J,I,R					
		4	100%				J,I,R					
	57.4-57.5 ft. Infilled fraction						J,I,R					
	57.6-59.8 ft. Solutioned, infilled with limestone fragments, glauconitic clay, sand						J,PL,SM-Fe					
58							J,PL,SM					
							J,I,R					
							J,I,R					
							J,I,SM,CL					
							J,PL,R					
	59.6-80.8 ft. Fresh to moderately weathered, thinly bedded, light olive gray (5Y 6/1), medium crystalline, extremely weak to medium strong, LIMESTONE, (ST. LOUIS FORMATION)						J,PL,R-CL					
60		421.80					J,PL,SM-CL					
		60.30					J,I,R					
							J,I,R					
	61.8-62.4 ft. Collapse filled with limestone fragments, clay and sand						J,I,R					
62		5	98%				J,PL,R					
							J,C,VR					
							J,I,R					
64												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-102-SS

Sheet 3 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1088087.7
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	ROCK TYPE										SW FR, MW, HW, CW	R6, R5, R4, R3, R2, R1	R1: 30; R2: 150; R3: 300; R4: 600; R5: 1500; R6		
	59.6-60.8 ft. Fresh to moderately weathered, thinly bedded, light olive gray (5Y 6/1), medium crystalline, extremely weak to medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,R						
66	64.0-65.4 ft. Collapse fraction infilled with clay, limestone fragments, sand			5	98%				J,I,R-SM						Numerous very small intact, clay and sand filled fractures 65.5-68.6 ft. Not mapped
	67.3-67.4 ft. Clay, sand and limestone fragment infilled fracture								J,I,R						
	67.9-68.0 ft. Clay and limestone framgent infilled fracture								J,I,R						
68									J,I,R-CL and sand filled						
			413.50						J,I,R-intact						
			68.60						J,I,R-CL						
									J,I,R-calcite filled						
									J,PL,R						
70	70.1-70.5 ft. Collapse infilled with limestone fragments, black clay, pyrite crystals, sand								J,I,R						
									J,C,SM						
									J,C,R						
	71.3-71.7 ft. Breccia filled zone, pyrite, limestone fragments, black clay infilling								J,I,R-Fe						
72	72.1-73.2 ft. Collapse zone			6	98%				J,I,R						
									J,I,R-CL (3)						Numerous small intact fractures not mapped 73.2-74.9 ft. Infilled clay, sand, limestone fragments
74									J,I,R (2)						
									J,I,R						
			407.20												
			74.90												
76									J,I,R-calcite						
				7	99%				J,I,R-calcite						
78															
									J,I,R-calcite						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-102-SS

Sheet 4 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068087.7
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.9
INCLINATION: -90

ROCK TYPE
J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (HT, 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	80.3-80.5 ft. Solutioned rock, infilled with limestone fragments, clay		401.30					0	J,I,R						
	80.8-82.3 ft. Moderately weathered, interbedded, light gray (N7), weak, SILTY CLAYSTONE, (ST. LOUIS FORMATION) Cherty		80.80					30	J,I,R						
82			399.80					60	J,I,R						
	82.3-84.0 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1), finely cyrstalline, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)		82.30	7	99%			90	J,I,R						
			398.10					0	J,PL,SM						
84	84.0-84.4 ft. Slightly weathered, thinly bedded, very light gray (N8), fine grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION)		84.00 397.70 84.40					30	J,PL,SM (2)						
			397.50					60	J,PL,SM						
	84.4-87.0 ft. Slightly weathered, thinly bedded, dark gray (N3) to medium gray (N5), weak, CLAYSTONE and SILTY CLAYSTONE, (ST. LOUIS FORMATION) Carbonaceous		84.60					90	J,I,R						
86			395.10					0	J,PL,SM (3)						
	87.0-89.9 ft. Slightly weathered to fresh, light brownish gray (5YR 6/1), microcrystalline, medium strong, CRYSTALLINE LIME -STONE, (ST. LOUIS FORMATION) Upper 1 ft. and lower 3 in. bioturbated, pyrite mineralization		87.00	8	100 %			30	J,PL,SM-CL						
88			392.20					60	J,PL,SM-CL						
			392.20					90	J,I,SM-CL						2/14/95 @ 14:25 Complete drilling
90	End of Record of Drillhole at 89.9 ft.		89.90												
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

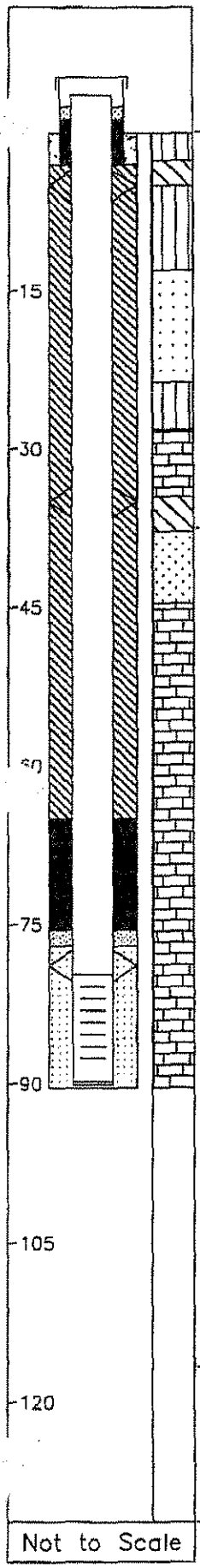
LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

Well No. PZ-102-SS

Boring No. X-Ref: PZ-102-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1088088 ft. Easting: 516888 ft.

Elevation Ground Level 482.1 ft. NGVD

Top of PVC Casing 483.85 ft. NGVD

Drilling Summary:

Total Depth 90.4 ft.

Borehole Diameter 10 1/4 in. (0.0-37.0 ft.) 5 7/8 in. (37.0-90.4 ft.)

Casing Stickup Height 1.80 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 In. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/13/95	15:21	2/13/95	14:25
Schramm Rotary	3/12/95	12:45	3/12/95	13:45
Geophys.Logging:				
Casing:	3/12/95	13:40	3/12/95	13:50
Filter Placement:	3/12/95	13:55	3/12/95	14:10
Cementing:				
Development				
Bentonite Grout	3/12/95	14:15	3/12/95	14:30
Bentonite Seal	3/12/95	14:30	3/12/95	15:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.80	-	79.70	C1	483.85	-	402.35
79.70	-	89.50	S1	402.35	-	392.55
89.50	-	90.83	C2	392.55	-	391.22

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 77.0-90.4 ft.

Filter Pack: Less than 50 mesh Silica Sand, 75.5-77.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-65.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 65.0-75.5 ft.

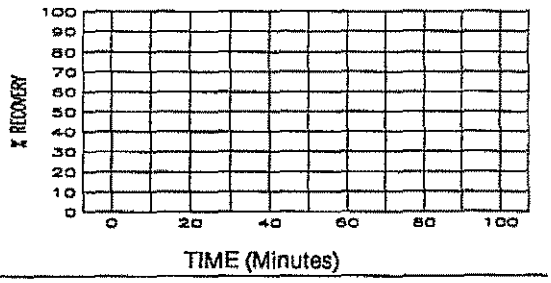
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ102SS

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO. 115088	DATE RECEIVED
ROUTE	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	CROSS REFERENCE NO.
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: AZ-102-55	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-341-3710	
ADDRESS: 1338 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL (SHOW LOCATION IN SECTION PLAT)

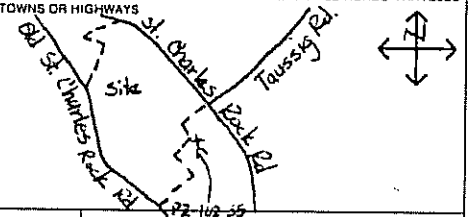
COUNTY: ST. LOUIS
ELEVATION: 482.0
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

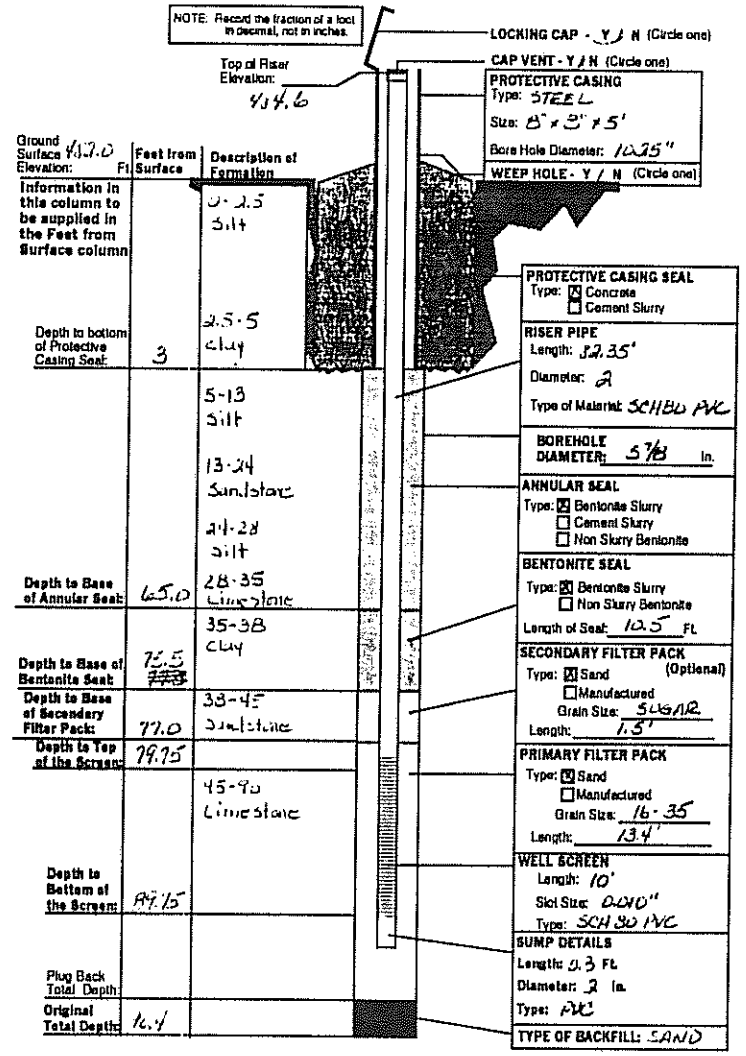
LAT. 38 ° 46 ' 02 " LONG. 90 ° 26 ' 27 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches.



MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS: ☐ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 3 TOTAL ☐ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS

SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-12-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM DATE: 4-11-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM DATE: 4-11-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger		BORING NO. PZ-102R-SS
			SHEET 1 OF 3
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:		
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		START / FINISH
	WATER LEVEL		TIME 8:30 / TIME 10:45
	TIME		
	DATE		DATE 6/15/95 / DATE 6/15/95
NORTHING: 1068131.86 DATUM EASTING: 516858.81 ELEVATION 484.5	CASING DEPTH		

DRILL RIG CME 75 - TRUCK MOUNT | SURFACE CONDITIONS Flat, grass covered area

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	5 5 5	1.5'/2.0' (75%)			(0.0-6.0 ft.) Firm, dark yellowish brown (10YR 4/2), CLAYEY SILT, trace organics (fine roots), NR, damp, (CL-ML), (TOPSOIL)	SP 1	
2	4 5 5	1.8'/2.0' (90%)				SP 2	
3							
4	3 4 5	1.8'/2.0' (90%)			@ 4.0 ft., color changes to moderate yellowish brown (10YR 5/4)	SP 3	
5							
6	4 4 5	1.5'/2.0' (75%)			(478.5) 6.0 (6.0-14.0 ft.) Loose, mottled, moderate yellowish brown (10YR 5/4) to pale yellowish brown (10YR 6/2), SILT, NR, damp, (ML), (LOESS)	SP 4	
7							
8	5 5 5	1.4'/2.0' (70%)				SP 5	
9							
10	4 5 6	1.5'/2.0' (75%)			@ 10.0 ft., Silt becomes compact	SP 6	
11	9						
12	3 5 8	1.8'/2.0' (90%)				SP 7	
13	11						
14	6 6 8	2.0'/2.0' (100%)			(14.0-17.8 ft.) Compact, light olive gray (5Y 6/1), SILT, trace iron staining, NR, damp, (ML), (LOESS)	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

DATE 7/14/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ102RSS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger		PZ-102R-SS
			SHEET 2 OF 3
	SAMPLING METHOD:		DRILLING
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		START TIME 8:30 / FINISH TIME 10:45
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		
NORTHING: 1068131.86 DATUM EASTING: 516858.81 ELEVATION 484.5	WATER LEVEL / TIME / DATE / CASING DEPTH		DATE 6/15/95 / DATE 6/15/95
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Flat, grass covered area		
ANGLE BEARING			
SAMPLE HAMMER			

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

DATE 7/14/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ102RSS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	3 4 5 8	1.8' 2.0' (90%)			(14.0-17.8 ft.) Compact, light olive gray (5Y 6/1), SILT, trace iron staining, NR, damp, (ML), (LOESS)	SP 8	
17					From 17.0-17.8 ft. Silt becomes wet	SP 9	
					(466.7) 17.8		
18	9 9 6 10	1.6' 2.0' (80%)			(17.8-22.7 ft.) Compact, pale yellowish brown (10YR 6/2), Fine SAND, trace Silt, trace iron oxide staining, NR, dry, (SP), (ALLUVIUM)	SP 10	
19							
20	4 6 7 9	1.5' 2.0' (75%)				SP 11	
21							
22	4 4 8 6	1.8' 2.0' (90%)					
					(461.8) 22.7		
23					(22.7-24.0 ft.) Compact, pale yellowish brown (10YR 6/2), Fine SANDY SILT, NR, damp, (ML), (LOESS)	SP 12	
24	5 6 6 6	1.6' 2.0' (80%)			(24.0-28.0 ft.) Compact, mottled moderate yellowish brown (10YR 5/4) to light olive gray (5Y 6/1), SILT, some iron oxide staining, NR, damp, (ML), (LOESS)	SP 13	
25							
26	5 3 5 8	1.8' 2.0' (90%)			@ 26.0 ft. color changes to olive gray (5Y 4/1) and Silt becomes moist	SP 14	
27							
28	4 6 10 10	2.0' 2.0' (100%)			(28.0-30.8 ft.) Stiff, olive gray (5Y 4/1) CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP 15	
29					@ 29.6 ft., thin silty fine sand seam, damp (<1 in. thick)		

LAIDLAW WASTE BYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-102R-SS
		SHEET 3 OF 3
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START TIME 8:30 DATE 6/15/95; FINISH TIME 10:45 DATE 6/15/95
NORTHING: 1068131.86 DATUM EASTING: 516858.81 ELEVATION 484.5	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Flat, grass covered area	
ANGLE BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	5 5 9 14	1.8" 2.0" (90%)			(28.0-30.8 ft.) Stiff, olive gray (5Y 4/1) CLAYEY SILT, NR, moist, (CL-ML), (LOESS) (453.7) 30.8 (30.8-32.0 ft.) Compact, olive gray (5Y 4/1), SILT, NR, moist, (ML), (LOESS) (452.5) 32.0	SP (16)	
32 33	47 44 26 27	1.2" 2.0" (60%)			(32.0-35.0 ft.) Very dense, light olive gray (5Y 6/1), fine GRAVEL and SILTY f-c SAND, trace pieces of lignite, NR, wet, (GP), (WEATHERED BEDROCK)	SP (17)	@ 32.0 ft, first water encountered overlying bedrock
34 35	16 50/2"	0.4" 1.0" (40%)			(449.5) 35.0 End of Soil Borehole Log at 35.0 ft. See PZ-102R-SS Record of Drillhole for rock descriptions	SP (18)	
36 37 38 39 40 41 42 43 44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 7/14/95

JOB NO.: 943-2848

FILENAME: PZ102RSS

RECORD OF DRILLHOLE PZ-102R-SS

Sheet 1 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/15/95 - 6/16/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068087.67
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.97
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: Dip wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-35.0 ft. See Soil Borehole Log PZ-102R-SS		447.10												
34															
36	35.0-37.0 ft. 35.00 Highly weathered, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		35.00 445.90	1	100%				J,I,R (6)						6/15/95 @ 11:00 Began coring Highly broken rock due to weathering and drilling
38	37.0-55.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		36.20	2	97%				J,I,R (6) J,PL,SM J,I,R (3) J,I,R (2) J,I,R,CL (2)						
40			442.60 39.50						B,I,R (2) J,I,R,CL (2)						6/15/95 @ 11:50 End Run 2
42									J,I,R (4) J,I,R J,I,R,CL J,I,R (4) J,I,R (3)						
44				3	94%				J,I,R (5) J,I,R,CL J,I,R (2)						
46									J,I,R,CL (3) J,PL,SM J,I,R (4)						
48									J,I,R,CL (4) J,I,R (2) J,I,R,CL (3)						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-102R-SS

Sheet 2 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/15/95 - 6/16/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068087.67
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.97
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
FL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

Depth Scale (Feet)	ROCK TYPE DESCRIPTION	Graphic Log	ELEV / DEPTH (FT)	Run No.	Core Recovery	RQD (80 60 40 20)	Fractures per foot (2 4 6 8 10)	Discontinuity Data: Dip wrt Core Axis (0 30 60 90)	Type and Surface Description	Graphic Log	Weathering Index (SW MW HW CW FR)	Strength Index (R6 R5 R4 R3 R2 R1)	Point Load Index (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	Test Orientation	NOTES WATER LEVELS INSTRUMENTATION
48	37.0-55.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			3	94%				B,I,R,CL						
			433.20						B,I,SM,CL						6/15/95 @ 13:45 End Run 3 Core loss possibly due to wash out of clay seams in joints
			48.90												
			432.60												
50			49.50						B,I,R (2)						
									J,I,R-intact						
									J,I,SM						
									B,PL,SM						
									J,I,R (2)						
52									J,I,R						
				4	100 %				B,I,R						
									B,I,R						
54									J,I,R						
									J,I,R (2)						
			426.30												6/15/95 @ 15:00 End Run 3
56	55.8-61.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		55.80						B,I,R						
	55.8-56.1 ft. Chert layer														
				5	100 %				B,I,R						
58	57.8-58.0 ft. Hard, greenish gray (5G 6/1), Siltstone layer								B,I,R (2)						
									J,I,R-intact						
			422.60						J,I,R						
			59.50						J,I,R-intact						6/15/95 @ 16:15 End Run 5 Stop drilling for the day 6/16/95 @ 7:15 Began Run 6
60															
									B,PL,SM,CL (3)						
	61.3-70.4 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic			6	100 %				B,I,R (3) J,PL,SM,Fe						
62									J,PL,SM (2)						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-102R-SS

Sheet 3 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/15/95 - 6/16/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068087.67
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 518887.97
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R6 1500, R5 600, R4 300, R3 150, R2 30, R1)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	61.3-70.4 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic								B,PL,SM						
66									B,PL,SM,CL						
				6	100 %										
68									J,PL,SM						
									B,PL,SM (2)						
			412.60												
70			69.50						B,I,SM						6/16/95 @ 8:25 End Run 6
	70.4-75.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic								B,I,R						
72				7	100 %										
									B,I,SM						
74	@ 74.2 ft. Stiff, dark greenish gray (5G 4/1), clay seam, (~1/2 in. thick) 75.2-76.0 ft. Fresh, thinly bedded, medium bluish gray (5B 5/1), micro-crystalline, very strong, Silicified Limestone, (ST. LOUIS FORMATION)								J,PL,SM,CL						
			406.90						B,PL,SM						6/16/95 @ 9:15 End Run 7
			75.20						J,I,R						
76	408.10														
	76.0-77.4 ft. Fresh, medium bedded, brownish gray (5YR 4/1), microcrystalline, strong, DOLOMITE, (ST. LOUIS FORMATION) Moderately porous, (open vugs <1 mm.)								B,I,SM						
	404.70														
	77.4-88.6 ft. Fresh, very thinly bedded, light olive gray (5Y 6/1), very fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some very thinly laminated shaley partings		77.40						J,PL,SM						
78				8	98%				J,PL,SM						
									J,I,R						
80									J,I,R						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-102R-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/15/95 - 6/16/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1059087.67
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.97
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	ROCK TYPE 77.4-88.6 ft. Fresh, very thinly bedded, light olive gray (5Y 6/1), very fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some very thinly laminated shaley partings								B,PL,SM						
82				8	98%				J,I,R B,I,R J,I,R						
84			398.10 84.00												6/16/95 @ 12:00 End Run 8
86									J,I,SM B,I,SM J,I,R						
88				9	100%				J,I,R (2)						
	393.50														
	88.6-90.0 ft. Fresh, medium bedded, medium dark gray (N4), very weak, CLAYSTONE, (ST. LOUIS FORMATION)														
	392.10		392.10												6/16/95 @ 15:00 Completed drilling
90	End of Record of Drillhole at 90.0 ft.		90.00												
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

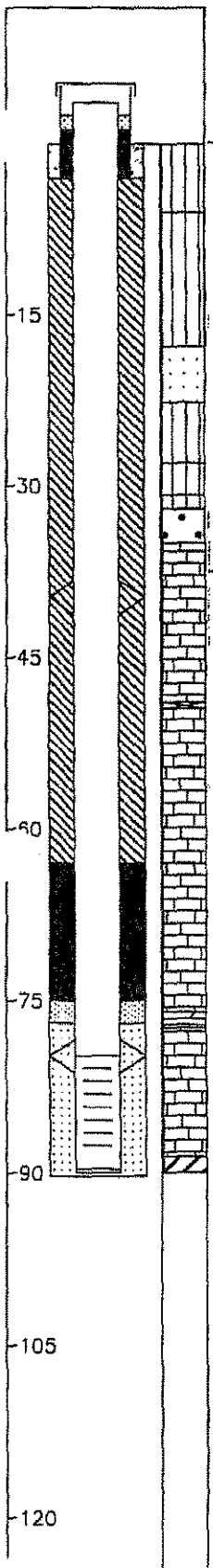
LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

Well No. PZ-102R-SS

Boring No. X-Ref: PZ-102R-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068132 ft. Easting: 516859 ft.

Elevation Ground Level 484.5 ft. NGVD

Top of PVC Casing 485.62 ft. NGVD

Drilling Summary:

Total Depth	90.3 ft.
Borehole Diameter	10 1/4" (0.0-35.0') 5 7/8" (35.0-90.3')
Casing Stickup Height	1.12 ft.
Driller	Layne-Western St. Louis, MO
Rig	CME 75, Schramm Portadrill T660H
Bit(s)	6 1/4" ID Hollow Stem Auger Bit, NX Core, 5 7/8" Button Bit for Reaming
Drilling Fluid	Auger-None, NX Core Water, Air Rotary
Protective Casing	8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	6/15/95	5:30	6/16/95	13:00
Schramm Rotary	6/18/95	13:00	6/18/95	13:45
Geophys.Logging:				
Casing:				
Filter Placement:	6/18/95	13:45	6/18/95	14:30
Cementing:				
Development				
Bentonite Grout	6/18/95	14:50	6/18/95	15:15
Bentonite Seal	6/18/95	14:35	6/18/95	14:55

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.12	-	79.83	C1	485.62	-	404.67
79.83	-	89.63	S1	404.67	-	394.87
89.63	-	89.96	C2	394.87	-	394.54
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 77.0-90.3 ft.

Filter Pack: Less than 50 mesh Silica Sand, 75.0-77.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-63.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 63.0-75.0 ft.

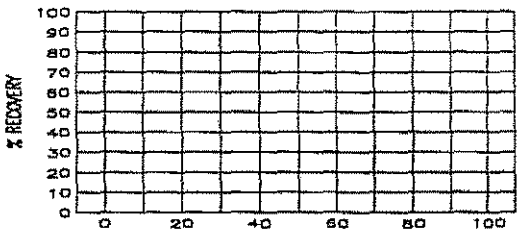
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ102RSS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122513	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
Laidlaw Bridgeton Sanitary Landfill	P2-102-R-SS

SITE ADDRESS	CITY	STATE	ZIP CODE
St. Charles Rock Rd.	Bridgeton	MO	63044

NAME	TELEPHONE
Laidlaw Waste Systems, Inc.	314-741-3710

ADDRESS	CITY	STATE	ZIP CODE
1938 N. Broadway	St. Louis	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

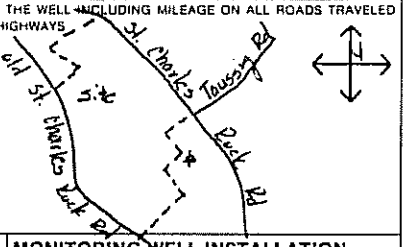
COUNTY St. Louis
ELEVATION 484.46
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38° 46' 01" LONG. 90° 26' 27"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
Layne Western Co, Inc.

DRILLING CONTRACTOR'S NAME
Layne Western Co, Inc.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
485.58

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 2 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-18-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Richard P. Vogt

PERMIT NUMBER	DATE
001356 WIII	7-07-95

SIGNATURE (DRILLING CONTRACTOR) Richard P. Vogt

PERMIT NUMBER	DATE
001356 WIII	7-07-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 485.58

LOCKING CAP - Y / N (Circle one) Y
CAP VENT - Y / N (Circle one) Y
PROTECTIVE CASING Type: STEEL Size: 8" x 5' Bore Hole Diameter: 10¼"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 484.46 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-1' Silt
Depth to bottom of Protective Casing Seal:	3.0	
		17-22 Sand
		22-32 Silt
		32-35 Sand
Depth to Base of Annular Seal:	63.0	
		35-75 Limestone
Depth to Base of Bentonite Seal:	75.0	75-77
Depth to Base of Secondary Filter Pack:	77.0	Dolomite
Depth to Top of the Screen:	79.4	
		77-87 Limestone
		87-90.5 Shale
Depth to Bottom of the Screen:	89.4	
Plug Back Total Depth		
Original Total Depth:	90.3	

PROTECTIVE CASING SEAL Type: ☒ Concrete ☐ Cement Slurry
RISER PIPE Length: 83' Diameter: 3" Type of Material: SCH 80 PVC
BOREHOLE DIAMETER: 5⅞ In.
ANNULAR SEAL Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite
BENTONITE SEAL Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite Length of Seal: 12 Ft.
SECONDARY FILTER PACK (Optional) Type: ☐ Sand ☐ Manufactured Grain Size: < 50 Length: 2'
PRIMARY FILTER PACK Type: ☒ Sand ☐ Manufactured Grain Size: 16-35 Length: 13.3'
WELL SCREEN Length: 10' Slot Size: 0.010 Type: SCH 80 PVC
SUMP DETAILS Length: 0.3 Ft. Diameter: 3 In. Type: PVC
TYPE OF BACKFILL: SAND

DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK/OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-103-SS
		SHEET 1 OF 4
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
NORTHING: 1067660.40 DATUM EASTING: 516723.54 ELEVATION 477.8	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 07:30 / TIME 12:00 DATE 2/21/95 / DATE 2/23/95
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1					(0.0-2.0 ft.) No samples collected due to coarse gravel placed for temporary road		
2					(475.8) 2.0		
2	1 2 3 4	1.6' / 2.0' (80%)			(2.0-16.0 ft.) Firm, dusky yellowish brown (10YR 2/2), CLAYEY SILT, trace fine Sand, NR, damp, (CL-ML), (LOESS)	SP (2)	
4	2 4 4 4	1.3' / 2.0' (65%)			@ 4.0 ft., color changes to pale yellowish brown (10YR 6/2) with moderate amount of iron oxide staining	SP (3)	
6	1 2 2 4	1.3' / 2.0' (65%)				SP (4)	
8	1 2 3 4	1.8' / 2.0' (90%)				SP (5)	
10	2 3 5 6	2.0' / 2.0' (100%)			@ 10.0 ft., intermittent moist zones (<2 inches thick)	SP (6)	
12	1 2 2 3	1.7' / 2.0' (85%)			Below 12.0 ft., increase in iron oxide staining (~50%)	SP (7)	
14		1.8' / 2.0' (90%)				SH (8)	

LOGGED BY B. TILTON

DATE 2/21/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ103SS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-103-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 4
NORTHING: 1067660.40 DATUM EASTING: 516723.54 ELEVATION 477.8	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START: TIME 07:30, DATE 2/21/95; FINISH: TIME 12:00, DATE 2/23/95
DRILL RIG: CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE: BEARING:		
SAMPLE HAMMER		

DRILLING CONTR: LAYNE-WESTERN

LOGGED BY: B. TILTON DATE: 2/21/95 CHK'D BY: W. HERST

JOB NO.: 943-2848 FILENAME: PZ103SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16					(2.0-16.0 Ft.) Firm, dusky yellowish brown (10YR 2/2), CLAYEY SILT, trace fine Sand, NR, damp, (CL-ML), (LOESS) (461.8) 16.0	SH 8	
16	7 11 10 11	1.3'/2.0' (65%)			(16.0-20.0 Ft.) Loose to compact yellowish orange (10YR 6/6), SILTY fine SAND, NR, damp, (SM), (ALLUVIAL)	SP 9	
18	1 4 3 8	1.1'/2.0' (55%)			@ 18.0 ft., silty sand becomes moist	SP 10	
20					(457.8) 20.0		
20	2 6 10 10	2.0'/2.0' (100%)			(20.0-22.0 Ft.) Stiff to very stiff, pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4) CLAYEY SILT with silty fine sand layers (<2 inches), WR, moist, (CL-ML), (ALLUVIUM)	SP 11	
22	1 3 6 7	1.1'/2.0' (55%)			(22.0-26.0 Ft.) Stiff, medium dark gray (N4), CLAYEY SILT, some thin silty fine sand zones (<1 inch), SR, damp to moist, (CL-ML), (ALLUVIUM)	SP 12	
24		0.4'/2.0' (20%)				SH 13	
26	15 47 50/5"	0.9'/2.0' (45%)			@ 26.0-27.5 Ft., limestone boulder or layer encountered, first water identified in borehole	SP 14	Wet zone appears to be isolated
28	2 6 7 10	1.4'/2.0' (70%)			(28.0-32.0 Ft.) Stiff, greenish gray (5G 6/1) CLAYEY SILT, trace to little Fine Sand, NR, damp, (CL-ML), (ALLUVIUM)	SP 15	
29							

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	6.25 inch I.D. Hollow Stem Auger
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-103-SS
SHEET	3 OF 4
DRILLING START / FINISH	TIME 07:30 / 12:00 DATE 2/21/95 / 2/23/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DATUM	NORTHING: 1067660.40 EASTING: 516723.54 ELEVATION 477.8
DRILL RIG	CME 75 - TRUCK MOUNT
ANGLE / BEARING	
SAMPLE HAMMER	
SURFACE CONDITIONS	

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	2 4 7 9	1.5'/2.0' (75%)			(28.0-32.0 ft.) Stiff, greenish gray (5G 6/1) CLAYEY SILT, trace to little fine Sand, NR, damp, (CL-ML), (ALLUVIUM) @ 31.6 ft, moderate reddish brown (10R 4/6) CLAYEY medium SAND layer (~1/2 inch) (445.8) 32.0	SP (16)	
32	2 4 5 11	1.6'/2.0' (80%)			(32.0-47.5 ft.) Stiff to very stiff, pale yellowish green (10G 7/2) SILTY CLAY, trace to little medium Sand, NR, damp, (CL)	SP (17)	
33					@ 33.4-33.8 ft, clayey medium grained sand layer, damp, (SC)		
34	2 7 8 11	1.8'/2.0' (90%)				SP (18)	
35							
36	1 3 7 11	1.5'/2.0' (75%)			@ 36.0 ft, color varies from very pale orange (10R 8/2) to moderate yellowish brown (10R 5/4) to pale green (5G 7/2), trace fine gravel	SP (19)	
37							
38	3 4 6 15	2.0'/2.0' (100%)				SP (20)	
39							
40	3 5 20 11	2.0'/2.0' (100%)				SP (21)	
41							
42	9 19 50/5"	1.0'/2.0' (50%)				SP (22)	
43					@ 43.0 ft, extremely weathered limestone boulder or layer encountered		
44	3 36 24 50/2"	0.5'/2.0' (25%)				SP (23)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. FILTEN

DATE 2/21/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ103SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	6.25 inch I.D. Hollow Stem Auger					PZ-103-SS
						SHEET 4 OF 4
	SAMPLING METHOD:					DRILLING
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					
	WATER LEVEL					TIME / TIME
	TIME					07:30 / 12:00
	DATE					DATE / DATE
NORTHING: 1067660.40 DATUM EASTING: 516723.54 ELEVATION 477.8	CASING DEPTH					2/21/95 / 2/23/95

DRILL RIG CME 75 - TRUCK MOUNT | SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL		SAMPLER TYPE	REMARKS
46	4 6 8 50/3"	2.0" 2.0" (100%)			(32.0-47.5 ft.) Stiff to very stiff, pale yellowish green (10G 7/2) SILTY CLAY, trace to little medium Sand, NR, damp, (CL) @ 45.5 ft., weathered limestone boulder or layer encountered @ 47.1 ft., thin silty fine sand layer (~1 inch), moist		SP 23 SP 24	
47						(430.3) 47.5		
48	23 5 2 48	1.8" 2.0" (90%)			(47.5-48.0 ft.) Hard, dark yellowish orange (10R 6/6), weathered SILTY CLAYSTONE, NR, damp, (CH) @ 48.0 ft., weathered limestone boulder encountered (48.0-50.0 ft.) Hard, moderate yellowish brown (10YR 5/4) SILTY CLAY, some weathered limestone pieces (<1 inch), WR-SR, moist, (CL)	(429.8) 48.0 (427.8) 50.0	SP 25	
49								
50					End of Soil Borehole Log at 50.0 ft. See PZ-103-SS Record of Drillhole for rock descriptions			
51								
52								
53								
54								
55								
56								
57								
58								
59								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 2/21/95

JOB NO.: 943-2848

FILENAME: PZ103SS

RECORD OF DRILLHOLE PZ-103-SS

Sheet 1 of 7

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/21/95-2/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067660.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD 80 60 40 20	FRACTURES PER FOOT 2 4 6 8 10	DISCONTINUITY DATA: DIP wrt CORE AXIS 0 30 60 90	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500	TEST ORIENTATION: R5 R6	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-50.0 ft. See Soil Borehole Log PZ-103-SS 50.0-51.5 ft. No samples collected														
50															
	426.30		426.30												
	51.5-62.7 ft. Moderately weathered, medium bedded, yellowish gray (5Y 8/1), medium crystalline, weak to medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites with iron oxide staining 53.4-53.9 ft. Pinkish gray (5YR 8/1), siltstone layer 54.7 ft. Oxidized pyrite nodules (<3 mm.) 56.4 ft. Vertical calcite filled vein (4 in.) 57.0 ft. Calcite filled vein at 90 degrees (1 in. thick)		51.50						Core Loss						Core loss possibly from 51.5-52.7 ft. in highly fractured rock and clay zones on top of bedrock
52															
54									J,I,R						
56				1	84%										
58									J,I,R						
			418.80						J,I,R,CL						
			58.00												59.0-60.0 ft. Five breaks that had been spun
60									J,I,R (2)						
				2	69%				J,PL,R						
62	62.7-62.9 ft. Extremely weak, greenish gray (5GY 6/1), glauconite clay layer		414.90												
	62.9-71.0 ft. Highly weathered, medium bedded, moderate yellowish brown (10YR 5/4), fine grained, weak, ARGILLACEOUS SANDSTONE, (ST. LOUIS FORMATION)		62.90												Core loss in soft formation or possible open void
64									Core Loss						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/21/95-2/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067880.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	62.9-71.0 ft. Highly weathered, medium bedded, moderate yellowish brown (10YR 5/4), fine grained, weak, ARGILLACEOUS SANDSTONE, (ST. LOUIS FORMATION)								Core Loss						
			411.80												
66	66.0-66.5 ft. Highly weathered, dark yellowish orange (10YR 6/6) extremely weak, SILTSTONE layer		66.00 411.30	2	69%										Core loss in soft formation or possible open void
			66.50						Core Loss						
68															
			408.80												
	69.6 ft. Very soft, dark yellowish orange (10YR 6/6), clay layer (2 in. thick)		69.00												
70				3	100%										
			406.80												
	71.0-71.7 ft. Slightly weathered, medium bedded, dark greenish gray (5GY 4/1), very fine crystalline, medium strong, DOLOMITIC LIMESTONE, moderate porosity, (ST. LOUIS FORMATION)		71.00 406.10						J,PL,SM						Run 3 stopped short, bit plugged off in claystones
			71.70						J,ST,SM						
			405.80						J,PL,SM						
72			72.00												2/21/95 @ 16:00 Stopped drilling in Run 3
	71.7-78.7 ft. Highly weathered, thinly bedded, medium dark gray (N4) to grayish black (N2), very weak, CLAYEY SILTSTONE, (ST. LOUIS FORMATION) Some disseminated pyrite, some thin layers of claystone (<3 in.)														2/22/95 @ 7:30 Began Run 4
74									B,I,R						
									B,I,R						
									J,I,R						
			402.20						J,PL,SM,CL						
	75.6-76.3 ft. Brownish gray (5YR 4/1), argillaceous LIMESTONE layer		75.60	4	100%				J,PL,SM						
76			401.50												
			76.30						J,PL,SM						
									J,PL,SM-Intact						
									J,I,R (2)						
78									B,I,R						
									B,I,R						
	78.7-87.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		399.10 78.70												
			398.60												
			79.20												
				5	100%										
80			397.80												
			80.00												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

Sheet 3 of 7

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/21/95-2/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067560.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 518723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R5 R4 R3 R2 R1 R0)	POINT LOAD INDEX (psi) (R2 30, R3 150, R4 300, R5 600, R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
	ROCK TYPE		397.80			80 60 40 20	2 4 6 8 10	0 30 60 90							
80	80.0-81.2 ft. Thinly laminated, olive gray (5Y 4/1), CLAYEY SILTSTONE layer		80.00												
			396.60												
	78.7-87.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		81.20												
82				5	100 %				J,PL,SM,CL (2)						
84															
86			391.80												9:45 Stopped Run 5 short, bit plugged off
			86.00						B,PL,SM						
	87.3-87.5 ft. Soft, greenish gray (5GY 6/1), glauconite Clay layer								J,I,R,CL						
88	87.5-103.8 ft. Fresh, thinly bedded, light olive green (5Y 6/1) to olive gray (5Y 4/1), very fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Trace disseminated pyrite								J,I,R (2)						
									J,PL,SM						
	89.0-91.5 ft. Moderate porosity, open vugs (<3 mm.), glauconite in some vugs (<1%) 90.4 ft. Thin silicified zone (~1/2 in.)			6	98%										
90									J,PL,SM						
92															
									J,PL,SM,CL						
94			383.30												
			94.50						J,I,SM (2)						
				7	98%										
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/21/95-2/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067660.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	87.5-103.8 ft. Fresh, thinly bedded, light olive green (5Y 6/1) to olive gray (5Y 4/1), very fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Trace disseminated pyrite							90	J,I,R						
								90	J,I,SM						
								90	J,I,R						
98								90	J,I,R						
								90	J,P,SM						
								90	J,P,SM						
								90	J,P,SM						
								90	B,I,SM,CL						
100				7	98%										
	101.3-103.6 ft. Moderate porosity, open vugs (<2 mm.)														
102															
			374.00												
104	103.8-105.6 ft. Freshly medium bedded, pale yellowish brown (10YR 6/2) to light brownish gray (5YR 6/1), medium crystalline, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)		103.80					90	J,U,SM						
			373.30												
			104.50					90	J,PL,R						
								30	J,PL,SM-healed with calcite						
			372.10												
108	105.6 ft. Brownish gray (5YR 4/1), Claystone layer, (~1 in. thick)		105.70												
	105.7-107.2 ft. Fresh, thickly bedded, olive gray (5Y 4/1), finely grained, strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)		370.60												
			107.20												
	107.2-109.6 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), finely crstalline, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Trace disseminated pyrite			8	100%			90	J,U,SM						
110	109.6-128.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), micro-crystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, some glauconite stringers							90	J,I,SM,CL						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

Sheet 5 of 7

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/21/95-2/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067660.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW HW, CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	112.0-113.5 ft. Becomes argillaceous 109.6-128.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), micro-crystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, some glauconite stringers			8	100 %	80 60 40 20	2 4 6 8 10	0 30 60 90	J,I,R,CL						
114			363.30												
			114.50						J,I,SM						
116									J,PL,SM						
									J,I,VR						
									J,PL,SM,CL						
118									J,PL,VR						
	119.2-124.0 ft. Thin chert zone generally less than 2 in. thick			9	100 %										
120	120.0-120.5 ft. Moderate siliceous								J,I,R,CL						
122									J,I,R,CL						
									J,I,SM,CL						
124			353.30												
			124.50												
	Two stylolites														
126				10	100 %				J,PL,SM (2)						
									J,P,SM						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/21/95-2/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067680.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128			349.40												
	128.4-133.9 ft. 128.40 Slightly weathered, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)														
130				10	108 #										
132															
			343.90												
134	133.9-136.5 ft. 133.90 Fresh, medium bedded, light olive gray (5Y 5/2), micro-crystalline to fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Trace disseminated pyrite, some thin veins of calcite (<1/4 in.)		343.50 134.30						J,PL,SM,CL						2/22/95 16:45 Stopped drilling on Run 10 2/23/95 7:40 Resumed drilling Measured water level at 52.15 ft. below ground surface
136									J,U,SM B,PL,SM						
			341.30												
	136.5-139.7 ft. 136.50 Slightly weathered, thickly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, ARENACEOUS DOLOMITE, (<1 in.), (ST. LOUIS FORMATION) Thin Limestone layers														
138				11	108 #										
			338.10												
	139.7-142.3 ft. 139.70 Slightly weathered, medium bedded, light olive gray (5Y 5/2), fine crystalline, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)								J,C,SM J,PL,SM J,I,R						
140															
142									J,I,R,CL						
			335.50												
	142.3-144.3 ft. 142.30 Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) 144.0-144.2 ft. Soft, grayish green (5G 5/2), glauconitic clay layer														Highly broken rock.
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

Sheet 7 of 7

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/21/95-2/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067860.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-Fe Oxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW HW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R6 1500, R5 600, R4 300, R3 150, R2 30, R1)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144			333.50	11	100	80 60 40 20	2 4 6 8 10	0 30 60 90	J,I,SM (2)						
	End of Record of Drillhole at 144.3 ft. 144.30		144.30												2/23/95 @ 9:00 Finish drilling corehole.
146															
148															
150															
152															
154															
156															
158															
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

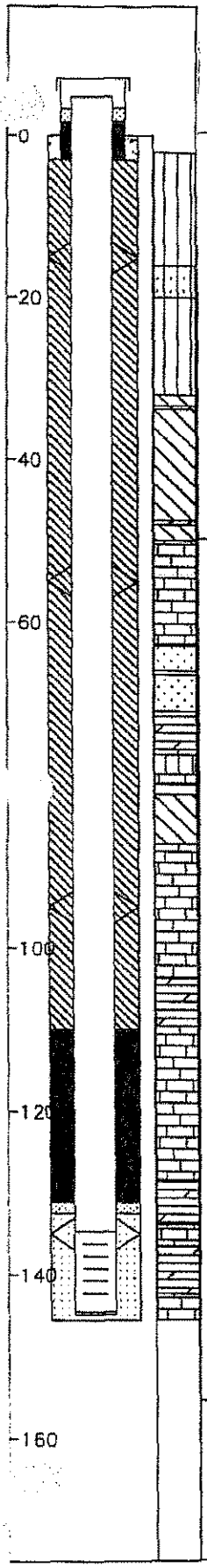
LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

Well No. PZ-103-SS

Boring No. X-Ref: PZ-103-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067660 ft. Easting: 516724 ft.

Elevation Ground Level 477.8 ft. NGVD

Top of PVC Casing 480.17 ft. NGVD

Drilling Summary:

Total Depth 145.5 ft.

Borehole Diameter 10 1/4 in. (0.0-51.0 ft.) 5 7/8 in. (51.0-145.5 ft.)

Casing Stickup Height 2.39 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/21/95	7:30	2/23/95	9:45
Schramm Rotary	2/26/95	9:30	2/26/95	11:20
Geophys.Logging:				
Casing:	2/26/95	11:20	2/26/95	11:40
Filter Placement:	2/26/95	11:45	2/26/95	12:00
Cementing:				
Development				
Bentonite Grout	2/26/95	13:30	2/26/95	14:30
Bentonite Seal	2/26/95	12:30	2/26/95	13:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.39	-	134.70	C1	480.17	-	343.08
134.70	-	144.50	S1	343.08	-	333.28
144.50	-	144.83	C2	333.28	-	332.95

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 132.5-145.5 ft.

Filter Pack: Less than 50 mesh Silica Sand, 131.1-132.5 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-35.0 ft. and 60.0-110.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 110.0-131.1 ft.

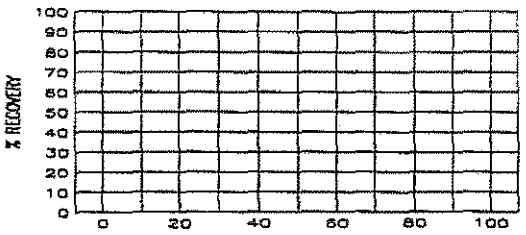
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Due to grout slurry lose above 60.0 ft., bentonite chips were placed from 35.0-60.0 ft. to seal borehole. The chips were hydrated at 1 ft. intervals during placement and were monitored with a weighted tape measure.

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ103SS

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 15083	DATE RECEIVED
ROUTE	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO
CHECKED BY	CROSS REFERENCE NO.
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-103-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-341-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL (SHOW LOCATION IN SECTION PLAT)

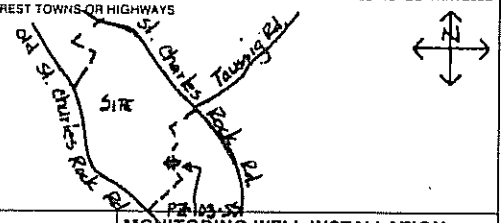
COUNTY: ST. LOUIS
ELEVATION: 477.78
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38 ° 45 ' 37 " LONG. 90 ° 26 ' 29 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 480.17

LOCKING CAP - (Y) / N (Circle one)
CAP VENT - (Y) N (Circle one)
PROTECTIVE CASING Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 477.78 Ft	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		0-15 Silt
Depth to bottom of Protective Casing Seal:	3	
		15-20 Sandy silt
		20-32 Silt
		32-51 Clay
		51-64 Limestone
Depth to Base of Annular Seal:	110.0	64-72 Sandy silt
		72-78 Shale
Depth to Base of Bentonite Seal:	131.1	78-87 Limestone
Depth to Base of Secondary Filter Pack:	132.5	87-111 Dolomite
Depth to Top of the Screen:	134.5	
		111-128 Limestone
		128-135 Dolomite
Depth to Bottom of the Screen:	144.5	135-137 Limestone
		137-143 Dolomite
Plug Back Total Depth		143-144.5 Limestone
Original Total Depth:	145.5	

PROTECTIVE CASING SEAL Type: (X) Concrete ( ) Cement Slurry
RISER PIPE Length: 136.67' Diameter: 2" Type of Material: SCH80 PVC
BOREHOLE DIAMETER: 5 7/8 In.
ANNULAR SEAL Type: (X) Bentonite Slurry ( ) Cement Slurry ( ) Non Slurry Bentonite
BENTONITE SEAL Type: (X) Bentonite Slurry ( ) Non Slurry Bentonite Length of Seal: 21.1 Ft.
SECONDARY FILTER PACK Type: (X) Sand (Optional) ( ) Manufactured Grain Size: SUGAR Length: 1.4'
PRIMARY FILTER PACK Type: (X) Sand ( ) Manufactured Grain Size: 20/40 Length: 13'
WELL SCREEN Length: 10' Slot Size: 0.010" Type: SCH80 PVC
SUMP DETAILS Length: 0.3 Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION: (X) ABOVE GROUND ( ) FLUSH MOUNT

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS: ( ) TOP OF RISER PIPE ( ) OTHER

DRILLING EQUIPMENT: (X) AIR ROTARY (X) AUGER TYPE 6¼ H.S.A. ( ) REVERSE ROTARY ( ) OTHER

CENTRALIZERS USED: (X) YES, AT 4 TOTAL ( ) STAINLESS STEEL ( ) OTHER ( ) NO

MULTIPLE CASED WELLS

SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 2-27-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256 WM | DATE: 4-11-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256 WM | DATE: 4-11-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1066993.15
DATUM EASTING: 516820.50 ELEVATION 482.3

DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-104-KS

SHEET 1 OF 3

					DRILLING START	DRILLING FINISH
WATER LEVEL						
TIME					15:40	17:58
DATE					DATE	DATE
CASING DEPTH					2/12/95	2/12/95

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE BEARING
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 5 4 4	1.6'/2.0' (80%)			(0.0-2.4 ft.) Stiff, dark yellowish brown (10YR 4/2), homogenous, CLAYEY SILT, rootlets, NR, moist, (ML-CL), (LOESS)	SP ①	2/12/95 - 15:40 Began drilling
2	2 2 2 2 2	1.2'/2.0' (60%)			(2.4-7.0 ft.) Soft to firm, dusky yellowish brown (10YR 2/2), homogenous, CLAYEY SILT, NR, moist, (ML-CL), (LOESS)	SP ②	
3							
4	2 3 3 3 3	1.5'/2.0' (75%)				SP ③	
5							
6		2.2'/2.0' (110%)				SH ④	
7					(7.0-15.4 ft.) Stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), homogenous, mottled CLAYEY SILT, NR, damp, (ML-CL), (LOESS)		
8	3 4 5 8	0.9'/2.0' (45%)				SP ⑤	
9							
10	3 4 5 7	1.1'/2.0' (55%)				SP ⑥	
11							
12	4 4 6 7	1.1'/2.0' (55%)				SP ⑦	
13							
14	3 5 8 9	1.2'/2.0' (60%)				SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 2/12/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ104KS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D. Hollow Stem Auger	PZ-104-KS
		SHEET 2 OF 3
	SAMPLING METHOD:	
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 15:40 / TIME 17:58
		DATE 2/12/95 / DATE 2/12/95
NORTHING: 1066993.15 DATUM EASTING: 516820.50 ELEVATION 482.3		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 2/12/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ104KS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL			SAMPLER TYPE	REMARKS
16		1.7'/2.0' (85%)			(7.0-15.4 ft.) Stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), homogenous, mottled CLAYEY SILT, NR, damp, (ML-CL), (LOESS)	(466.9)	15.4	SH (8)	
17					(15.4-20.8 ft.) Compact, light gray (N7), homogenous, SILT, NR, dry, (ML), (LOESS)			SH (9)	
18	6	1.1'/2.0' (55%)							
19	5 6 8							SP (10)	
20	4	1.2'/2.0' (60%)							
21	4 6 8					(461.5)	20.8	SP (11)	
22	6	1.6'/2.0' (80%)			(20.8-22.4 ft.) Stiff, light olive gray (5Y 6/1), homogenous, CLAYEY SILT, SR, dry, (CL-ML), (LOESS)	(459.9)	22.4		
23	6 7 8				(22.4-23.31 ft.) Compact, pale yellowish brown (10YR 6/2), homogenous, SILTY coarse SAND, NR, dry, (SM), (ALLUVIUM)	(459.0)	23.3	SP (12)	
24	6	1.1'/2.0' (55%)			(23.31-24.8 ft.) Compact, light olive gray (5Y 6/1), homogenous, SILT, NR, dry, (ML), (ALLUVIUM)				
25	5 7 9					(457.5)	24.8	SP (13)	
26	2	1.3'/2.0' (65%)			(24.8-31.0 ft.) Compact to stiff, medium gray (N5), stratified very fine SAND and CLAYEY SILT, NR, dry, (SC), (ALLUVIUM)				
27	5 5 6							SP (14)	
28	4	1.6'/2.0' (80%)			@ 28.0 ft., 5-6 inch clayey silt layers, (0.5-2.0 inch fine SAND layers				
29	4 5 4							SP (15)	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
	4.25 inch I.D. Hollow Stem Auger					PZ-104-KS	
						SHEET	
	SAMPLING METHOD:					3 OF 3	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					15:40	17:58
	DATE					DATE	DATE
NORTHING: 1066993.15 DATUM EASTING: 516820.50 ELEVATION 482.3	CASING DEPTH					2/12/95	2/12/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL			SAMPLER TYPE	REMARKS
31	4 7 7 10	1.6'/2.0' (80%)			(24.8-31.0 Ft.) Compact to stiff, medium gray (N5), stratified very fine SAND and CLAYEY SILT, NR, dry, (SC), (ALLUVIUM)	(451.3)	31.0	SP (16)	
32	10 5 4 12	0.9'/2.0' (45%)			(31.0-33.1 Ft.) Compact, medium dark gray (N4), homogenous, f-m SAND, trace Silt and Clay, NR, moist, (SP), (ALLUVIUM) @ 28.0 ft., 6 inch clayey silt layer, (0.5-2.0 inch fine SAND layers	(449.2)	33.1	SP (17)	
34	6 17 28 52	1.6'/2.0' (80%)			(33.1-36.0 Ft.) Very stiff, light gray (N7), homogenous, SILTY CLAY, NR, dry, (CL), (WEATHERED BEDROCK)	(446.3)	36.0	SP (18)	
36					End of Soil Borehole Log at 36.0 ft. See PZ-104-KS Record of Drillhole for rock descriptions				
37									
38									
39									
40									
41									
42									
43									
44									

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER DATE 2/12/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ104KS

RECORD OF DRILLHOLE PZ-104-KS

Sheet 1 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/t CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 >600, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-36.0 ft. See Soil Borehole Log PZ-104-KS 36.0-38.0 ft. No samples collected														
34															
36															
38	444.30 38.0-84.7 ft. 38.00 Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		444.30 38.00						J,PL,SM J,PL,R (2)						5/22/95 @ 14:00 Began drilling
40				1	100 %				J,PL,R J,PL,R,CL J,PL,R,Fe						
42			439.30 43.00						J,PL,SM,CL J,PL,SM,CL J,P,R,CL J,I,R,Fe						5/22/95 @ 14:40 End of Run 1
44	44.9-45.0 ft. Clay layer 437.00 45.3-46.6 ft. Clay layer 435.70 46.60		45.30	2	100 %				J,I,R,Fe J,PL,R,Fe J,PL,R,CL						
46									J,PL,SM,CL J,I,R,CL						
48									J,C,R,Fe						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 2 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 518820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	38.0-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 5/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 48.0-54.5 ft. Stylolites common, very thinly bedded clay layers common								J,PL,SM,CL		SW FR MW HW CW	R5 R6 R4 R3 R2 R1	R1 10 R2 150 R3 300 R4 600 R5 1500 R6		
									J,PL,SM,CL (3)						
50				2	100 %				J,PL,SM,CL J,I,R						
52									J,PL,SM,CL						
			429.30						J,PL,SM,CL						5/22/95 @ 16:00 End of Run 2
			53.00												
	53.5-63.0 ft. Joints have approximately 1/2 in. of clay								B,PL,SM (3)						
54									J,I,R (4)						
									J,PL,SM,CL (7)						
56									J,PL,SM,CL (2)						
									J,PL,SM,CL (4)						
									J,PL,SM,CL (2)						
58				3	100 %				J,PL,SM,CL (4)						
									J,PL,SM,CL (4)						
60									J,I,R,CL J,PL,R						
									J,PL,SM,CL						
62	61.9-62.6 ft. Abundant argillaceous partings 62.6-62.7 ft. Clay layer								J,PL,SM,CL (2)						
			419.30												5/22/95 @ 17:00 End of Run 3
			63.00												
				4	100 %										
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 3 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 518820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	38.0-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM						
66	@ 65.6 ft. Chert layer														
	67.3-73.0 ft. Stylolites common								J,PL,SM,CL						
68				4	100 %				J,PL,SM						
									J,PL,SM,CL (2)						
70									J,PL,SM,CL						
72			409.30 / 73.00												5/22/95 @ 17:45 End of Run 4
	73.4-83.3 ft. Abundant argillaceous partings														
74									J,I,R						
									B,I,SM						
									J,PL,SM,CL						
76				5	100 %				J,PL,SM,CL						
									J,PL,SM,CL						
78									J,PL,SM,CL						
	79.1-79.2 ft. Clay layer								J,PL,SM,CL (2)						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 4 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 518820.50
INCLINATION: -90

J-Joint, F-Fault, B-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	38.0-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM,CL						
				5	100 %										
82			389.30												5/22/95 @ 18:30 End of Run 5 Ended drilling for the day 5/23/95 @ 7:25 Began drilling
			83.00												
84									J,I,R,CL						
	84.7-84.9 ft. Medium light gray (N6), fine grained, SANDSTONE layer, (ST. LOUIS FORMATION)								J,I,R,CL						
86	84.9-91.4 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), f-m crystalline, medium strong, LIMESTONE (ST. LOUIS FORMATION) Calcite filled fractures, clay filled fractures 86.3-86.6 ft. Clay layer			6	83%				J,I,SM-intact						
									J,I,VR						
									J,I,R,CL						
									J,I,R						
88									J,I,R,CL						
			392.90												
			89.40												
90									Core Loss						Core Loss, possible salt rock
			391.60												5/23/95 @ 8:30 End of Run 6
			90.70												
	390.90														
	91.4-91.9 ft. Slightly weathered, thinly bedded, medium gray (N5), fine grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION) Thickly laminated clay layers		91.40						B,PL,SM (2)						
92			390.40												
			91.90												
	91.9-103.0 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline to fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant argillaceous layers								J,I,R,CL						
				7	100 %										
94									J,I,R						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 5 of 24

PROJECT: LAIDLAW/PI-FS
PROJECT NO: 943-2849
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEP... SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	91.9-103.0 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline to fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant argillaceous layers								J,PL,R						
98				7	100 %				J,PL,R,CL						
			383.10												5/23/95 @ 9:00 End of Run 7
			99.20												
100															
	101.1-103.0 ft. Abundant chert														
102															
			379.30	8	80%										
	103.0-108.0 ft. Slightly weathered, thickly laminated, medium dark gray (N4), fine grained, very weak, SILTSTONE grades to sandy SILTSTONE with depth, (ST. LOUIS FORMATION)		103.00												
104															
106			376.20												
			106.10												Core Loss, soft rock
			374.50												5/23/95 @ 10:10 End of Run 8
			374.50												
			107.80						B,PL,SM,CL						
108	108.0-118.2 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites present								B,PL,SM,CL (5)						
									J,U,SM,CL						
110				9	100 %										
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW HW, CW R6	STRENGTH INDEX: R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	108.0-118.2 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites present			9	100 %				B,PL,SM,CL						
114			388.10 / 114.20												5/23/95 @ 10:40 End of Run 9
116															
118			384.10												
	118.2-119.8 ft. Slightly weathered, medium bedded, olive gray (5Y 4/1), medium grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)		118.20	10	100 %				J,PL,SM,CL						
			382.50												
120	119.8-121.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		119.80												
									J,PL,SM,CL						
122	121.7-123.2 ft. Fresh, medium bedded, light olive gray (5Y 6/1), m-c grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM,CL (2)						
	123.2-133.8 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Pyrite at contact								J,I,R						
124			358.10 / 124.20												5/23/95 @ 11:40 End of Run 10
									J,PL,SM,CL						
126				11	100 %										
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 7 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	123.2-133.8 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Pyrite at contact							90	J,PL,SM,CL						
130				11	100 %			90	J,PL,SM,CL						
132								90	J,I,SM,CL						
	348.50														
134	133.8-135.3 ft. 133.80 Slightly weathered, thinly bedded, light olive gray (5Y 6/1) fine grained, weak, SANDSTONE, (ST. LOUIS FORMATION) Thickly laminated, argillaceous layers 347.00		348.10 / 134.20					90	J,I,SM,CL						5/23/95 @ 12:20 End of Run 11
								90	B,PL,SM						
	135.3-137.5 ft. 135.30 Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic							90	J,PL,SM						
138	137.5-140.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Includes fine sand and silt			12	100 %			90	J,PL,SM,CL						
140	140.0-144.7 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic							90	J,PL,SM						
142								90	J,PL,SM						
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 10, R2 150, R3 399, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	144.7-149.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		338.10 / 144.20	12	100 %				J,PL,SM J,PL,R						5/23/95 @ 13:00 End of Run 12
146															
148									J,PL,R						
150	149.2-152.2 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2) to medium gray (N5), fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites and argillaceous partings common			13	100 %				J,PL,R B,PL,SM,CL (3)						
152	152.3-154.6 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								B,PL,SM,CL (2)						
154	154.6-162.3 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, argillaceous partings		328.10 / 154.20												5/23/95 @ 14:10 End of Run 13
156				14	100 %				B,PL,SM (2)						
158									J,PL,SM						
160									B,I,R						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: Dip wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	160.2-161.2 ft. Abundant clay zones, slightly weathered rock														
162	162.3-167.6 ft. Fresh, medium bedded, grayish orange (10YR 7/4), f-m crystalline, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION) 320.00 / 162.30			14	100 %										@ 162.3 ft. Inferred top of SALEM FORMATION
164			318.10 / 164.20												5/23/95 @ 15:00 End of Run 14
166															
168	167.6-171.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)			15	100 %										
170															
172	171.7-185.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m crystalline, medium strong, LIMESTONE, (SALEM FORMATION)								J,I,R						
174			308.10 / 174.20						B,PL,SM,CL (4)						5/23/95 @ 16:00 End of Run 15
176	175.3-190.1 ft. Abundant argillaceous layers and partings			16	100 %				B,PL,SM						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
176	171.7-185.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine to medium crystalline, medium strong, LIMESTONE, (SALEM FORMATION)							90	J,PL,SM						
178	178.4-185.0 ft. Abundant chert layers and nodules														
180				16	100 %										
182								90	J,PL,R						
								90	J,PL,R						
184			298.10 / 184.20												5/23/95 @ 16:45 End of Run 16 Finished drilling for the day 5/24/95 @ 7:30 Began drilling Run 17 Water level before drilling @ 112.0 ft.
186	185.0-186.7 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Chert nodules abundant														
	186.7-189.0 ft. Slightly weathered, thinly bedded, medium gray (N5), fine and medium grained, medium strong LIMESTONE, (SALEM FORMATION) Abundant argillaceous partings and layers							90	B,PL,SM,CL						
188				17	100 %										
								90	B,PL,SM,CL (2)						
190	189.0-197.2 ft. Fresh, thinly bedded to thickly bedded (with depth), pale yellowish brown (10YR 6/2), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Abundant chert nodules														
192															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 11 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2948
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 8/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	189.0-197.2 ft. Fresh, thinly bedded to thickly bedded (with depth), pale yellowish brown (10YR 6/2), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Abundant chert nodules														
				17	100 %										
194			288.10												5/24/95 @ 8:40 End of Run 17
			194.20												
196															
	197.2-204.0 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2) and medium gray (N5), fine grained, medium strong, LIMESTONE, (SALEM FORMATION) Abundant large, strong nodules and layers of chert			18	100 %				J,PL,SM,CL						
198									J,PL,SM,CL						
									J,PL,SM						
									J,I,R						
									J,PL,R						
200			281.70												5/24/95 @ 10:15 End of Run 18
			200.60												
202															
204	204.0-222.7 ft. Fresh, medium bedded, grayish orange (10YR 7/4), medium crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Silicified zones and abundant chert			19	99%				J,PL,SM (3)						
206															
									J,PL,SM						
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 12 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2548
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068983.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 518620.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
208	204.0-222.7 ft. Fresh, medium bedded, grayish orange (10YR 7/4), medium crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Silicified zones and abundant chert			19	99%				J,PL,SM						
			273.10						J,PL,SM (2)						5/24/95 @ 11:40 End of Run 19
			209.20						J,PL,SM (2)						
210				20	49%				J,I,R						
									J,PL,SM (2)						
			270.60												
			270.60												
			211.50												
212									Core Loss						Core Loss
			268.40												
			213.90												Core Loss, washed out 5/24/95 @ 13:20 End of Run 20
214									B,PL,SM (2)						
216				21	92%										
218															
			263.50												
			218.60												
			263.10												Core Loss (clay ?) 5/24/95 @ 14:00 End of Run 21
			219.20												
220															
222				22	100 %										
	222.7-228.0 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), coarse crystalline, weak, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Highly silicious, argillaceous														> 10 mechanical breaks/foot
224															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 13 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224	222.7-228.0 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), coarse crystalline, weak, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Highly silicious, argillaceous														
226				22	100 %										
									J,PL,R						
228	228.0-230.7 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), f-m crystalline, medium strong, LIMESTONE, (SALEM FORMATION)		253.10												5/24/95 @ 15:30 End of Run 22
			228.20												
230															
									F,U,R (2)						
	230.7-238.9 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), m-c crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Argillaceous, silicious														
232															
									J,PL,R						
234				23	100 %										
236															236.0-237.0 ft. Additional mechanical breaks
									J,PL,R (2)						
									J,PL,R						
238															
	238.9-247.4 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), m-c crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Argillaceous, silicious, includes fossiliferous zones		243.10												
			239.20												
				24	100 %				B,PL,SM,CL						5/24/95 @ 16:00 End of Run 23
240															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 14 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1: 30, R2: 150, R3: 300, R4: 600, R5: 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	238.9-247.7 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), m-c crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Argillaceous, silicious, includes fossiliferous zones														
242															
244				24	100 %										
246									J,PL,R						
248	247.4-256.8 ft. Fresh, medium bedded, light to medium gray (N6 to N5), m-c crystalline, strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)		233.10 / 249.20												5/24/95 @ 16:45 End of Run 24
250															
252				25	100 %										
254															
256															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2548
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068983.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
256													
	226.00												
	256.3-258.8 ft. 258.30 Fresh, thinly bedded, medium dark gray (N4), fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)												256.3 ft. Top of WARSAW FORMATION encountered
			25	100 %			90	B,PL,SM,CL (2)					
258													
	223.50												
	258.8-260.8 ft. 258.80 Fresh, medium bedded, medium gray (N5), m-c crystalline, strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Argillaceous, silicious	223.10											5/24/95 @ 17:30 End of Run 25
260		259.20											
	221.50												5/26/95 6 in steel casing installed to 257.0 ft. in 9 7/8 in. borehole and sealed with cement Core drilling resumed 6/1/95 @ 11:00
	260.8-264.6 ft. 260.80 Fresh, thinly bedded, olive gray (5Y 4/1), very fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)												
262			26	100 %									
254		218.10											
	217.70	264.20											
	264.6-267.2 ft. 264.60 Fresh, thinly bedded, medium dark gray (N4), coarse crystalline, strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Chert nodules common (<5 mm.)							B,PL,SM (2)					
268								J,I,R					
	267.2-271.9 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION)		27	100 %				J,U,SM					
268								J,PL,SM					
270													
	271.9-274.0 ft. Fresh, thinly bedded, medium dark gray (N4), coarse crystalline, strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Chert nodules common (<5 mm.)												
272													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 16 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 462.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP WRT CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): FT, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
272	271.9-274.0 ft. Fresh, thinly bedded, medium dark gray (N4), coarse crystalline, strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Chert nodules common (<5 mm.)			27	100 %				J,PL,SM						
274	274.0-279.9 ft. Fresh, thin to medium bedded, olive gray (5Y 4/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Porous, (<1 mm. open vugs) 274.4-275.5 ft. Several partially calcite crystal filled voids (<2 in.)		208.10 / 274.20						J,C,SM J,I,R J,I,R J,I,R (4)						274.4-275.5 ft. Possible high porosity zone
278				28	100 %				B,I,SM						
280	279.9-295.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), coarse crystalline, medium strong to strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Abundant chert nodules (<2 mm.), fossiliferous with some silicified zones, stylolitic								J,I,VR J,PL,SM,Fe						
282															
284	284.2-285.4 ft. Olive gray (5Y 4/1), Argillaceous Limestone layer		198.10 / 284.20												6/1/95 @ 15:25 End of Run 28
286				29	100 %				J,PL,SM						
288															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 17 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1086993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
288	279.9-295.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), coarse crystalline, medium strong to strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Abundant chert nodules (<2 mm.) fossiliferous with some silicified zones, stylolitic														
290				29	100 %										
292															
294			188.10 / 294.20												6/1/95 @ 16:20 End of Run 29
296	295.7-303.7 ft. Fresh, thinly bedded, medium dark gray (N4), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION)														
298	297.5-299.3 ft. Partially silicified, porous (open vugs <3 mm.)							90	J,PL,SM						
300	299.3-303.7 ft. Rock becomes weak due to high clay content			30	100 %			90	J,PL,SM,CL						
302															
304	303.7-305.0 ft. Fresh, thinly bedded, medium gray (N5), coarse crystalline, medium strong, LIMESTONE, (WARSAW FORMATION)														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 18 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 518820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 R2 R3 R4 R5	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
304			178.10	30	100%										6/1/95 @ 17:00 End of Run 30 Stop drilling 6/2/95 @ 8:30 Begin Run 31
			304.20												
	177.30														
	305.0-309.7 ft. 305.00 Fresh, thinly bedded, medium dark gray (N4), very fine grained, weak, SILTSTONE, (WARSAW FORMATION)														
306															
308															
				31	100%				B,PL,SM						
	172.60														
	309.7-313.5 ft. 309.70 Fresh, thinly bedded, medium gray (N5), m-c crystalline, medium strong, LIMESTONE, (WARSAW FORMATION) Numerous clay partings, stylolitic								B,PL,SM						
310															
312									B,PL,SM,CL						
									B,U,SM,CL						
314	313.5-322.0 ft. Fresh, thinly to medium bedded, light olive gray (5Y 6/1) to dark gray (N3), very fine to medium grained 314.20 medium strong, alternating layers of ARGILLACEOUS LIMESTONE and SILTSTONE (2-6 in. thick) (WARSAW FORMATION)		168.10												6/2/95 @ 11:30 End of Run 31 Slow drilling, a lot of rod wobble
			314.20						B,PL,SM,CL						
	167.30														
	315.00														
	166.30														
316	316.00														
									B,PL,SM (4)						
	165.30														
	317.00			32	98%										
	164.30														
318	318.00														
	163.30														
	319.00														
	162.30														
320	320.00														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 19 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
320	ROCK TYPE 162.30 313.5-322.0 ft. 320.00 Fresh, thinly to medium bedded, light olive gray (5Y 6/1) to dark gray (N3), very fine to medium grained; 161.30 medium strong, alternating 321.00 layers of ARGILLACEOUS LIMESTONE and SILTSTONE (2-6 in. thick) (WARSAW FORMATION) 160.30 322.00														
322	322.0-347.4 ft. Fresh, thickly bedded, dark gray (N3), very fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)			32	95%				B,I,R						
324			158.10 324.20												6/2/95 @ 12:40 End Run 32
326															
328				33	100%				J,PL,SM,CL						
330															
332			148.10 333.20												6/2/95 @ 14:00 End of Run 33
334				34	100%										
338															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 20 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 518820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 10, R2 150, R3 360, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
336	322.0-347.4 ft. Fresh, thickly bedded, dark gray (N3), very fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)														
				34	100 %										
338	338.0-347.2 ft. Siltstone becomes weak														
			143.10												
	339.3-339.5 ft. Soft, medium gray (N5), Clay seam		339.20												
340															
342															
				35	100 %										
344															
346															
	134.90														
	347.4-358.3 ft. 347.40 Fresh, thinly bedded, medium dark gray (N4), fine crystalline, medium strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Argillaceous, numerous shaley partings, some thin interbeds of Siltstone (<4 in. thick), fossiliferous, coarse chert nodules common		134.10												
348			348.20												
350				36	100 %										
352															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 21 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1056993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
352	347.4-358.3 ft. Fresh, thinly bedded, medium dark gray (N4), fine crystalline, medium strong. DOLOMITIC LIMESTONE, (WARSAW FORMATION) Argillaceous, numerous shaley partings, some thin interbeds of Siltstone (<4 in. thick), fossilliferous, coarse chert nodules common														
354				36	100 %										
356															
358			124.00												
	358.3-384.7 ft. Fresh, thinly bedded, medium gray (N5), alternating fine crystalline and coarse crystalline layers, medium strong to strong, ARGILLACEOUS LIMESTONE, (KEOKUK FORMATION) Some zones fossiliferous, abundant medium bluish gray (5B 5/1), chert layers, coarse grained chert nodules common, thinly laminated, shaley partings common, trace disseminated pyrite		358.30												@ 358.3 ft. Inferred top of KEOKUK FORMATION Drilling rate slows significantly due to chert layers 6/2/95 @ 17:00 End of Run 36
360															
362									● J,I,R						
				37	100 %										
364															
366															
368															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 22 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
368	357.7-384.7 ft. Fresh, thinly bedded, medium gray (N5), alternating fine crystalline and coarse crystalline layers, medium strong to strong, ARGILLACEOUS LIMESTONE, (KEOKUK FORMATION) Some zones fossiliferous, abundant medium bluish gray (5B 5/1), chert layers, coarse grained chert nodules common, thinly laminated, shaley partings, common, trace disseminated pyrite		114.00 / 368.30	37	100 %	80 60 40 20	2 4 6 10	0 30 60 90			SW FR NW INV CW	R6 R5 R4 R3 R2 R1	R1 30 R2 150 R3 300 R4 600 R5 1500 R6		6/2/95 @ 18:00 End of Run 37
370															
372				38	98%										
374			108.00 / 374.30												6/2/95 @ 19:15 End of Run 38 Stop drilling 6/3/95 @ 7:00 Drilling resumed
376				39	100 %										
378	Below 378.5 ft. Only occasional shaley partings		103.00 / 379.30						B,U,SM,CL						6/3895 @ 13:30 End of Run 39
380															
382				40	100 %										
384															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

Sheet 23 of 24

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
384	384.7-393.8 ft. Slightly weathered, thinly bedded, pinkish gray (5Y 8/1) to light olive gray (5Y 6/1), f-m crystalline, medium strong to strong, LIMESTONE, (KEOKUK FORMATION) Some zones coarse grained, chert layers common (<6 in.), stylolitic, some zones silicified		98.00 / 384.30	40	100 %										6/3/95 @ 15:00 End of Run 40 Stop drilling 6/4/95 @ 8:00 Drilling resumed
386															
388				41	100 %										
390															
392	@ 392.0 ft. Three open vugs with quartz crystals (<1 in. dia.)														
394	393.8-406.5 ft. Moderate to highly weathered, thinly bedded, light gray (N7), f-c crystalline, medium strong to weak, SILICIFIED LIMESTONE, (KEOKUK FORMATION) Chert nodules and layers common, stylolitic		88.50 / 393.80												
396				42	94%										
398	398.5-399.1 ft. Highly weathered, very porous, (open vugs <5 mm.), weak rock														
400															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066893.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 518820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
400	393.8-408.5 ft. Moderate to highly weathered, thinly bedded, light gray (N7), f-c crystalline, medium strong to weak, SILICIFIED LIMESTONE, (KEOKUK FORMATION) Chert nodules and layers common, stylolitic			42	94%	85 60 20	2 4 5 8 10	0 30 60 90							
402			79.10												
			403.20												Core Loss in highly weathered rock 6/4/95 @ 14:10 End Run 42
			78.50												
404	@ 403.8 ft. Highly weathered, very porous, weak rock		403.80												
406				43	96%										
408	73.50		73.50												6/4/95 @ 14:45 Drilling completed
	End of Record of Drillhole at 408.8 ft.		408.80												
410															
412															
414															
416															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

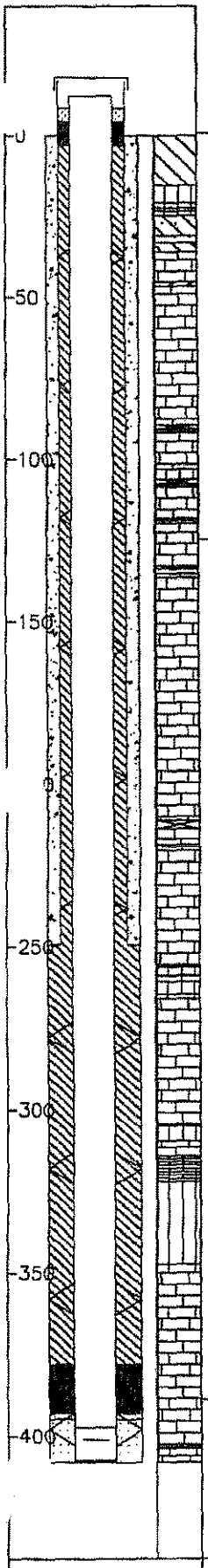
LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

Well No. PZ-104-KS

Boring No. X-Ref: PZ-104-KS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066993 ft. Easting: 516821 ft.

Elevation Ground Level 482.3 ft. NGVD

Top of PVC Casing 484.04 ft. NGVD

Drilling Summary:

Total Depth 408.0 ft.

Borehole Diameter 10 in. (0.0-249.0 ft.) 5 7/8 in. (249.0-408.0 ft.)

Casing Stickup Height 1.72 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. and 10 in. Button Bits

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (augers)	2/21/95	15:40	2/21/95	17:58
CME 75 (core)	5/22/95	14:00	5/22/95	14:45
Schramm Rotary	6/7/95	7:15	6/7/95	11:30
Geophys.Logging:	6/8/95	10:30	6/8/95	12:15
Casing:				
2" PVC	6/19/95	9:30	6/19/95	11:00
6" Steel	5/25/95	12:30	5/25/95	13:30
Filter Placement:	6/19/95	11:05	6/19/95	13:00
Cementing:				
Development				
Bentonite Grout	6/19/95	13:15	6/19/95	17:00
Bentonite Seal	6/19/95	13:00	6/19/95	13:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.72	-	397.37	C1	484.04	-	84.95
397.37	-	407.17	S1	84.95	-	75.15
407.17	-	407.50	C2	75.15	-	74.82
+ 1.00	-	249.00	C3	483.30	-	233.32
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 395.0-408.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 393.0-395.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-378.0 ft., Neat cement, 3.0-249.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 378.0-393.0 ft.

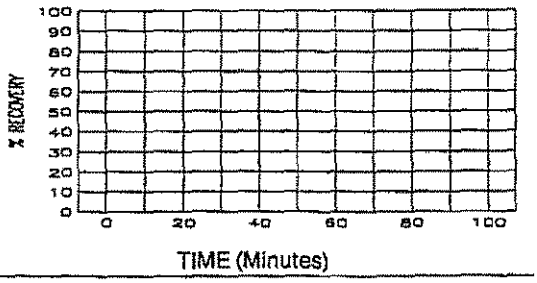
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ104KS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122504	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	[redacted] PZ-104-KS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1138 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

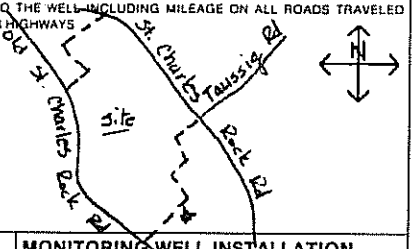
COUNTY ST. LOUIS
ELEVATION 482.32
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG 5 (E) OR W

LAT. 38 ° 45 ' 50 " LONG. 90 ° 36 ' 37 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

NOTE: Record the fraction of a foot in decimal, not in inches

LOCKING CAP - (Y) N (Circle one)
CAP VENT - Y / (N) (Circle one)
Top of Riser Elevation: 484.04

PROTECTIVE CASING
Type: STEEL
Size: 8" x 5' x 5'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 482.32 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-37 No sampling
Depth to bottom of Protective Casing Seal:	3.0	
		37-100 Limestone
		100-105 Shale
		105-250 Limestone
		250-253 Shale
		253-256 Limestone
		256-294 Shale
		294-366 Limestone
Depth to Base of Annular Seal:	378.0	366-376 Dolomite
		376-397 Limestone
		397-304 Shale
Depth to Base of Bentonite Seal:	343.0	304-317 Limestone
Depth to Base of Secondary Filter Pack:	345.0	317-342 Shale
		342-406 Limestone
Depth to Top of the Screen:	347.5	
Depth to Bottom of the Screen:	407.5	
Plug Back Total Depth		
Original Total Depth:	408.0	

PROTECTIVE CASING SEAL
Type: (X) Concrete ( ) Cement Slurry

RISER PIPE
Length: 349.2'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: (X) Bentonite Slurry 345-378
(X) Cement Slurry 3-345
( ) Non Slurry Bentonite

BENTONITE SEAL
Type: (X) Bentonite Slurry
( ) Non Slurry Bentonite
Length of Seal: 15 Ft.

SECONDARY FILTER PACK (Optional)
Type: (X) Sand
( ) Manufactured
Grain Size: 2 50
Length: 2.0'

PRIMARY FILTER PACK
Type: (X) Sand
( ) Manufactured
Grain Size: 16-35
Length: 13.0'

WELL SCREEN
Length: 10'
Slot Size: 0.010
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.5 FT.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION
(X) ABOVE GROUND ( ) FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
484.04

MEASURING POINT IS
(X) TOP OF RISER PIPE
( ) OTHER

DRILLING EQUIPMENT
(X) AIR ROTARY (X) AUGER TYPE 6¼ H.S.A.
( ) REVERSE ROTARY ( ) OTHER

CENTRALIZERS USED
(X) YES, AT 9 TOTAL
(X) STAINLESS STEEL
( ) OTHER
( ) NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-19-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogl

PERMIT NUMBER	DATE
001256 WM	7-07-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogl

PERMIT NUMBER	DATE
001256 WM	7-07-95

MO 780-1419 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

RECORD OF DRILLHOLE PZ-104-SD

Sheet 1 of 1

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/6/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1067013.26
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516634.43
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 10 R2 150 R3 350 R4 650 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	0.0-245.3 ft. No sampling conducted See Soil Borehoole Log and Record of Drillhole for PZ-104-KS														0.0-38.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers, then borehole advanced to 245.3 ft. with 5 7/8 in. air rotary bit
242															
244			236.80												
246	245.3-252.8 ft. 245.30 Fresh, thickly bedded, medium dark gray (N4), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Coarse grained calcite crystals common 247.4-250.1 ft. Limestone is moderate yellowish brown (10YR 5/4) due to iron oxide		245.30												6/6/95 @ 8:30 Began coring
248															
250				1	94%										
252	229.30														
254	252.8-255.0 ft. 252.80 Slightly weathered, thinly bedded, moderate yellowish brown (10YR 5/4), very fine grained, weak, SILTSTONE, (WARSAW FORMATION) 254.4-255.0 ft. Siltstone becomes highly weathered 227.10		227.70 254.40						Core Loss						Core Loss due to highly weathered SILTSTONE 6/6/95 @ 11:30 Coring completed
256	End of Record of Drillhole at 255.0 ft. 255.00														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: S. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

Well No. PZ-104-SD

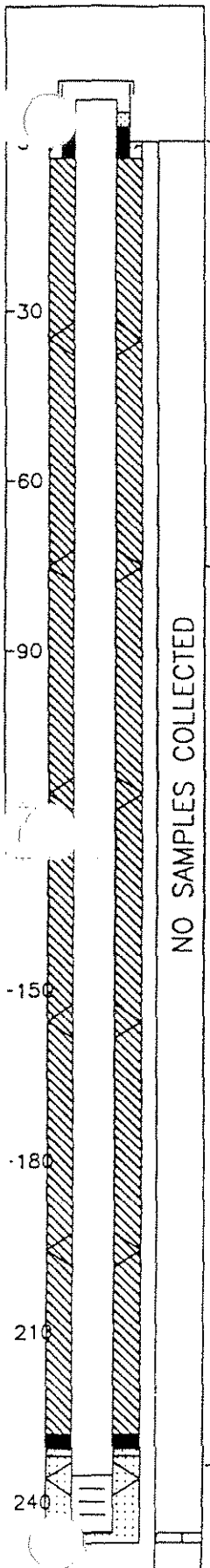
Boring No. X-Ref: PZ-104-SD

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067013 ft. Easting: 516834 ft.

Elevation Ground Level 482.1 ft. NGVD

Top of PVC Casing 483.69 ft. NGVD



Drilling Summary:

Total Depth 252.5 ft.

Borehole Diameter 10 1/4 in. (0.0-38.0 ft.) 5 7/8 in. (38.0-252.5 ft.)

Casing Stickup Height 1.59 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	5/5/95	15:00	5/6/95	14:00
Geophys.Logging:	6/8/95	12:30	6/8/95	15:00
Casing:	6/17/95	12:10	6/17/95	12:30
Filter Placement:	6/17/95	12:30	6/17/95	13:00
Cementing:				
Development				
Bentonite Grout	6/17/95	13:20	6/17/95	15:00
Bentonite Seal	6/17/95	13:00	6/17/95	13:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.59	-	235.20	C1	483.69	-	248.90
235.20	-	245.00	S1	246.90	-	237.10
245.00	-	245.33	C2	237.10	-	236.77
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 231.8-247.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 230.5-231.8 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-220.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 220.0-230.5 ft.

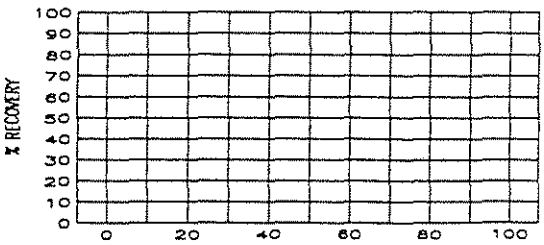
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: When PVC casing was installed, it was observed that there was about 5.0 ft. of sluff in borehole from 247.5-252.5 ft. It did not appear that the sluff could be removed from the borehole since the borehole had remained open to allow for geophysical logging and packer testing and slaking of shale units and argillaceous limestones in the borehole. Two feet of sand pack was used to seperate the bottom of the piezometer from the sluff at the bottom of the borehole.

Not to Scale

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ104SD

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122512	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
Lindenwood Bridgeton Sanitary Landfill	PZ-104-SD

SITE ADDRESS	CITY	STATE	ZIP CODE
31 Charles Rock Rd.	Bridgeton	Mo.	63044

NAME	TELEPHONE
Lindenwood White Systems, Inc.	314-241-3110

ADDRESS	CITY	STATE	ZIP CODE
1538 N Broadway	St Louis	Mo	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

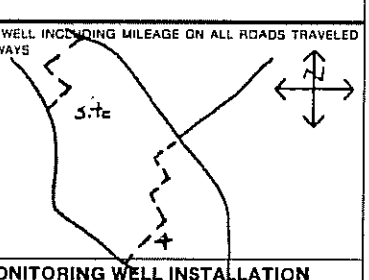
COUNTY St Louis
ELEVATION 453.64
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38 ° 45 ' 50 " LONG. 90 ° 26 ' 27 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
Layne Western Co, Inc.

DRILLING CONTRACTOR'S NAME
Layne Western Co., Inc.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
453.64

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 6 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-17-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001956 WI-A	7-07-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001956 WI-A	7-07-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 453.64

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING Type: Steel Size: 8" x 10'-5" Bore Hole Diameter: 10¼"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 453.64 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	228.0	
Depth to Base of Bentonite Seal:	230.5	
Depth to Base of Secondary Filter Pack:	231.8	
Depth to Top of the Screen:	235.0	
Depth to Bottom of the Screen:	245.0	
Plug Back Total Depth:		
Original Total Depth:	252.5	

PROTECTIVE CASING SEAL Type: ☒ Concrete ☐ Cement Slurry
RISER PIPE Length: 232' Diameter: 2" Type of Material: Sch 80 PVC
BOREHOLE DIAMETER: 9⅞ In.
ANNULAR SEAL Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite
BENTONITE SEAL Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite Length of Seal: 2.5 Ft.
SECONDARY FILTER PACK (Optional) Type: ☒ Sand ☐ Manufactured Grain Size: #50 Length: 1.3'
PRIMARY FILTER PACK Type: ☒ Sand ☐ Manufactured Grain Size: 16-35 Length: 22.7'
WELL SCREEN Length: 10 Slot Size: 0.010" Type: PVC
SUMP DETAILS Length: 0.5 Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: Chips

MO 780-1415 (2-94) DISTRIBUTION: WHITE DIVISION CANARY: MONITORING WELL CONTRACTOR PINK/OWNER

RECORD OF DRILLHOLE PZ-104-SS

Sheet 1 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/4/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1067028.01
AZIMUTH: 0

COLLAR ELEV: 481.6
E: 518847.19
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES / WATER LEVELS / INSTRUMENTATION
128	0.0-135.0 ft. No sampling conducted See Record of Drillhole for PZ-104-KS														0.0-38.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers, then borehole advanced to 135.0 ft. with 5 7/8 in. air rotary bit
130															
132															
134															
	346.60		346.60												
	135.0-138.1 ft. 135.00 Fresh, medium bedded, pale yellowish brown (10YR 6/2), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		135.00						J,PL,R						6/4/95 @ 9:30 Begin Run 1
136									J,I,R						
									J,P,R						
138	343.50														
	138.1-138.7 ft. 138.10 Slightly weathered, finely bedded, dark greenish gray (5GY 4/1), very fine 342.90 grained, very weak, CLAYSTONE, 138.70 (ST. LOUIS FORMATION)								J,I,R,CL						
									J,I,R,CL						
									J,PL,SM,CL						
									J,I,VR,calcite						
	138.7-145.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			1	100 %				J,C,R						
140															
142									J,PL,SM (2)						
									J,I,SM						
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 8/4/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/4/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1067028.01
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 516847.19
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	138.7-145.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), very fine grained, medium strong, LIMESTONE, 336.60 (ST. LOUIS FORMATION) 145.00		336.60	1	100 %	80 60 40 20	2 4 6 8 10	0 30 50 90				R5 R4 R3 R2 R1			
	End of Record of Drillhole at 145.0 ft.		145.00												
146															
148															
150															
152															
154															
156															
158															
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

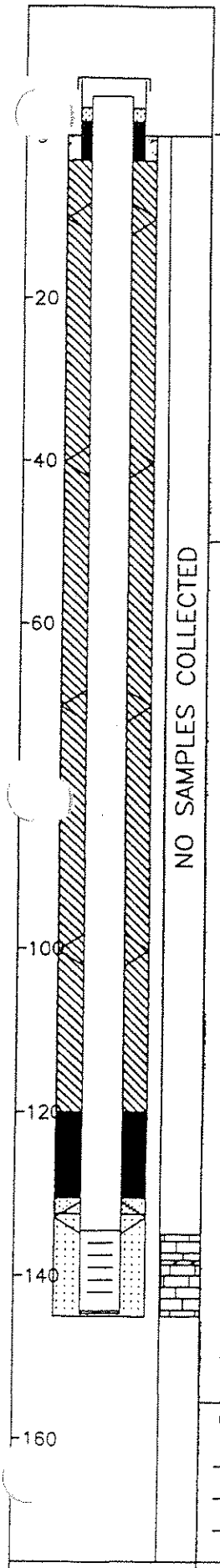
LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 6/4/95

Golder Associates

Well No. PZ-104-SS

Boring No. X-Ref: PZ-104-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067028 ft. Easting: 516847 ft.

Elevation Ground Level 481.6 ft. NGVD

Top of PVC Casing 483.63 ft. NGVD

Drilling Summary:

Total Depth 145.0 ft.

Borehole Diameter 10 1/4" (0.0-37.0') 5 7/8" (37.0-145.0')

Casing Stickup Height 2.07 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4" ID Hollow Stem Auger Bit, NX Core, 5 7/8" Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling CME 75 Schramm Rotary	6/3/95	12:30	6/4/95	11:45
Geophys.Logging:				
Casing:	6/4/95	11:45	6/4/95	12:00
Filter Placement:	6/4/95	12:00	6/4/95	12:45
Cementing:				
Development				
Bentonite Grout	6/4/95	13:05	6/4/95	13:25
Bentonite Seal	6/4/95	12:45	6/4/95	13:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.07	-	134.50	C1	483.63	-	347.06
134.50	-	144.30	S1	347.06	-	337.26
144.30	-	144.63	C2	337.26	-	336.93
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 132.5-145.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 130.5-132.5 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-120.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 120.0-130.5 ft.

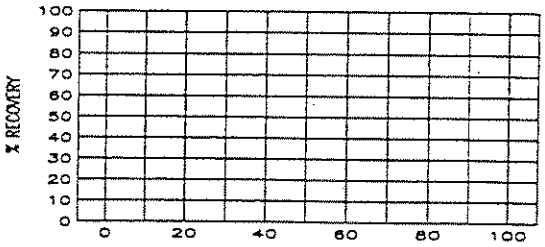
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ104SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122511	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-104-35

SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: MO | ZIP CODE: 63044

NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710

ADDRESS: 1638 N. BROADWAY | CITY: ST LOUIS | STATE: MO | ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

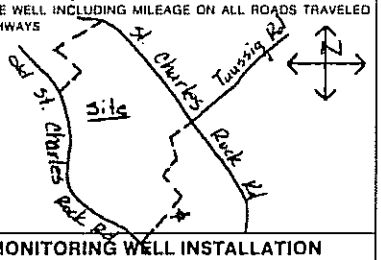
COUNTY: ST. LOUIS
ELEVATION: 481.6
AREA NO:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38 · 45 · 50 · LONG. 90 · 26 · 27 ·

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 483.6
Ground Surface Elevation: 481.6

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	
Depth to bottom of Protective Casing Seal: 3.0	
Depth to Base of Annular Seal: 120.0	
Depth to Base of Bentonite Seal: 130.5	
Depth to Base of Secondary Filter Pack: 132.5	
Depth to Top of the Screen: 134.5	
Depth to Bottom of the Screen: 144.5	
Plug Back Total Depth:	
Original Total Depth: 145.0	

LOCKING CAP - (Y) N (Circle one)
CAP VENT - Y (N) (Circle one)
PROTECTIVE CASING Type: STEEL Size: 8" x 5" x 5' Bore Hole Diameter: 10¼"
WEEP HOLE - Y / (N) (Circle one)
PROTECTIVE CASING SEAL Type: [X] Concrete [ ] Cement Slurry
RISER PIPE Length: 136.6' Diameter: 2" Type of Material: SCH 80 PVC
BOREHOLE DIAMETER: 5 7/8 in.
ANNULAR SEAL Type: [ ] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite
BENTONITE SEAL Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite Length of Seal: 10.5 FL
SECONDARY FILTER PACK Type: [X] Sand [ ] Manufactured (Optional) Grain Size: <50 Length: 3'
PRIMARY FILTER PACK Type: [X] Sand [ ] Manufactured Grain Size: 16-35 Length: 12.5'
WELL SCREEN Length: 10' Slot Size: 0.010" Type: SCH 80 PVC
SUMP DETAILS Length: 0.3 FL Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: SAND

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 483.6

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A. [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 5 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 6-4-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM | DATE: 7-07-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM | DATE: 7-07-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
THE WHITE COPY IS TO BE MAILED TO DIVISION OF GEOLOGY AND LAND SURVEY, P.O. BOX 250 ROLLA, MO 65401

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-105-SS
			SHEET
	SAMPLING METHOD:		1 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		START / FINISH
	WATER LEVEL		TIME / TIME
	TIME		14:20 / 17:15
	DATE		DATE / DATE
NORTHING: 1066421.35 DATUM EASTING: 516230.23 ELEVATION 481.2	CASING DEPTH		5/19/95 / 5/19/95

DRILL RIG CME 75 - TRUCK MOUNT | SURFACE CONDITIONS Grassy field

ANGLE -90 BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	1 3 3 2	1.3' / 2.0' (65%)			(0.0-4.4 ft.) Firm, moderate yellowish brown (10YR 5/4), SILT, with trace fine Sand, NR, moist, (ML), (LOESS)	SP 1	
2	2 2 3 2	1.8' / 2.0' (90%)				SP 2	
3							
4	2 3 5 7	2.0' / 2.0' (100%)			(476.8) 4.4	SP 3	
5					(4.4-18.5 ft.) Very soft to stiff, moderate yellowish brown (10YR 5/2), SILTY CLAY, NR, moist, (CL), (LOESS)		
6	1 2 4 5	1.5' / 2.0' (75%)				SP 4	
7					From 7.0-16.0 ft., grades to include trace fine sand, color grades to light olive gray (5Y 6/1) and moderate yellowish brown (10YR 5/2) (mottled)		
8	0 2 3 2	2.0' / 2.0' (100%)				SP 5	
9							
10	1 2 1 2	2.0' / 2.0' (100%)				SP 6	
11							
12	0 0 1 3	2.0' / 2.0' (100%)				SP 7	
13							
14	2 2 5 8	1.9' / 2.0' (95%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLDWAY CHK'D BY W. HERST

DATE 7/14/95

JOB NO.: 943-2848

FILENAME: PZ105SS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION: LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	BORING NO. PZ-105-SS SHEET 2 OF 3

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME 14:20	TIME 17:15
TIME						
DATE					DATE 5/19/95	DATE 5/19/95
CASING DEPTH						

NORTHING: 1066421.35
DATUM EASTING: 516230.23 ELEVATION 481.2

DRILL RIG CME 75 - TRUCK MOUNT — SURFACE CONDITIONS Grassy Field

ANGLE -90 BEARING NA

SAMPLE HAMMER

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY DATE 7/14/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ105SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 4 7 8	1.9' 2.0' (95%)			From 16.0-18.5 ft., grades to little fine sand, color grades to medium light gray (N6)	SP (8)	
17						SP (9)	
18	5 5 8 9	1.5' 2.0' (75%)			(18.5-20.5 ft.) Stiff, olive gray (5Y 4/1), fine SANDY CLAY, NR, wet, (CL), (ALLUVIUM)	SP (10)	
19							
20	3 6 9 13	1.7' 2.0' (85%)			(460.7) 20.5	SP (11)	
21					(20.5-27.1 ft.) Compact, medium gray (N5), f-m poorly graded SAND, NR, wet, (SP), (ALLUVIUM)		
22	1 4 8 9	1.3' 2.0' (65%)			@ 22.5 ft., grades to less silt	SP (12)	
23							
24	4 8 18 19	1.5' 2.0' (75%)			@ 24.7 ft., grades to more silt	SP (13)	
25							
26	1 4 5 9	1.3' 2.0' (65%)			(454.1) 27.1	SP (14)	
27					(27.1-29.6 ft.) Loose to compact, medium gray (N5), SILT with little fine Sand, NR, wet, (ML), (ALLUVIUM)		
28	1 1 3 12	1.7' 2.0' (85%)			(451.6) 29.6	SP (15)	
29					(29.6-33.8 ft.) Very loose to dense, medium gray (N5), f-m poorly graded SAND, NR, wet, (SP), (ALLUVIUM)		

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1066421.35
DATUM EASTING: 516230.23 ELEVATION 481.2

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					START	FINISH
WATER LEVEL						
TIME					1420	1715
DATE					5/19/95	5/19/95
CASING DEPTH						

BORING NO. PZ-105-SS

SHEET 3 OF 3

DRILLING

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Grassy Field

ANGLE -90 BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	2 8 18 29	2.0' 2.0' (100%)			(29.6-33.8 Ft.) Very loose to dense, medium gray (N5), f-m poorly graded SAND, NR, wet, (SP), (ALLUVIUM)	SP 16	
32	1 10 37 33	2.0' 2.0' (100%)				SP 17	
33							
34	45 50/3'	0.5' 1.0' (50%)			(33.8-35.0 Ft.) Very dense, light olive gray (5Y 6/1), LIMESTONE GRAVEL, SR, wet, (WEATHERED LIMESTONE BEDROCK) (446.2) 35.0	SP 18	
35					End of Soil Borehole Log at 35.0 Ft. See PZ-105-SS Record of Drillhole for rock descriptions		
36							
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY

DATE 7/14/95 CHK'D BY V. HERST

JOB NO.: 943-2848

FILENAME: PZ105SS

RECORD OF DRILLHOLE PZ-105-SS

Sheet 1 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NS Core & water
DRILLING DATE: 5/20/95 - 5/21/95
DRILL RIG CME 75

DATUM: MSL
COORDINATES N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 518230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD 80 60 40 20	FRACTURES PER FOOT 2 4 6 8 10	DISCONTINUITY DATA: DIP w/r CORE AXIS 0 30 60 90	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-35.0 ft. See Soil Borehole Log PZ-105-SS														
34	35.0-39.0 ft. Slightly weathered, thinly bedded, medium light gray (N6), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 446.20		446.20												
	35.2-35.9 ft. 35.20 Dark yellowish orange (10YR 6/6), Claystone layer		35.00												5/20/95 @ 8:20 Began drilling Run 1
36															
38				1	73%				Core Loss						5/20/95 @ 9:00 End of Run 1
	39.0-52.9 ft. Slightly weathered, medium bedded, medium light gray (N6), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Clay filled joints and layers of Claystone		442.20 39.00												
40				2	77%										
42			438.30						Core Loss						5/20/95 @ 9:45 End of Run 2
			42.90												
44									J,I,VR,Fe (2)						43.0-44.0 ft. Healed seam at 0°
				3	93%										
46									J,PL,R,CL (3)						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

Sheet 2 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NS Core & water
DRILLING DATE: 5/20/95 - 5/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	39.0-52.9 ft. Slightly weathered, medium bedded, medium light gray (N6), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			3	93%				J,PL,R,CL						
			432.20 / 49.00						Core Loss						5/20/95 @ 10:20 End of Run 3
	49.0 ft. Color grades to pale yellowish brown (10YR 6/2)														
50	50.5 ft. Pyrite present								J,P,R (2)						
	51.0-51.2 ft. Sandstone layer			4	100%				J,P,R (2)						
52	51.9-52.3 ft. Sandstone layer														
	52.9-65.2 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine to microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Zones of thin clay or silicous laminations		428.30 / 52.90						J,PL,VR						
54	54.6-54.8 ft. Chert layer								J,PL,VR						
56				5	98%				J,I,R,CL						
58	57.8-57.9 ft. Clay layer 57.9-58.6 ft. Sandstone layer		422.20 / 59.00												5/20/95 @ 12:00 End of Run 5
60									J,PL,R J,C,SM,CL						
				6	100%				J,PL,R (3)						
62									J,PL,R (2)						
									J,PL,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 5/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NS Core & water
DRILLING DATE: 5/20/95 - 5/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 518230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	52.9-65.2 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine to microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 416.00								J,PL,R						
	65.2-79.0 ft. 65.20 Fresh, medium bedded, medium gray (N5), microcrystalline to fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Pyrite and calcite filled fractures								J,PL,R						
66									J,PL,R (2)						
				6	100 %										
68									J,I,R (2)						5/20/95 @ 13:00 End of Run 6
			412.20												
			69.00						J,ST,SM						
70															
72															
									J,ST,R						
74				7	100 %				J,I,R						
76															
	77.6-78.5 ft. Clayey layer														
78															
	79.0-80.3 ft. 402.20 Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION) 79.00 Includes thickly laminated clay layers		402.20 79.00	8	99%										5/20/95 @ 14:00 End of Run 7

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 9/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NS Core & water
DRILLING DATE: 5/20/95 - 5/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 518230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	ROCK TYPE		400.90												
	80.3-89.3 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine to medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		80.30					0 30 60 90	J,I,R J,I,SM,CL						
82									J,ST,CL (2)						
									J,I,R,CL (2)						
84	84.0-86.8 ft. Abundant chert, some clay layers (green clay)			8	99%										
									J,PL,SM J,PL,SM,CL						
86									J,PL,SM,CL						86.7-86.8 ft. Broken zone
									J,PL,SM,CL						
88									J,PL,SM,CL						
			392.20												
	89.3-118.6 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 89.3-92.7 ft. Silicified		89.00						J,I,R						
90															5/20/95 @ 15:00 End of Run 8
				9	100 %				J,PL,SM,CL						
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 8/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

Sheet 5 of 8

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NS Core & water
DRILLING DATE: 5/20/95 - 5/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DISCONTINUITY DATA

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 10, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	89.3-118.6 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)			9	100 %				J,PL,SM						
98									J,PL,SM						5/20/95 @ 15:30 End of Run 9
			382.20 / 99.00												
100									J,PL,SM						
102	101.5-105.0 ft. Silicified														
									F,PL,SM						
104				10	100 %				J,C,SM,CL						
106	105.0-115.5 ft. Scattered stylolites, chert								J,PL,SM,CL						
									J,PL,SM,CL						
108			372.20 / 109.00												5/20/95 @ 16:15 End of Run 10
									J,PL,R,CL						
110				11	100 %				J,PL,R,CL						
									J,PL,SM						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MARURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NS Core & water
DRILLING DATE: 5/20/95 - 5/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, HW, HW, CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	89.3-118.6 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)					80 60 40 20	2 4 6 8 10	0 30 60 90	J,PL,SM						
									J,PL,SM (3)						
114									J,ST,R						
				11	100 %				J,PL,SM,CL (2)						
116															
									J,PL,SM						
118															5/20/95 @ 17:15 End of Run 11 Ended drilling for the day 5/21/95 @ 7:30 Resume drilling
	118.6-131.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong, LIMESTONE, fossiliferous, (ST. LOUIS FORMATION)								J,PL,SM,CL						
			362.20 119.00												
120	120.5-121.4 ft. Claystone layer														
122															
	123.0 ft. Calcite crystals on fracture								B,PL,SM,CL J,PL,R						
	123.7-125.3 ft. ARGILLACEOUS LIMESTONE			12	100 %										
124	124.0 ft. Calcite crystals on fractures														
126									B,PL,SM,CL						
									B,PL,SM,CL						
128	128.0 ft. Calcite crystals on fractures														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NS Core & water
DRILLING DATE: 5/20/95 - 5/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 <10, R2 10-50, R3 50-150, R4 150-350, R5 350-900, R6 900-1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	128.0 ft. Calcite crystals on fractures														
				12	100 %			0	J,PL,R						
								90	B,PL,SM,CL						5/21/95 @ 8:30 End of Run 12
			352.20												
			129.00												
130	129.5 ft. Color grades to light olive gray (5Y 5/2)							90	B,PL,SM,CL (2)						
132	131.5-141.6 ft. Fresh, medium bedded, light olive gray (5Y 5/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
134				13	100 %			90	J,PL,SM,CL						
136															
138								90	J,PL,SM,CL						
			342.20												5/21/95 @ 9:40 End of Run 13
			139.00												
140															
142	141.6-148.7 ft. Fresh, medium bedded, pale yellowish brown (10Y 6/2) to light olive gray (5Y 5/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, clay filled fractures			14	100 %			90	J,PL,SM,CL						
								60	J,PL,SM,CL						
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NS Core & water
DRILLING DATE: 5/20/95 - 5/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 518230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR, SW, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R7 10, R6 30, R5 100, R4 300, R3 1000, R2 3000, R1 10000)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	141.6-148.7 ft. Fresh, medium bedded, pale yellowish brown (10Y 6/2) to light olive gray (5Y 5/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, clay filled fractures								J,PL,SM,CL (2)						
146	146.0-147.0 ft. Clay filled vugs and fractures abundant			14	100 %				J,PL,SM,CL J,PL,SM,CL						
148	148.7-149.0 ft. Slightly weathered, thinly bedded, grayish orange (10YR 7/4), fine grained, medium strong DOLOMITE, very shallow vugs, (ST. LOUIS FORMATION) 332.50								J,PL,SM,CL						5/21/95 @ 10:30 End of drilling
	148.78 332.20		332.20												
	End of Record of Drillhole at 149.0 ft. 149.00		149.00												
150															
152															
154															
156															
158															
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

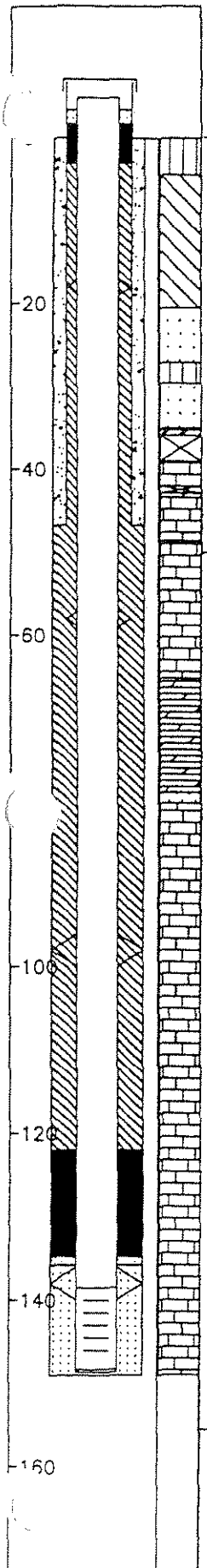
LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

Well No. PZ-105-SS

Boring No. X-Ref: PZ-105-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066421 ft.
Easting: 516230 ft.

Elevation Ground Level 481.2 ft. NGVD
Top of PVC Casing 483.61 ft. NGVD

Drilling Summary:

Total Depth 149.0 ft.
Borehole Diameter 9 7/8 in. (0.0–45.0 ft.) 5 7/8 in. (45.0–149.0 ft.)
Casing Stickup Height 2.39 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core,
5 7/8 in. Button Bit and 7 7/8 in. Tricone Bit
Drilling Fluid Auger–None, NX Core Water,
Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/19/95	14:20	5/21/95	10:30
Schramm Rotary	5/24/95	7:45	5/24/95	12:00
Geophys.Logging:				
Casing:				
2" PVC	5/24/95	12:00	5/24/95	12:20
6" Steel	5/23/95	7:30	5/23/95	13:00
Filter Placement:	5/24/95	12:30	5/24/95	13:05
Cementing:				
Development				
Bentonite Grout	5/24/95	14:15	5/24/95	15:00
Bentonite Seal	5/24/95	14:00	5/24/95	14:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.39	-	138.50	C1	483.61	-	342.72
138.50	-	148.30	S1	342.72	-	332.92
148.30	-	148.63	C2	332.92	-	332.59
+ 1.50	-	45.00	C3	482.70	-	438.22
	-				-	
	-				-	

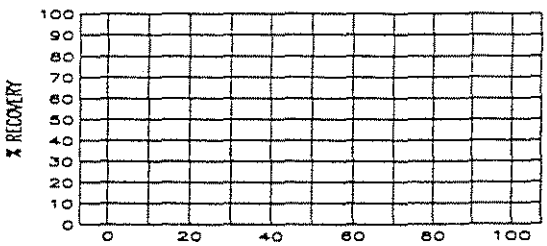
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3–see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16–35 mesh Silica Sand, 135.8–149.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 134.8–135.8 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0–122.0 ft., Neat cement, 3.0–45.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 122.0–134.8 ft.
Concrete: 0.0–3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/2 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ105SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122510	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-10555

SITE ADDRESS	CITY	STATE	ZIP CODE
51. CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
120 S BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

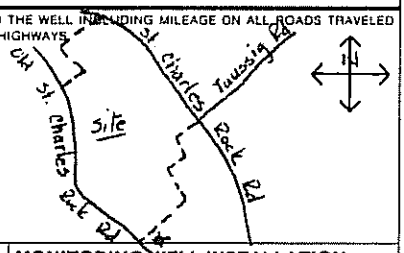
COUNTY ST LOUIS
ELEVATION 481.2
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG 5 E OR W

LAT. 38° 45' 44" LONG. 90° 30' 35"

SKETCH THE LOCATION TO THE WELL, INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME

LAYNE WESTERN Co, Inc.

DRILLING CONTRACTOR'S NAME

LAYNE WESTERN Co, Inc.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
483.6

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ I.S.A
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-24-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogl

PERMIT NUMBER	DATE
001296WIM	7-07-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogl

PERMIT NUMBER	DATE
001296WIM	7-07-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 483.6

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING Type: STEEL Size: 6"x8'x5' Bore Hole Diameter: 9⅛
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 481.2 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	0-35 no samples
		35-144 Limestone
Depth to Base of Annular Seal:	122.0	
Depth to Base of Bentonite Seal:	134.8	
Depth to Base of Secondary Filter Pack:	135.8	
Depth to Top of the Screen:	138.5	
Depth to Bottom of the Screen:	148.5	
Plug Back Total Depth		
Original Total Depth:	149.0	

PROTECTIVE CASING SEAL Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE Length: 140.7' Diameter: 3" Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5⅞ in.

ANNULAR SEAL Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite Length of Seal: 12.8 FL

SECONDARY FILTER PACK (Optional) Type: ☒ Sand ☐ Manufactured Grain Size: < 50 Length: 1'

PRIMARY FILTER PACK Type: ☒ Sand ☐ Manufactured Grain Size: 16-35 Length: 13.2'

WELL SCREEN Length: 10' Slot Size: 0.010 Type: SCH 80 PVC

SUMP DETAILS Length: 0.5 FL Diameter: 2 in. Type: PVC

TYPE OF BACKFILL: SAND

SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MO 780-1415 (2-94) DISTRIBUTION: WHITE DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D. Hollow Stem Auger	PZ-106-KS
		SHEET 1 OF 2
	SAMPLING METHOD:	
LAIDLAW\RI-FS\MD WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	10:30 / 13:55
	DATE	DATE / DATE
NORTHING: 1066704.02 DATUM EASTING: 515431.62 ELEVATION 460.8	CASING DEPTH	2/28/95 / 2/28/95

DRILL RIG CME 75 - TRUCK MOUNT | SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DRILLING CONTR LAYNE-WESTERN

LOGGED BY H. HIRT DATE 2/28/95 CHK'D BY W. HERST

JOB NO.: 943-2948 FILENAME: PZ106KS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1					(0.0-2.0 Ft.) No sample collected		Note: All depth measured from top of 1 foot thick gravel pad
					(458.8) 2.0		
2	2 2 2 4	1.5' / 2.0' (75%)			(2.0-4.7 Ft.) Firm, brownish gray (5YR 4/1), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP (2)	
3							
4	2 4 8 10	1.7' / 2.0' (85%)					
					(456.1) 4.7		
5					(4.7-8.8 Ft.) Very stiff, brownish gray (5YR 4/1), CLAY, little silt, NR, damp, (CH), (LOESS)	SP (3)	
6		2.0' / 2.0' (100%)				SH (4)	
7							
8	3 6 8 9	1.2' / 2.0' (60%)					
9					(8.8-11.9 Ft.) Very stiff, mottled pale yellowish brown (10YR 6/2) and moderate yellowish brown (10YR 5/4), CLAY, little silt, iron stained, NR, damp, (CL), (LOESS)	SP (5)	
10	4 4 6 7	0.1' / 2.0' (5%)			@ 10.0-12.0 Ft., stiff	SP (6)	
11							
					(448.9) 11.9		
12	1 5 5 5	0.9' / 2.0' (45%)			(11.9-15.0 Ft.) Stiff, light olive gray (5Y 5/2), CLAYEY SILT, iron stained, NR, damp, (CL-ML), (LOESS)	SP (7)	
13							
14	8 13 23 19	1.0' / 2.0' (50%)				SP (8)	

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION: LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	BORING NO. PZ-106-KS SHEET 2 OF 2
NORTHING: 1066704.02 DATUM EASTING: 515431.62 ELEVATION 460.8	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START: TIME 10:30, DATE 2/28/95 DRILLING FINISH: TIME 13:55, DATE 2/28/95
DRILL RIG: CME 75 - TRUCK MOUNT ANGLE: BEARING: SAMPLE HAMMER:	SURFACE CONDITIONS	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	50/5"	0.0" / 2.0" (0%)			(15.0-15.5 Ft.) Compact, pale yellowish brown (10YR 6/2), Fine SAND, to gravel, NR, dry, (SP), (ALLUVIAL) (445.3) 15.5 (15.5-21.2 Ft.) Dense, very light gray (N8), LIMESTONE GRAVEL interbedded, with medium dark gray (N4), Fine SAND, (SR gravel, NR sand), dry, (GP), (ALLUVIAL)	SP 8	
17						SP 9	
18	10 26 14 15	0.8" / 2.0" (40%)				SP 10	
19							
20	6 15 23 32	1.0" / 2.0" (50%)				SP 11	
21					(439.6) 21.2 (21.2-27.7 Ft.) Hard, medium dark gray (N4), CLAY, NR, damp, (CH), (ALLUVIUM)		
22	8 18 24 30	0.6" / 2.0" (30%)				SP 12	
23							
24	6 13 20 29	1.3" / 2.0" (65%)			@ 24.7 ft., becoming dark gray (N3)	SP 13	
25							
26	9 17 38 40	0.8" / 2.0" (40%)				SP 14	
27					(433.1) 27.7 (27.7-29.3 Ft.) Hard, medium light gray (N6), SILTY CLAY, NR, dry, (CL), (ALLUVIUM) (431.5) 29.3		
28	19 39 50/3"	0.9" / 2.0" (45%)			(29.3-30.0 Ft.) Very dense, very light gray, (N8), LIMESTONE GRAVEL, SR, dry, (GP) End of Soil Borehole Log at 30.0 ft. See PZ-106-KS Record of Drillhole for rock descriptions	SP 15	Auger/split spoon refusal at 30.0 Feet
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HURT

DATE 2/28/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ106KS

RECORD OF DRILLHOLE PZ-106-KS

Sheet 1 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 643-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-30.0 ft. See Soil Borehole Log PZ-106-KS														
18															
20															
22															
24															
26															
28															
30	431.80		431.80												
	30.0-36.5 ft. 30.00 Fresh, medium bedded, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1), medium grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)		30.00	1	69%				J,I,R (2) J,ST,R J,I,R J,PL,SM						2/28/95 @ 14:45 Begin coring
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 2 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: ° 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, X-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	30.0-36.5 ft. Fresh, medium bedded, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1), medium grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
	33.5-34.0 ft. Hard clay infilling								J,ST,R						
34	34.0-34.5 ft. ARENACEOUS DOLOMITE 427.30			1	69%				J,PL,R,CL						Core loss probably due to highly fractured nature of rock
	34.50														
									Core Loss						
36			425.30												
	36.5-37.9 ft. Highly weathered, thickly laminated, medium dark gray (N4), fine grained, medium strong, SILTSTONE, (ST. LOUIS FORMATION)		36.50												
	Cross bedded, Limestone 423.90														
38	breccia 37.90														
	37.9-41.5 ft. Completely weathered, thinly laminated, grayish black (N2), very fine grained, extremely weak, CLAYSTONE. (ST. LOUIS FORMATION)														
	38.5-38.6 ft. 60° silt crossbeds, pyrite crystals abundant			2	93%				B,PL,SM (3)						
40									J,I,SM (5)						
	41.0-41.5 ft. Greenish gray (5GY 6/1) clay layer 420.30								J,I,SM (2)						
	41.5-42.7 ft.								J,I,R						
	Fresh, medium bedded, light greenish gray (5GY 8/1), medium grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) 419.10								B,PL,SM						
42			419.30												
	42.5-42.7 ft. Clay infilling 42.70		42.50												Bit getting plugged off
	42.7-48.4 ft. Fresh, thickly bedded, medium light gray (N6), medium grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION)														
44				3	96%										
46	46.0-46.5 ft. Siltstone								B,I,R						
	46.7-46.8 ft. Claystone								J,I,R						
	46.8-47.1 ft. Chert														
	47.3-47.5 ft. Siltstone		414.50												
	47.5-48.1 ft. Clay layer		47.30	4	96%										
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

Dis... SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48			413.40												
	48.4-52.3 ft. 48.40 Moderately weathered, medium bedded, medium light gray (N6), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic														
50	49.6-50.6 ft. Chert nodules 50.0-50.1 ft. Claystone 50.3-50.6 ft. Claystone 51.0-51.5 ft. Claystone			4	98%				J,I,R,CL						
52			409.50												
	52.3-55.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, numerous pyrite crystals		52.30						J,I,R (2) J,I,R J,I,R J,I,R,CL J,I,R (2)						
54															
									J,I,R (2)						
56	55.7-59.6 ft. Slightly weathered, medium bedded, medium light gray (N6), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Porous/vuggy, some pyrite crystals and chert nodules, vugs <1 mm. diameter			5	99%				J,PL,R,CL						
58			402.40												
			59.40												
	59.6-70.0 ft. 59.60 Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy, vugs <1 mm.														
60															
				6	98%				J,PL,SM						
62	62.2-62.8 ft. Claystone 62.8-63.4 ft. Calcite crystals								B,PL,SM B,PL,SM J,I,R, calcite crystals J,I,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chloride, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64													
	64.7-65.2 ft. calcite crystals							J,I,R calcite crystals J,I,R					
								J,I,R J,I,R calcite crystals					
68	65.9-66.9 ft. Calcite crystals and iron staining		8	98%									
		394.20 67.60						J,I,SM					8:45 End Core Run 6
68	67.8-68.6 ft. Calcite crystals, some iron staining							J,I,R J,I,SM					
	69.7-70.7 ft. Calcite crystals 391.80							J,PL,SM J,PL,SM					
70	70.0-98.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 70.00							J,I,SM J,I,R,CL J,I,R,Fe J,I,R					
			7	99%									
72													
	72.6-73.3 ft. 0° calcite vein												
	73.4-73.6 ft. Arenaceous, slightly weathered							J,I,R,CL (2)					
74		387.40 74.40											9:30 End Core Run 7
								J,I,R (2)					
76	76.4-80.9 ft. Microcrystalline, stylolitic							J,I,R					
			6	100%				J,I,SM (3)					
78								J,I,R (2)					
	79.6-79.8 ft. Dolomite layer							J,PL,SM,CL					
80													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 5 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.6
E: 815432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR, SW, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R6 1500, R5 600, R4 300, R3 150, R2 30, R1)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	70.0-98.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)														
	80.9-82.8 ft. Fine grained, arenaceous			8	100 %				J,I,R (2)						
82			379.00												
			82.80												10:15 End Core Run 8
	83.9-84.2 ft. Calcite filled vugs								J,PL,SM,CL J,I,R						
84	85.0-87.1 ft. Microcrystalline, stylolitic								J,I,R						
86				9	100 %				J,PL,SM						
	87.1-88.3 ft. Porous/vuggy Dolomite								J,PL,SM						
88	88.3-90.6 ft. Microcrystalline, stylolitic								B,I,R J,I,R						
			372.40												
			89.40						J,I,R						11:05 End Core Run 9
90	90.6-92.0 ft. Porous/vuggy Dolomite														
92	92.2-94.1 ft. Microcrystalline, some silty laminae			10	95%				J,PL,R J,I,R,CL J,I,SM J,I,R J,I,R						
94									J,I,R,CL						
									J,I,R,CL						
96	95.9-96.1 ft. Moderately weathered, arenaceous														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

LENGTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	70.0-98.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM,CL						
	97.5-97.8 ft. Dolomitic		363.80	10	99%										
98	98.0-119.3 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy		98.00												
			382.40												
			98.40												11:55 End Core Run 10
100															
	101.2-104.3 ft. Medium grained Limestone								J,PL,SM,CL J,PL,SM J,I,R						
102									J,PL,R J,PL,R (2)						
104				11	100%				J,PL,SM,CL						
106															
	107.1-108.0 ft. Interbedded Limestone and Dolomite														
108	108.0-110.9 ft. Arenaceous Limestone								J,I,R J,I,SM,CL						
			352.40						J,I,R						
			109.40												13:25 End Core Run 11
110	110.0-110.3 ft. 45° healed fracture								J,I,R (2) J,I,R						
				12	95%				J,I,R,CL						
	111.0-111.9 ft. Moderate to highly weathered, arenaceous Dolomite, some chert														
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SN-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	112.0-112.4 ft. Crystalline Limestone, moderately weathered								J,I,R,CL						
									J,ST,SM						
									J,I,SM (2)						
	113.2-115.0 ft. Crystalline Limestone								J,I,SM,CL (2)						
									J,PL,SM						
114									J,I,SM						
	115.0-115.3 ft. 10° calcite filled vein (2 mm. thick)								J,I,SM						
				12	98%										
116															
									J,I,SM						
	117.0-119.0 ft. 10° calcite filled veins (2 mm. thick)														
118															
		342.50													
	119.3-133.8 ft. Fresh, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Some braciopod fossils	119.30	342.40 / 119.40												14:05 End Core Run 12
120															
122															
	123.1-124.9 ft. Greenish gray (5GY 6/1) to dark greenish gray (5GY 4/1), Dolomite with calcite veins and vugs			13	98%										
124									J,I,R						
	124.9-126.0 ft. 10° calcite filled veins								J,I,R,calcite						
									J,PL,R (2)						
	125.6-133.2 ft. Microcrystalline to fine grained, thinly laminated, Silt and Dolomite interbeds														
126									J,I,R,CL (2)						
	127.6-131.7 ft. Large chert nodules														
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP WRT CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	119.3-133.8 ft. Fresh, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Some braciopod fossils			13	98%				J,PL,SM						
			332.40												
130			129.40						J,PL,SM						14:50 End Core Run 13
									J,I,SM						
132									J,I,SM (2)						
	132.4-132.5 ft. Claystone								B,PL,SM						
			328.00												
134	133.8-146.6 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)		133.80	14	100 %										@ 133.8 ft. Inferred top of SALEM FORMATION
136															
138															
	138.7-139.7 ft. Fine to medium grained arenaceous Limestone, cross bedded		322.60						J,I,SM						
			139.20						J,PL,SM						8:45 End Core Run 14
140	139.7-142.1 ft. Fine grained to microcrystalline														
	140.4-140.7 ft. Chert layer								J,PL,SM						
				15	99%				J,PL,SM,CL						
142	142.1-142.4 ft. Clay layer								J,I,SM,CL (2)						
	142.5-142.7 ft. Chert nodules								J,I,R						
	143.4-146.1 ft. Medium grained Limestone														
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 8 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	119.3-133.8 ft. Fresh, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Some braciopod fossils			13	98%				J,PL,SM						
			332.40 / 129.40												14:50 End Core Run 13
130									J,PL,SM						
									J,I,SM						
									J,I,SM (2)						
132	132.4-132.5 ft. Claystone								B,PL,SM						
			326.00 / 133.80												@ 133.8 ft. Inferred top of SALEM FORMATION
134	133.8-146.6 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)			14	100 %										
136															
138	138.7-139.7 ft. Fine to medium grained arenaceous Limestone, cross bedded		322.60 / 139.20						J,I,SM						8:45 End Core Run 14
									J,PL,SM						
	139.7-142.1 ft. Fine grained to microcrystalline														
140	140.4-140.7 ft. Chert layer														
									J,PL,SM						
				15	98%				J,PL,SM,CL						
142	142.1-142.4 ft. Clay layer														
	142.5-142.7 ft. Chert nodules								J,I,SM,CL (2)						
	143.4-146.1 ft. Medium grained Limestone								J,I,R						
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 9 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	144.0-144.4 ft. Chert layer												
	146.1-146.2 ft. Chert nodule												
146	146.2-146.6 ft. Thinly laminated, arenaceous Limestone, cross bedded	315.20	15	99%				J,I,R (2)					
	146.6-152.6 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (SALEM FORMATION) Slightly porous/vuggy, interbedded chert nodules	146.60											
148	148.8-149.0 ft. Chert zone	313.00											
		148.80											9:50 End Core Run 15
150	150.4-150.7 ft. Chert zone		16	100 %				J,U,R					
								J,I,SM					Driller reports rock is very hard
	151.8-152.0 ft. Chert zone							J,I,R (2)					
152	152.5 ft. 1 in. diameter, black claystone clast	309.20						J,I,R					
	152.6-160.5 ft. Fresh, thinly laminated, light olive gray (5Y 5/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Crossbedded, numerous chert nodules/beds	152.60						J,PL,SM					
		308.70											
		153.10											10:40 End Core Run 16
154	153.0-153.6 ft. Chert zone							J,PL,SM					
								J,I,R					Driller reports rock is very hard
	155.5-155.6 ft. Chert zone												
156	156.1-157.5 ft. Pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2)		17	97%									
	156.4 ft. Brachiopod fossils												
	157.0-157.2 ft. Chert zone												
158	158.2-158.4 ft. Chert zone							J,I,SM					
								J,U,SM					
								J,U,SM (2)					
	159.0-159.4 ft. Chert zone							J,U,SM					
		302.50						J,PL,SM					
		159.30						J,I,SM					11:50 End Core Run 17
	159.6-159.7 ft. Chert nodule		18	100 %									
160													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 10 of 23

PROJECT: LAIDLAW/R-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	160.2-160.4 ft. Chert zone 160.5-174.3 ft. Fresh, thickly laminated, medium light gray (N6), coarse grained, medium strong, FOSSILIFEROUS DOLOMITIC LIMESTONE, (SALEM FORMATION)								J,I,SM						
162									J,U,R						
164				18	100 %				J,ST,R						
166															
168									J,PL,SM						
			292.50 169.30												13:45 End Core Run 18
170				19	100 %										
172															
174			287.50												
	174.3-178.8 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2) to medium light gray (N6), f-c grained, medium strong, CALCAREOUS DOLOMITE, (SALEM FORMATION) Some fossils, cross bedding		174.30												
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 11 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
176	174.3-178.8 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2) to medium light gray (N6), fine to coarse grained, medium strong, CALCAREOUS DOLOMITE, (SALEM FORMATION) Some fossils, cross bedding								J,PL,SM; J,PL,R						
				19	100 %										
178	176.9-177.2 ft. Chert zone 178.3-178.5 ft. Chert zone														
	178.8-187.0 ft. Slightly weathered, medium bedded, moderate yellowish brown (10YR 5/4), medium grained, medium strong, DOLOMITE, (SALEM FORMATION) Some fossils, calcite crystals, porous/vuggy 180.2-180.3 ft. Chert nodule		282.50 / 179.30						J,I,R; J,PL,R						14:30 End Core Run 19
180															
182															
184	183.9-184.1 ft. Chert zone			20	99%				J,I,R; J,I,R						
186															
			274.80						J,I,SM (2)						
	187.0-189.3 ft. Fresh, thinly laminated, pale yellowish brown (10YR 6/2), medium grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) Some cross bedding, fossils		187.00												
188															
			272.50												
	189.3-201.3 ft. Fresh, thickly laminated, light olive gray (5Y 6/1), interbedded medium and very coarse grained, medium strong, ARGILLACEOUS FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) 190.8-191.4 ft. Brecciated		189.30												15:30 End Core Run 20
190				21	98%										
192															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 12 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/26/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	189.3-201.3 ft. Fresh, thickly laminated, light olive gray (5Y 6/1), interbedded medium and very coarse grained, medium strong, ARGILLACEOUS FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)														
194															
	195.4-195.7 ft. Cross bedded, brecciated			21	98%										
196															
198			262.60												
			199.30												16:35 End Core Run 21
200	200.5-201.2 ft. Cross bedded, brecciated														
			260.60												
	201.2-209.2 ft. Fresh, thinly laminated, medium dark gray (N4), very fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) Brachiopod fossils		201.20						J,PL,SM,CL						201.9-202.5 ft. GTS-1 collected for perm. testing at laboratory
202															
				22	99%										
204															
	205.1-207.2 ft. Medium gray (N5), fine to medium grained														
206									J,I,R,CL						
	207.1-207.2 ft. Brecciated														
	207.3-End of Borehole Olive gray (5Y 4/1), medium strong								J,PL,SM,CL						
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 13 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.6
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
208	201.2-209.2 ft. Fresh, thinly laminated, medium dark gray (N4), very fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) 252.60			22	99%										17:35 End Core Run 22
	Brachiopod fossils 209.20		252.50												
	209.2-225.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)		209.30						J,PL,SM						3/11/95 @ 10:15 Begin coring Run 23 after installing 6 in. dia. casing to 204 ft.
210															
212	212.2-213.7 ft. Slightly weathered, porous/vuggy, calcareous Dolomite, some fossils								B,PL,SM						
									J,I,SM (2)						
									J,I,SM						
214				23	98%										
216															
	217.3-218.5 ft. Medium grained														
218															
			242.50												
			219.30												12:30 End Core Run 23
220	220.1-221.9 ft. Medium grained								J,PL,R						
									J,I,R						
222				24	101%										
224															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 14 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.6
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: Dip wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR MW HW CW	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224	209.2-225.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)														
	236.40 / 225.40														
228	225.4-233.2 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) Some calcite crystals, fossils 225.4-228.3 ft. Slightly porous/vuggy (<1 mm.)			24	101 %				J,ST,SM,CL						
			232.50												
230			229.30												13:55 End Core Run 24 229.6-230.1 ft. GTS-2 collected for perm. testing at laboratory
232									J,I,SM,CL						
	228.60 / 233.20														
234	233.2-251.3 ft. Fresh, medium bedded, olive gray (5Y 4/1), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Stylolitic, some calcite crystals			25	98%				J,PL,SM						
236	235.9-238.3 ft. Slightly weathered								J,I,R						
238	239.0-240.0 ft. Slightly weathered		222.50						J,I,R						
			239.30	26	100 %				J,I,R J,I,R						14:50 End Core Run 25
240															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 15 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.6
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP WRT CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, MW, HW, CW, FR)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1, R2 30, R3 150, R4 300, R5 600, R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	233.2-251.3 ft. Fresh, medium bedded, olive gray (5Y 4/1), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Stylolitic, some calcite crystals							90	J,I,R						
242															
244				26	100%										
246	246.3-246.5 ft. Fine grained, Dolomitic Limestone														
248			212.50												
			249.30												15:40 End Core Run 26
250								90	J,I,R						
	250.3-251.3 ft. Medium grained														
			210.50					90	J,I,R						
	251.3-257.7 ft. Slightly weathered, medium bedded, olive gray (5Y 4/1), fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) Porous/vuggy (<1 mm.)		251.30					90	J,I,R						
252				27	98%			90	J,PL,SM,CL (2)						
254															
256															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 18 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
256	251.3-257.7 ft. Slightly weathered, medium bedded, olive gray (5Y 4/1), fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) Porous/vuggy (<1 mm.)								J,PL,SM						
	204.10														
	257.7-259.7 ft. Fresh, medium bedded, olive gray (5Y 4/1), medium grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)			27	98%										
258									J,PL,SM,CL						
			202.50												
			259.30												16:25 End Core Run 27
	202.10														
	259.7-263.7 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION)								B,I,SM,CL						
260															
	261.8-262.3 ft. Calcite crystals, some large vugs (>10 mm.)								J,PL,SM						
262									J,I,SM brecciated						
	263.5-163.7 ft. Highly weathered								B,I,SM (4)						
	198.10														
	263.7-269.3 ft. Fresh, medium bedded, olive gray (5Y 4/1), coarse grained, strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)			28	98%										
264									J,I,SM,CL						
266	266.3-266.4 ft. Claystone								J,I,SM,CL						
268	268.3-269.3 ft. Calcareous claystone								J,I,SM,CL J,PL,SM						
	192.50		192.50												
	269.3-284.2 ft. Fresh, medium bedded, medium dark gray (N4), very fine grained, very weak, CLAYSTONE, (WARSAW FORMATION) Some calcite crystals		269.30						J,PL,SM						17:15 End Core Run 28
270				29	96%										
	271.3-271.7 ft. Slightly wethered, porous								J,PL,SM (2)						
272															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 17 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 109703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r/t CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
272	269.3-284.2 ft. Fresh, medium bedded, medium dark gray (N4), very fine grained, very weak, CLAYSTONE, (WARSAW FORMATION) Some calcite crystals			29	96%				J,PL,SM						
274			187.50												
			274.30												8:45 End Core Run 29 Problems coring, drill string very wobbly due to large diameter casing
276	275.1-276.0 ft. Slightly weathered, porous														
	277.6 ft. Calcite filled vug (3 cm.)														
278				30	100%										
280															
282	282.7-283.2 ft. Calcareous, weak														
	283.3-284.1 ft. Slightly weathered, porous														
284			177.60												
	284.2-301.4 ft. Fresh, medium bedded, medium dark gray (N4), fine grained, medium strong, CALCAREOUS CLAYSTONE, (WARSAW FORMATION)		284.20						J,I,SM						10:00 End Core Run 30 Cuttings not coming out with return; flush hole
286				31	100%				J,PL,SM						
									J,I,SM						
288															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 18 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
288	284.2-301.4 ft. Fresh, medium bedded, medium dark gray (N4), fine grained, medium strong, CALCAREOUS CLAYSTONE, (WARSAW FORMATION)			31	100%										
			172.60												
	289.2-290.6 ft. Dolomite		289.20												12:00 End Core Run 31
290															
292									J,I,SM J,I,SM,CL						
294	293.4-295.6 ft. Dolomite			32	99%										
296															
298															
			162.60												
			299.20												13:50 End Core Run 32
300															
			160.40												
	301.4-346.4 ft.		301.40												
302	Fresh, thinly bedded, medium dark gray (N4), m-vc grained, medium strong, LIMESTONE, (WARSAW FORMATION) Some Claystone partings			33	100%										
	302.6-304.3 ft. Dolomitic Claystone, some fossils														
304															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 19 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW HW, CW	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
304	301.4-346.4 ft. Fresh, thinly bedded, medium dark gray (N4), m-vc grained, medium strong, LIMESTONE, (WARSAW FORMATION) Some Claystone partings		157.80 / 304.20	33	100 %										14:15 End Core Run 33
306															
308	307.9 ft. Calcite filled vug (3 cm.)														
				34	99%										
310															
312															
314			147.80 / 314.20												14:50 End Core Run 34
	315.5 ft. Chert zone														
316	316.2 ft. Chert zone														
				35	100 %										
318									J,U,SM,CL						
320															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 20 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
ROCK TYPE											SW FR / MW / HW / CW	R6 R5 R4 R3 R2 R1	R1 R2 R3 R4 R5 R6		
320	301.4-346.4 ft. Fresh, thinly bedded, medium dark gray (N4), m-vc grained, medium strong, LIMESTONE. (WARSAW FORMATION) Some Claystone partings														
322				35	100 %										
	323.2-323.3 ft. Chert zone														
324			137.60 / 324.20												15:45 End Core Run 35
	324.8 ft. Chert zone														
	325.3, 325.8, and 326.3 ft. Chert zones														
328															
	327.4 ft. Chert zone														
328															
	328.5 ft. Chert zone														
	329.1 ft. Chert zone			36	99%										
	329.6-329.9 ft. Chert zone														
330															
332															
	333.4 ft. Chert zone								J,I,SM,CL						
334			127.50 / 334.20				3		J,I,SM						16:40 End Core Run 36
				37	100 %										
336	335.8 ft. Chert zone														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 21 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1, R2 30, R3 150, R4 300, R5 600, R6 1500	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
338	301.4-346.4 ft. Fresh, thinly bedded, medium dark gray (N4), m-vc grained, medium strong, LIMESTONE, (WARSAW FORMATION) Some Claystone partings														
	336.6-346.4 ft. No more claystone partings														
	336.9 ft. Chert zone														
338	337.9-339.2 ft. Chert zone								J,I,R calcite crystals						
340	339.9 ft. Chert zone			37	100 %										
	340.9-341.3 ft. Chert zone														
342	342.0-342.2 ft. Chert zone								J,I,SM,chert						
	342.3-343.5 ft. Chert zone														
	343.8 ft.								J,I,SM						
344	Chert zone								J,I,SM						
			117.60												
			344.20												8:30 End Core Run 37
	344.6 ft. Chert zone														
346									J,I,R,fossils						
			115.40												
	346.4-363.6 ft. Slightly weathered, thinly to medium bedded, light gray (N7), medium grained, medium strong, CALCAREOUS DOLOMITE, (KEOKUK FORMATION) Interbedded with chert zones and nodules; porous/vuggy; some filled with calcite crystals; some calcite veins		348.40						J,I,R,chert						
348				38	98%										
350									J,I,SM						
352									J,I,SM,chert						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 22 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
352	346.4-363.6 ft. Slightly weathered, thinly to medium bedded, light gray (N7), medium grained, medium strong, CALCAREOUS DOLOMITE (KEOKUK FORMATION) Interbedded with chert zones and nodules; porous/vuggy: some filled with calcite crystals; some calcite veins														
				38	98%				J,I,R						
354			107.60 / 354.20						J,I,SM J,I,R						9:30 End Core Run 38
									J,I,R						
358									J,I,R						
358	358.0-361.1 ft. Moderately weathered, very vuggy								J,I,R J,I,R calcite crystals J,I,R						
				39	95%										
360															
362									J,I,R (2)						Drilling rate much slower due to presence of chert
									J,PL,R (2)						
	98.80 / 363.00		98.40 / 363.40						Core Loss						362.9-363.4 ft. Core loss 11:00
	363.6-370.1 ft. Slightly weathered, thinly bedded, light gray (N7), m-vc grained, medium strong, DOLOMITIC LIMESTONE, (KEOKUK FORMATION) Slightly vuggy, some chert nodules								J,I,R (3)						End Core Run 39
364									J,I,SM						
									J,I,R						
366				40	100 %										
368															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

Sheet 23 of 23

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
Pl-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1, R2, R3, R4, R5, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
368	363.6-370.1 ft. Slightly weathered, thinly bedded, light gray (N7), m-vc grained, medium strong, DOLOMITIC LIMESTONE, (KEOKUK FORMATION) Slightly vuggy, some chert nodules								J,I,SM,chert						
370	369.4-370.1 ft. Chert layer 91.70 370.10								J,PL,SM						
	370.1-373.4 ft. Moderately weathered, medium bedded, medium light gray (N6), fine grained, medium strong, DOLOMITE, (KEOKUK FORMATION) Porous/vuggy, some chert nodules and calcite crystals			40	100 %										3/13/95 @ 12:05 Core Run 40
372									J,I,SM (2)						
	88.40		88.40						J,I,SM						
	End of Record of Drillhole at 373.4 ft. 373.40		373.40						J,I,SM						
374															
376															
378															
380															
382															
384															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

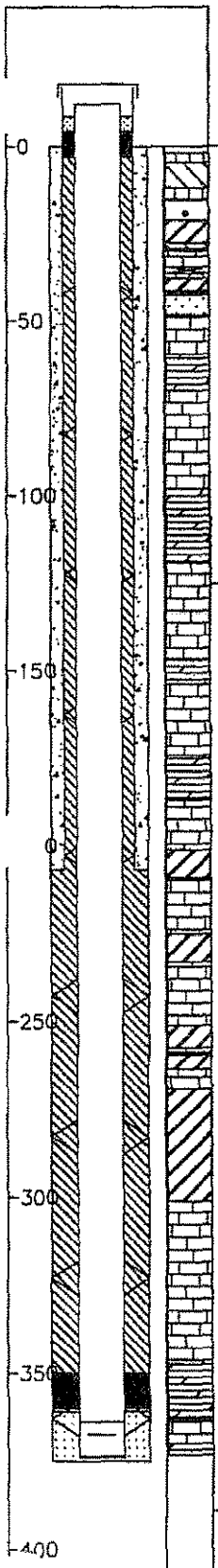
LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

Well No. PZ-106-KS

Boring No. X-Ref: PZ-106-KS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066704 ft. Easting: 515432 ft.

Elevation Ground Level 461.8 ft. NGVD

Top of PVC Casing 464.26 ft. NGVD

Drilling Summary:

Total Depth 375.0 ft.

Borehole Diameter 9 7/8 in. (0.0-204.0 ft.) 5 7/8 in. (204.0-375.0 ft.)

Casing Stickup Height 2.49 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. and 9 7/8 in. Button Bits

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/28/95	10:30	3/6/95	17:30
Schramm Rotary	3/20/95	7:30	3/20/95	11:30
Geophys.Logging:	3/20/95	12:45	3/20/95	16:30
Casing:				
2" PVC	3/23/95	8:30	3/23/95	9:40
6" Steel	3/9/95	11:45	3/10/95	8:00
Filter Placement:	3/23/95	9:40	3/23/95	10:45
Cementing:	3/9/95	14:15	3/9/95	9:00
Development				
Bentonite Grout	3/23/95	11:15	3/23/95	13:15
Bentonite Seal	3/23/95	10:45	3/23/95	11:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.49	-	363.75	C1	464.26	-	98.02
363.75	-	373.57	S1	98.02	-	88.20
373.57	-	373.90	C2	88.20	-	87.87
+ 1.50	-	204.00	C3	463.30	-	257.77
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 361.0-375.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 360.0-361.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-350.0 ft., Neat cement, 3.0-204.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 350.0-360.0 ft.

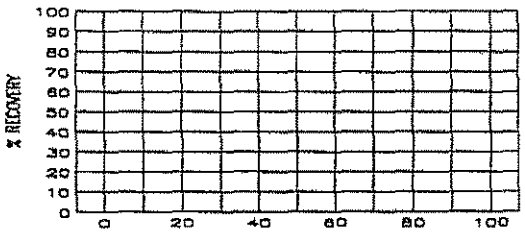
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 OD Steel Casing

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ106KS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 115092	DATE RECEIVED
ROUTE	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	CROSS REFERENCE NO
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-106-KS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

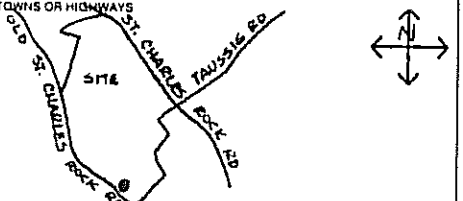
COUNTY: ST. LOUIS
ELEVATION: 461.8
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38 ° 45 ' 47 " LONG. 90 ° 26 ' 45 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
464.26

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼" H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 10 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-23-95

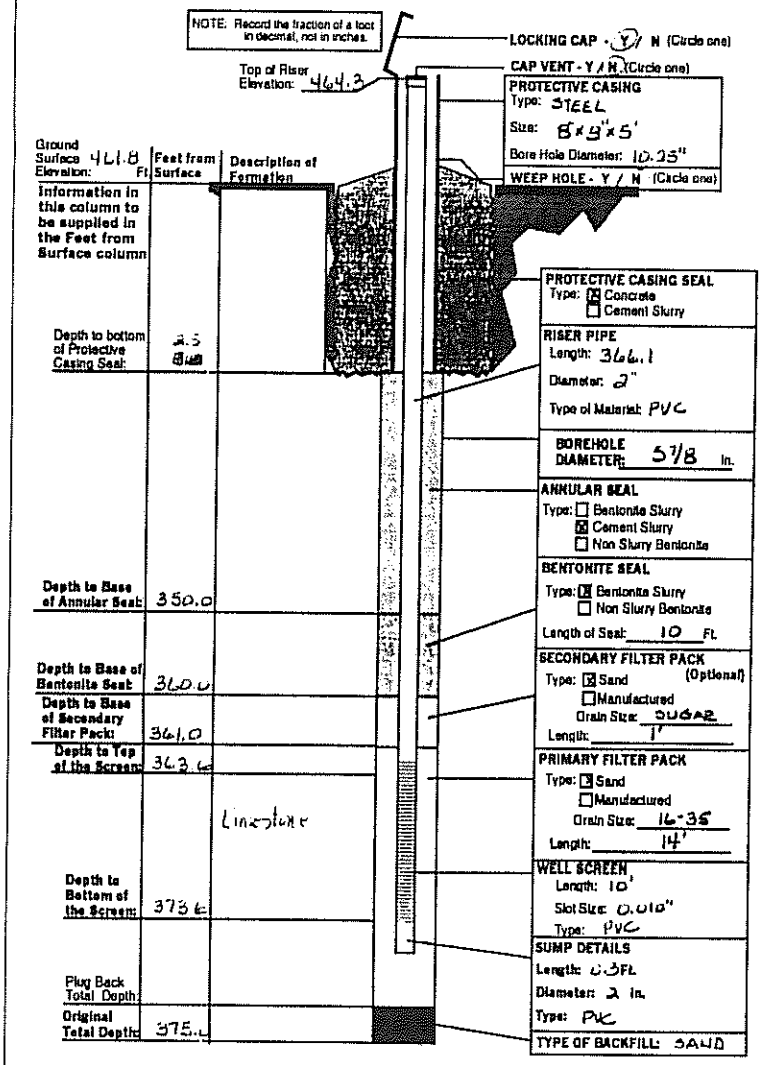
I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogl

PERMIT NUMBER	DATE
OO1256W/M	5-10-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogl

PERMIT NUMBER	DATE
OO1256W/M	5-10-95



MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

RECORD OF DRILLHOLE PZ-106-SD

Sheet 1 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/24/95
DRILL RIG: SCRAMM

DATUM: MSL
COORDINATES N: 1068715.1
AZIMUTH: 0

COLLAR ELEV: 461.5
E: 515418.0
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80, 60, 40, 20)	FRACTURES PER FOOT (2, 4, 6, 8, 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 60, 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR, SW, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (RT 30, R2 150, R3 360, R4 800, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
178	0.0-189.9 ft. No sampling conducted See Record of Drillhole for PZ-106-KS														0.0-30.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers, then borehole advanced to 189.9 ft. with 5 7/8 in. air rotary bit
176															
180															
182															
184															
186															
188															
190	271.60 189.9-199.9 ft. 189.90 Fresh, thinly laminated, light olive gray (5Y 6/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION) Fossiliferous		271.60 189.90	1	99%				J,I,R						3/24/95 @ 11:00 Began coring
192															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 5/26/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-SD

Sheet 2 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/24/95
DRILL RIG: SCRAMM

DATUM: MSL
COORDINATES N: 1068715.1
AZIMUTH: 0

COLLAR ELEV: 461.5
E: 515416.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1, R2 30, R3 150, R4 300, R5 600, R6 1500, R8)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	189.9-199.9 ft. Fresh, thinly laminated, light olive gray (5Y 6/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION) Fossiliferous								J,I,SM						
194									J,I,R						
196				1	93%										
198															
	261.60		261.60												3/24/95 @ 13:15 Finish Run 1
200	End of Record of Drillhole at 208.0 ft. 199.90		199.90												
202															
204															
206															
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: S. TILTON
CHECKED: R. BOOTH
DATE: 5/26/95

Golder Associates

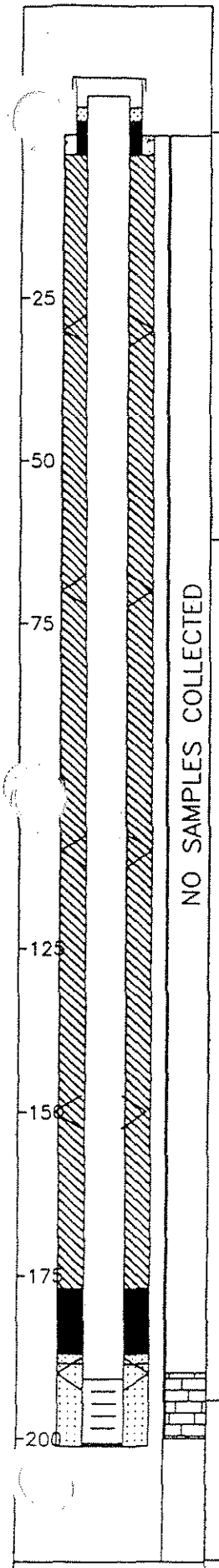
Well No. PZ-106-SD

Boring No. X-Ref: PZ-106-SD

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1066715 ft.
Easting: 515416 ft.

Elevation Ground Level 461.5 ft. NGVD
Top of PVC Casing 463.42 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 201.1 ft.
Borehole Diameter 10 1/4 in. (0.0-26.0 ft.) 5 7/8 in. (26.0-201.1 ft.)
Casing Stickup Height 1.97 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	3/23/95	16:15	3/24/95	13:00
Geophys.Logging:	3/24/95	16:15	3/24/95	18:30
Casing:	3/24/95	12:40	3/24/95	13:00
Filter Placement:	3/24/95	13:10	3/24/95	13:40
Cementing:				
Development				
Bentonite Grout	3/24/95	14:00	3/24/95	14:45
Bentonite Seal	3/24/95	13:40	3/24/95	13:55

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.97	-	190.79	C1	463.42	-	270.66
190.79	-	200.59	S1	270.66	-	260.86
200.59	-	200.93	C2	260.86	-	260.52
	-				-	
	-				-	
	-				-	

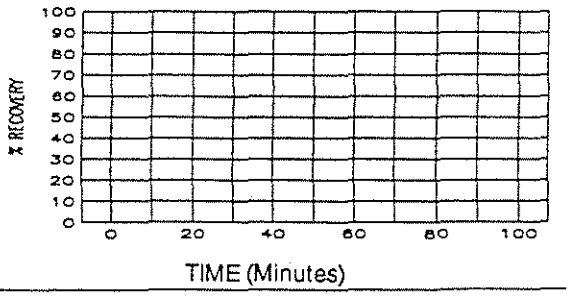
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 188.5-201.1 ft.
Filter Pack: Less than 50 mesh Silica Sand, 187.0-188.5 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-177.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 177.0-187.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by W. Herst
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ106SD

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY		DATE RECEIVED	
REF NO	15091	CHECK NO	
ROUTE		TRANSMITTAL NO	
STATE WELL NUMBER		CROSS REFERENCE NO	
CHECKED BY		ENTERED Ph 1 Ph 2 Ph 3	
APPROVED BY		DATE APPROVED	

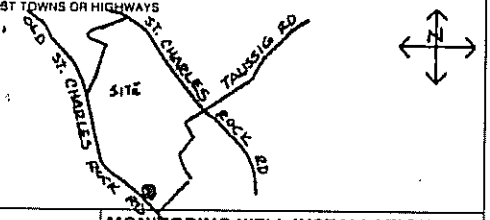
INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-106-SD
SITE ADDRESS: St. Charles Rock Rd. | CITY: Bridgeton | STATE: Mo. | ZIP CODE: 63044
NAME: Laidlaw Waste Systems, Inc. | TELEPHONE: 314-341-3710
ADDRESS: 1838 N. Broadway | CITY: St. Louis | STATE: Mo. | ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: St. Louis
ELEVATION: 461.4
AREA NO.:
SMALLEST ¼ ____ ¼ ____ ¼ LARGEST ¼ ____
SEC. ____ TWN. 47 N.RNG. 5 (E) OR W
LAT. 35 ° 45 ' 47 " LONG. 90 ° 26 ' 46 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: Layne Western Co., Inc.

DRILLING CONTRACTOR'S NAME: Layne Western Co, Inc.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 463.42

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER ____

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

CENTRALIZERS USED: ☒ YES, AT 6 TOTAL ☒ STAINLESS STEEL ☐ OTHER ____ ☐ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 3-26-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM | DATE: 5-10-95
SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM | DATE: 5-10-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 463.4
LOCKING CAP - (Y) / N (Circle one)
CAP VENT - Y / (N) (Circle one)
PROTECTIVE CASING Type: STEEL Size: 8"x8"x5' Bore Hole Diameter: 10.25"
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 461.4 Ft.

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	177.0	
Depth to Base of Bentonite Seal:	197.0	
Depth to Base of Secondary Filter Pack:	188.5	
Depth to Top of the Screen:	190.6	
		Limestone
Depth to Bottom of the Screen:	200.6	
Plug Back Total Depth:		
Original Total Depth:	201.1	

PROTECTIVE CASING SEAL Type: ☒ Concrete ☐ Cement Slurry
RISER PIPE Length: 192.6' Diameter: 2" Type of Material: SCH. 80 PVC
BOREHOLE DIAMETER: 5⅞ In.
ANNULAR SEAL Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite
BENTONITE SEAL Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite Length of Seal: 10 Ft.
SECONDARY FILTER PACK Type: ☒ Sand (Optional) ☐ Manufactured Grain Size: SUGAR (50 Length: 1.5'
PRIMARY FILTER PACK Type: ☒ Sand ☐ Manufactured Grain Size: 16-35 Length: 12.6'
WELL SCREEN Length: 10' Slot Size: 0.010" Type: SCH. 80 PVC
SUMP DETAILS Length: 0.3 Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: SAND

MO 780-1415 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

RECORD OF DRILLHOLE PZ-106-SS

Sheet 1 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/4/95 - 4/5/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1068726.3
AZIMUTH: 0

COLLAR ELEV: 461.0
E: 515399.9
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	0.0-154.9 ft. No sampling conducted See Record of Drillhole for PZ-106-KS														0.0-30.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers, then borehole advanced to 154.9 ft. with 5 7/8 in. air rotary bit
146															
148															
150															
152															
154															
	306.10		306.10												
156	154.9-160.3 ft. 154.90 Fresh, thinly bedded to thinly laminated, light olive gray (5Y 6/1), f-m grained, medium strong, AGILLACEOUS LIMESTONE, (SALEM FORMATION) Chert nodules, silt lenses, stylolitic, fossiliferous		154.90						J,I,R						4/4/95 @ 12:20 Begin Run 1 @ 13:30 Rig breaks down
158				1	100 %				J,C,R J,I,R						
160									J,I,SM						4/5/95 @ 7:30 Resume drilling at 159.5 ft.

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: J. MILLER
CHECKED: B. TILTON
DATE: 5/26/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-SS

Sheet 2 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/4/95 - 4/5/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1066726.3
AZIMUTH: 0

COLLAR ELEV: 481.0
E: 515388.9
INCLINATION: -90

ROCK TYPE
J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, HW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	160.3-165.0 ft. Slightly weahtered, thickly laminated, yellowish gray (5Y 7/2), coarse grained, strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)								J,C,SM						
162				1	100 %				J,I,R (2)						
164	Fossil fragments, sandy														
	296.00		296.00												4/5/95 @ 10:00 End Run 1
	End of Record of Drillhole at 165.0 ft. 165.00		165.00												
166															
168															
170															
172															
174															
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

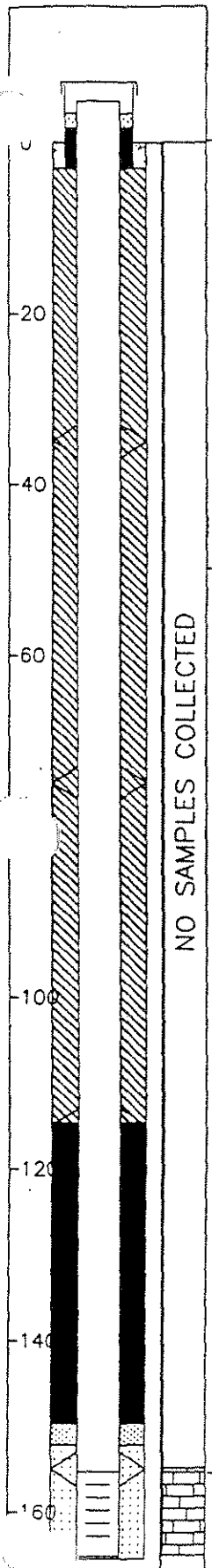
LOGGED: J. MILLER
CHECKED: B. TILTON
DATE: 5/26/95

Golder Associates

Well No. PZ-106-SS

Boring No. X-Ref: PZ-106-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066726 ft. Easting: 515400 ft.

Elevation Ground Level 461.0 ft. NGVD

Top of PVC Casing 462.70 ft. NGVD

Drilling Summary:

Total Depth 165.4 ft.

Borehole Diameter 10 1/4 in. (0.0-23.0 ft.) 5 7/8 in. (23.0-165.4 ft.)

Casing Stickup Height 1.75 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	4/4/95	8:25	4/5/95	10:00
Geophys.Logging:				
Casing:	4/5/95	11:45	4/5/95	12:10
Filter Placement:	4/5/95	12:15	4/5/95	12:30
Cementing:				
Development				
Bentonite Grout	4/5/95	13:05	4/5/95	13:41
Bentonite Seal	4/5/95	12:30	4/5/95	13:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.75	-	155.30	C1	462.70	-	305.65
155.30	-	165.10	S1	305.65	-	295.85
165.10	-	165.43	C2	295.85	-	295.52
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 152.2-165.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 149.7-152.2 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-114.7 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 114.7-149.7 ft.

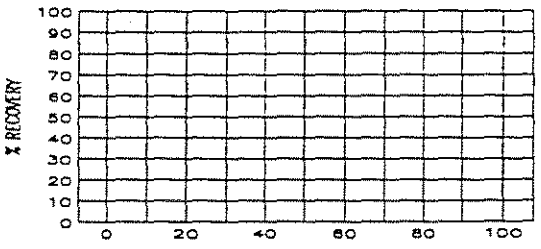
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by J. Miller

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ106SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122480	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-106-SS

SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: Mo | ZIP CODE: 63044

NAME: LAIDLAW WASTE SYSTEMS, INC | TELEPHONE: 314-241-3710

ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: Mo | ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

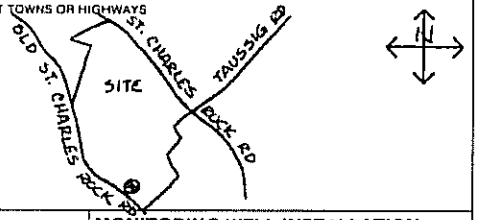
COUNTY: ST. LOUIS
ELEVATION: 460.9
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG 5 (E) OR W

LAT. 38 ° 45 ' 47 " LONG. 90 ° 26 ' 46 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co., INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 462.70

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 15', 35', 75', 115', 155' ☒ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-05-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WIM | DATE: 5-10-95
SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WIM | DATE: 5-10-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 462.7

LOCKING CAP - (Y) / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10.25'

WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 460.7 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	114.7	
Depth to Base of Bentonite Seal:	147.7	
Depth to Base of Secondary Filter Pack:	152.2	
Depth to Top of the Screen:	155.1	Limestone
Depth to Bottom of the Screen:	165.1	
Plug Back Total Depth		
Original Total Depth:	165.4	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 156.9'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 35 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR <50
Length: 2.5'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 13.2'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1420 (6-93)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger					PZ-107-SS
						SHEET 1 OF 3
	SAMPLING METHOD:					DRILLING
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					START TIME 13:00 / FINISH TIME 16:25
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					
	WATER LEVEL					
	TIME					
	DATE					START DATE 3/26/95 / FINISH DATE 3/26/95
NORTHING: 1067163.45 DATUM EASTING: 515254.52 ELEVATION 462.6	CASING DEPTH					

DRILL RIG CME 75	SURFACE CONDITIONS
ANGLE -90° BEARING	
SAMPLE HAMMER	

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 5 5 5	0.9'/2.0' (45%)			(0.0-2.0 ft.) Stiff, moderate yellowish brown (10YR 5/4), SILTY CLAY, trace of very fine Sand, WR, damp, (CL), (FILL)	SP ①	
2 3	2 2 4 18	1.0'/2.0' (50%)			(2.0-4.0 ft.) Firm, yellowish brown (10YR 5/4), SILTY CLAY, little Gravel, trace amount of trash at bottom, WR, damp, (CL), (FILL)	SP ②	
4 5	3 8 11 10	1.1'/2.0' (55%)			(4.0-6.0 ft.) Very stiff, medium light gray (N5) to dark greenish gray (5GY 4/1), SILTY CLAY, some Gravel, SR, moist, (CL), (FILL)	SP ③	
6					(456.6) 6.0		
6 7	4 8 23 5	1.1'/2.0' (55%)			(6.0-8.0 ft.) Mixed damp waste and silty clay	SP ④	
8 9	7 2 4 1	0.3'/2.0' (15%)			(8.0-10.0 ft.) Trash	SP ⑤	
10 11	3 3 4 4	0.0'/2.0' (0%)			(10.0-12.0 ft.) Waste becomes wet	SP ⑥	
12					(450.6) 12.0		From 12.0-28.0 ft., no samples recovered, but drilling indicated mixed waste and silty clay layers
13	8 32 15 9	0.0'/2.0' (0%)	NO RECOVERY		(12.0-14.0 ft.) No Recovery	SP ⑦	
14	6 12 8 5	0.0'/2.0' (0%)			(14.0-15.0 ft.) No Recovery	SP ⑧	

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ107SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger					PZ-107-SS	
						SHEET	
	SAMPLING METHOD:					2 OF 3	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					13:00	16:25
	DATE					DATE	DATE
NORTHING: 1067163.45 DATUM EASTING: 515254.52 ELEVATION 462.6	CASING DEPTH					3/26/95	3/26/95

DRILL RIG CME 75	SURFACE CONDITIONS
ANGLE -90° BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	5 8 13 6	0.0" 2.0" (0%)	NO RECOVERY		(15.0-16.0 Ft.) No Recovery	SP (8)	
					(16.0-18.0 Ft.) No Recovery	SP (9)	
18	5 7 35 41	0.0" 2.0" (0%)			(18.0-20.0 Ft.) No Recovery	SP (10)	
20	5 5 5 3	0.0" 2.0" (0%)			(20.0-22.0 Ft.) No Recovery	SP (11)	
22	5 4 7 9	0.0" 2.0" (0%)			(22.0-24.0 Ft.) No Recovery	SP (12)	
24	6 7 7 10	0.0" 2.0" (0%)			(24.0-26.0 Ft.) No Recovery	SP (13)	
26	5 5 9 12	0.4" 2.0" (20%)			(26.0-28.0 Ft.) Waste	SP (14)	
28					(434.6) 28.0 (28.0-32.0 Ft.) Stiff, dark greenish gray (5GY 4/1), SILTY CLAY, NR, wet, (CL), (LOESS)		
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CRISIP

DATE 6/1/95 CHK'D BY W. HINST

JOB NO.: 943-2848

FILENAME: PZ107SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067163.45
DATUM EASTING: 515254.52 ELEVATION 462.6

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

BORING NO. PZ-107-SS

SHEET 3 OF 3

DRILLING

START	FINISH
TIME 13:00	TIME 16:25
DATE 3/26/95	DATE 3/26/95

DRILL RIG CME 75

SURFACE CONDITIONS

ANGLE -90° BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
31					(28.0-32.0 ft.) Stiff, dark greenish gray (5GY 4/1), SILTY CLAY, NR, wet, (CL), (LOESS)			
32					(430.6) 32.0 End of Soil Borehole Log at 32.0 ft. See PZ-107-SS Record of Drillhole for rock descriptions below 55.0 ft.			
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

DATE 6/1/95

CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ107SS

RECORD OF DRILLHOLE PZ-107-SS

Sheet 1 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087183.45
AZIMUTH: 0

COLLAR ELEV: 462.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-32.0 ft. See Soil Borehole Log PZ-107-SS 32.0-54.0 ft. No samples collected														5/18/95 - 5/19/95 A 9 7/8 in. borehole (air rotary) was advanced through 10 1/4 in. ID hollow stem augers from 30.0-55.0 ft., and 6 in. steel was sealed in borehole from surface to 55.0 ft. with neat cement. Bedrock was encountered at 51.0 ft. BGS during drilling
50															
52															
54	408.60 54.0-59.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		408.60 54.00												5/21/95 @ 15:30 Began coring
56				1	92%				J,PL,SM,CL						
58									J,PL,SM						5/21/95 @ 15:50 End of Run 1
	403.60 59.0-63.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		59.00						J,PL,R						
60	60.0 ft. Fossiliferous								B,PL,SM						
				2	98%				J,PL,SM,CL J,PL,R						
62															
64	63.5-82.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)								B,PL,SM						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-SS

Sheet 2 of 4

PROJECT: LAIDLAW/FI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067183.45
AZIMUTH: 0

COLLAR ELEV: 462.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R6 30, R5 75, R4 150, R3 300, R2 600, R1 1500	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	63.5-82.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)								B,PL,SM						
									B,PL,SM,CL						
66	64.3 ft. Argillaceous layers common, stylolites common			2	98%										
									J,PL,SM						
									J,PL,SM,CL						
68									J,PL,SM,CL						5/21/95 @ 16:15 End of Run 2
			383.60												
			69.00						J,PL,R						
70									B,PL,SM,CL (5)						
72	72.1-72.6 ft. Argillaceous layer								B,PL,SM,CL						
									J,I,R						
74				3	100 %				B,PL,SM,CL						
76	76.7-77.2 ft. Argillaceous layer														
78	78.4-79.9 ft. Argillaceous layer								J,PL,SM (2)						5/21/95 @ 17:40 End of Run 3
			383.60												
			79.00												
				4	100 %				J,PL,SM						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-SS

Sheet 3 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087163.45
AZIMUTH: 0

COLLAR ELEV: 482.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	63.5-82.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)							0	J,PL,SM (3)						
82								0	J,PL,SM (2)						
	82.3-84.6 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
84															
	84.6-88.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Thinly laminated Clay layers abundant			4	100 %										
86								0	J,PL,SM,CL (2)						
								0	J,C,SM						
88															
	88.5-94.1 ft. Fresh, medium bedded, light olive gray (5Y 5/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites abundant		373.60 / 89.00												5/21/95 @ 18:40 End of Run 4 Quit drilling for the day 5/22/95 @ 7:30 Began drilling
90															
92				5	100 %										
94	94.1-97.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant thinly laminated Clay layers							0	B,PL,SM,CL (3)						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-SS

Sheet 4 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087163.45
AZIMUTH: 0

COLLAR ELEV: 462.6
E: 513254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (I1 30, I2 150, I3 300, I4 600, I5 1500, I6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	94.1-97.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE,(ST. LOUIS FORMATION) Abundant thinly laminated Clay layers								B,PL,SM						
98	97.2-100.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), fine to medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Calcite filled healed fractures common		363.60	5	100 %	80 80 40 20	2 4 6 8 10	0 30 60 90							5/22/95 @ 8:10 End of Run 5
100			99.00						J,PL,R,CL						
102	100.7-104.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant thinly laminated clay layers			6	100 %				J,PL,R						
									J,PL,R						
104			358.60						J,PL,R						5/22/95 @ 8:30 Finished coring
	End of Record of Borehole at 104.0 ft.		104.00												
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

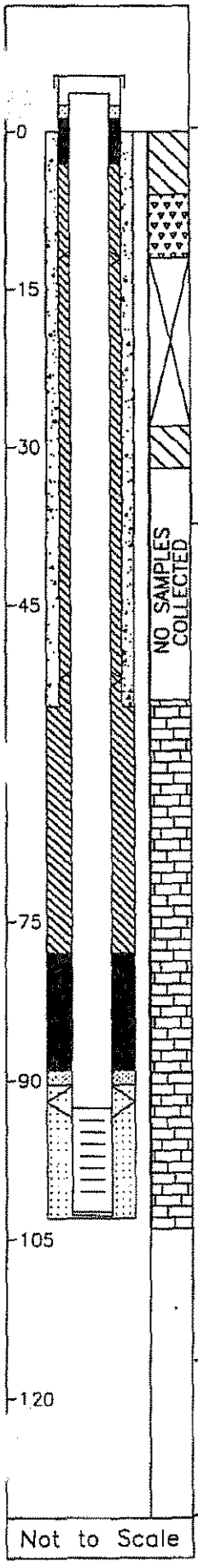
Well No. PZ-107-SS

Boring No. X-Ref: PZ-107-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067163 ft.
Easting: 515255 ft.

Elevation Ground Level 462.6 ft. NGVD
Top of PVC Casing 464.66 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 103.0 ft.
Borehole Diameter 14 1/4 in. (0.0-32.0 ft.) 5 7/8 in. (32.0-103.0 ft.)
Casing Stickup Height 2.03 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (augers)	3/28/95	13:00	3/28/95	16:25
CME 75 (core)	5/21/95	15:30	5/22/95	8:30
Schramm Rotary	5/22/95	11:00	5/22/95	11:30
Geophys.Logging:				
Casing:				
2" PVC	5/22/95	11:30	5/22/95	11:35
6" Steel	5/18/95	9:00	5/18/95	14:00
Filter Placement:	5/22/95	11:40	5/22/95	11:55
Cementing:				
Development				
Bentonite Grout	5/22/95	12:10	5/22/95	12:45
Bentonite Seal	5/22/95	11:55	5/22/95	12:10

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.03	-	92.60	C1	464.86	-	370.03
92.60	-	102.40	S1	370.03	-	360.23
102.40	-	102.73	C2	360.23	-	359.90
+ 1.00	-	55.00	C3	463.60	-	407.63
	-				-	
	-				-	

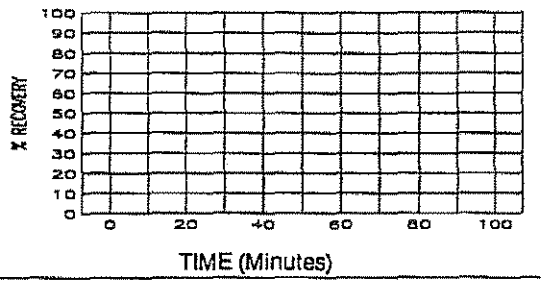
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 90.4-103.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 89.0-90.4 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-78.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 78.0-89.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Surface Casing C3: 6 1/8 ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ107SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122508	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ - 10755

SITE ADDRESS	CITY	STATE	ZIP CODE
9T CHARLES ROCK RD	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-344-3710

ADDRESS	CITY	STATE	ZIP CODE
1638 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

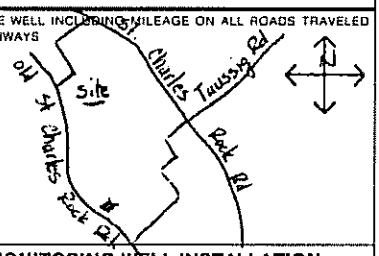
COUNTY ST. LOUIS
ELEVATION 450.6
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38° 45' 53" LONG. 90° 26' 48"

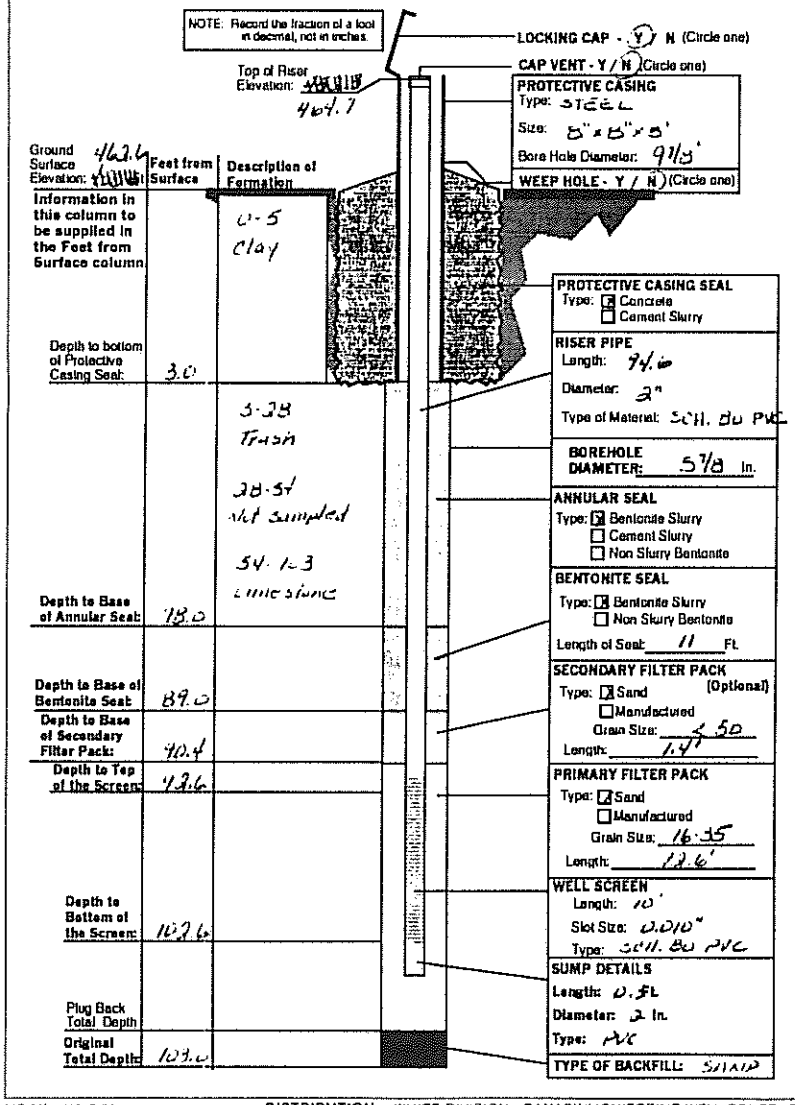
SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME

LAYNE WESTERN Co, INC.



DRILLING CONTRACTOR'S NAME

LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
464.7

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ HSA
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-22-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256WM	6-02-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256WM	6-02-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK/OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067678.37
DATUM EASTING: 515972.61 ELEVATION 454.1

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL					
TIME					
DATE					
CASING DEPTH					

BORING NO. PZ-108-SS

SHEET 1 OF 2

DRILLING

START	FINISH
TIME 16:30	TIME 7:50
DATE 3/21/95	DATE 3/22/95

DRILL RIG CME 75

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	20 25 13 9	1.2'/2.0' (60%)			(0.0-2.0 ft.) Dense, pale yellowish brown (10YR 6/2), CLAYEY GRAVEL, some fine to coarse Sand, SR, damp, (GC), (FILL)	SP (1)	
2					(452.1) 2.0		
3	3 6 7 6	1.0'/2.0' (50%)			(2.0-6.0 ft.) Stiff to very stiff, dark yellowish brown (10YR 4/2), SILTY CLAY, some Gravel, little fine to coarse Sand, SR, damp, (CL), (FILL)	SP (2)	
4	6 11 11 11	0.8'/2.0' (40%)				SP (3)	
5							
6	3 8 11 15	0.9'/2.0' (45%)			(6.0-12.0 ft.) Stiff to very stiff, dark yellowish brown (10YR 4/2), SILTY CLAY, trace Gravel, trace to some fine to coarse Sand, SR, damp, (CL), (FILL)	SP (4)	
7							
8	6 6 8 7	0.5'/2.0' (25%)				SP (5)	
9							
10	8 8 10 12	0.4'/2.0' (20%)				SP (6)	
11							
12	8 8 12 15	1.6'/2.0' (80%)			(12.0-19.0 ft.) Very stiff, yellowish gray (5Y 7/2), SILTY CLAY, trace fine Gravel consisting of limestone, trace to little fine to coarse Sand, moderate amount of iron oxide staining, SR, damp, (CL), (ALLUVIUM)	SP (7)	
13							
14	4 8 11 14	1.8'/2.0' (90%)				SP (8)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY V. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ108SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067678.37
DATUM EASTING: 515972.61 ELEVATION 454.1

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME					16:30	7:50
DATE					DATE	DATE
CASING DEPTH					3/21/95	3/22/95

BORING NO. PZ-108-SS

SHEET 2 OF 2

DRILL RIG CME 75

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
16	5 9 7 9	1.8' / 2.0' (90%)			(12.0-19.0 ft.) Very stiff, yellowish gray (5Y 7/2), SILTY CLAY, trace fine Gravel consisting of limestone, trace to little fine to coarse Sand, moderate amount of iron oxide staining, SR, damp, (CL), (ALLUVIUM)	SP	8	
17						SP	9	
18	3 5 9 38	1.2' / 2.0' (60%)						
19					(19.0-20.0 ft.) Very stiff, light olive gray (10Y 5/4), SILTY CLAY, little highly weathered limestone, gravel pieces, little fine to coarse Sand, moderate iron oxide staining, NR, damp, (CL), (ALLUVIUM)	SP	10	
20					(434.1) 20.0 End of Soil Borehole Log at 20.0 ft. See PZ-108-SS Record of Drillhole for rock descriptions			Top of weathered bedrock encountered @ 20.0 ft.
21								
22								
23								
24								
25								
26								
27								
28								
29								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ108SS

RECORD OF DRILLHOLE PZ-108-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/t CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-20.0 ft. See Soil Borehole Log PZ-108-SS														
18															
20	434.10		434.10												
	20.0-24.4 ft. 20.00 Highly weathered, thinly bedded, pale olive (10Y 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Clay infillings 20.2-20.4 ft. Bluish-gray Shale 20.7-20.9 ft. Bluish-gray Shale		20.00	1	59%										3/22/95 @ 8:30 Started coring Run 1
22	21.6-22.1 ft. Chert (Brown-angular)														Core loss probably due to highly fractured nature of rock, clay infilling may also be the reason
24			429.70						Core Loss						
	24.4-29.6 ft. Fresh, thickly bedded, light olive gray (5Y 5/2), fine grained, medium strong, FOSSILIFEROUS LIMESTONE, (ST. LOUIS FORMATION)		24.40					J,I,R J,I,R							
28	426.70 27.4-28.6 ft. 27.40 Thin layers of bluish-gray Siltstone			2	100 %										
28	425.50 28.60		424.50												
30	29.6-36.3 ft. Fresh, thickly bedded, yellowish gray (5Y 7/2), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Fossils common, stylolitic, little pyrite crystals		29.60	3	99%			J,I,R J,I,R J,I,R							
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067878.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	422.00														
	32.1-33.3 ft. Dolomitic Limestone								J,I,CL						
	32.10								J,I,R						
	33.3-35.0 ft. Arenaceous Dolomite								J,I,R J,PL,CL						
34				3	99%				J,I,CL						
	419.10														
	35.0-36.2 ft. Bluish-gray Shale layer														
	35.00														
36	417.90														
	36.20		417.80												
	36.3-41.3 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION) Scattered pyrite crystals, trace of fossils		36.30						J,PL,CL						
38	38.1-40.2 ft. Arenaceous Limestone with Shale thin beds			4	96%				J,PL,CL						
40	40.2-41.3 ft. Arenaceous Dolomite								J,PL,SM						
	412.80		412.80												
	41.3-50.6 ft. Moderately weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Few large (~5 mm.) pyrite crystals, thin layers of bluish-gray Shale, vugs <1 mm., crystals and chert nodules, abundant intact open joints		41.30						J,I,R (6)						
42									J,I,CL (2)						
				5	93%				J,I,R (2) J,I,CL						
44									J,I,CL (3)						This zone may show high permeability due to the open joints intact
			408.40												
	45.7-46.1 ft. Arenaceous Limestone		45.70												
46	46.1-47.1 ft. Stylolitic with joints, filled with glauconite crystals, Limestone			6	100 %										
			407.00												
	47.1-47.5 ft. Stylolitic, microcrystalline, abundant crystals of quartz		47.10												
				7	100 %				J,I,R (3)						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	41.3-50.6 ft. Moderately weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Few large (~5 mm.) pyrite crystals, thin layers of bluish-gray Shale, vugs <1 mm., crystals and chert nodules, abundant intact open joints 48.6-49.4 ft. Abundant open intact joints 50.6-54.4 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Porous, vugs up to 3 mm., semi-filled with quartz crystals Lenses/big crystals of pyrite at 50.9 ft., abundant veins of calcite throughout sample		404.70 / 49.40	7	100 %						SW FR / MW / HW / CW	R6 R5 R4 R3 R2 R1	RT R2 30 R3 150 R4 300 R5 600 R6 1500		Intact open joints observed in bottom 8 inches
50								0 30 60 90	J,I,R (2)						
									J,I,CL (2)						
									J,I,R (2)						
52				8	100 %				J,I,R						
									J,I,R (2)						
									J,I,R						
54			399.70 / 54.40												
	54.4-60.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Little veins of calcite <2 mm., few porous areas showing vugs up to 3 mm., trace of pyrite at 58.4 ft.														
56															
58									J,I,R (2)						
				9	100 %				J,I,R						
60	60.0-66.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few 1-3 mm. calcite veins, stylolitic, few zones showing 1 mm. or less vugs								J,I,R						
									J,I,R						
									J,I,R						
62									J,I,R						
									J,I,R						
									J,I,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-SS

Sheet 4 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	60.0-66.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION), Few 1-3 mm. calcite veins, stylolitic, few zones showing 1 mm. or less vugs		389.70	9	100%										
	64.4-65.6 ft. Little gray quartzose chert rosettes are observed		64.40					90	J,I,R						
66	66.5-71.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Scattered fossils throughout							0	J,I,R						
								90	J,I,CL						
								90	J,I,R						
68								90	J,I,R						
				10	99%			90	J,I,CL (4)						
70								90	J,I,R						
	71.2-72.7 ft. Fresh, medium bedded, greenish gray (5GY 6/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Cross bedded							90	J,I,R (2)						
								0	J,I,CL						
72								90	J,I,CL (4)						
	72.7-76.3 ft. Strongly weathered, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, highly laminated														
74			379.70												
			74.40												3/23/95 @ 7:30 Began drilling, water level at start was 11.9 ft. BGS
76	76.3-79.4 ft. Moderately weathered, medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, few intact open joints filled with clayey material, trace of quartz crystals and trace of pyrite			11	100%			90	J,I,R (3)						
								0	J,I,R						
								0	J,I,CL						
78								90	J,I,R (4)						
								90	J,I,CL (2)						
	79.4-93.6 ft. Fresh, medium bedded, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1), fine grained, medium strong, STYLOLITIC LIMESTONE, (ST. LOUIS FORMATION) 79.5 ft. Calcite vein of approximately 5-10 mm. thick		374.70												
			79.40												
80				12	98%			90	J,I,CL (2)						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-SS

Sheet 5 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067878.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	79.4-93.6 ft. Fresh, medium bedded, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1), fine grained, medium strong, STYLOLITIC LIMESTONE, (ST. LOUIS FORMATION) 79.5 ft. Calcite vein of approximately 5-10 mm. thick							90	J,I,R						
								30	J,P,R						
								90	J,I,R						
82								90	J,I,R (2)						
				12	98%										
								90	J,I,R						
84															
	84.4-85.8 ft. Crystalline Stylolitic Limestone		369.70 84.40					90	J,I,R						
								90	J,I,CL						
								30	J,I,R						
86	85.8-87.6 ft. Fine grained, Limestone, stylolitic, abundant quartz and pyrite cyrstals							90	J,I,R (2)						
								90	J,I,R						
								90	J,I,CL						
88	87.9 ft. 5 mm. joint filled with a dark greenish-gray (5G 4/1), clayey material 87.9-93.6 ft. Stylolitic crystalline Limestone														
				13	99%										
90	90.1-91.9 ft. Abundant silicified fossils							90	J,I,CL (2)						
92								90	J,I,CL						
								90	J,I,R						
	93.6-96.4 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few calcite veins (1 mm.)							60	J,P,SM						
94			359.70 94.40												
				14	100 %										
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067878.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	96.4-109.4 ft. Fresh, thickly bedded, light olive gray (5Y 6/1) to olive gray (5Y 4/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, abundant calcite veins, pyrite crystals observed in clay filled joints, large (<4 mm.) calcite crystals at 98.0 ft. 96.4-104.0 ft. Abundant clayey filled intact joints								J,I,R; J,I,CL; J,I,R; J,I,R						
98															
100	100.0-102.5 ft. Oolitic Limestone			14	100 %				J,I,CL (2)						
102	101.0-102.0 ft. Brecciated Limestone, cemented with greenish-blue clayey material								J,I,CL (2); J,I,R						
104			349.70 / 104.40												
106	104.8-104.9 ft. Layer of bluish-green clayey material, foliated; 107.2-107.7 ft. Highly brecciated								J,I,R; J,P,SM						
108	100.0-108.4 ft. Scattered calcite veins (1-2 mm.) throughout this core section			15	100 %				J,I,R; J,I,R						
110	109.4-114.8 ft. Fresh, medium to thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few chert nodules, banded down to 111.4 ft. with finely crystalline Limestone (.20-1 mm.)								J,I,R; J,I,CL						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067878.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.8
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, Irregular; P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, HW HW, HW CW)	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	109.4-114.8 ft. Fresh, medium to thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few chert nodules, banded down to 111.4 ft. with finely crystalline Limestone (.20-1 mm.)			15	100 %										
114	111.9-112.9 ft. Abundant rounded pyrite crystals		339.70 / 114.40												
	114.8-119.4 ft. Fresh, medium to thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Very large brachiopods from 115.4-118.7 ft.								J,C,SM						@ 114.8 ft. top of Salem Limestone encountered
116															
118	118.3-119.5 ft. Dark greenish gray (5GY 4/1), Oolitic Limestone with calcite veins and large crystals of calcite (10 mm.)			16	100 %				J,I,CL						
									J,I,CL						
120	120.4-120.7 ft. Highly brecciated								J,I,R						
	121.0-121.3 ft. Highly brecciated								J,I,CL						
									J,I,CL						
122	121.8-124.4 ft. Dolomitic Limestone														
	122.4-124.4 ft. Very large chert nodules								J,PL,SM						
									J,PL,CL						
124			329.70 / 124.40												
	124.4-130.4 ft. Fresh, thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, LIMESTONE, (SALEM FORMATION) Large beds of chert, large chert nodules								J,I,R						
126				17	100 %				J,PL,SM						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Heated, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	124.4-130.4 ft. Fresh, thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, LIMESTONE, (SALEM FORMATION) Large beds of chert, large chert nodules														
130	130.4-134.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)			17	100 %			J,I,R							
132															
134	134.2-134.6 ft. Crystalline Limestone 134.6-139.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (SALEM FORMATION) Stylolitic, large (10 mm.) calcite crystals, abundant clay filled intact joints, abundant chert nodules		319.70 134.40												
136								J,I,CL							
138								J,I,CL							
	138.6-139.0 ft. Crinoid fragments 139.0-140.8 ft. Finely grained Arenaceous Limestone			18	100 %										
140	140.8-144.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Interbedded with Dolomite							J,I,R							
142															
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515872.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1, R2 30, R3 150, R4 300, R5 600, R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	140.8-144.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Interbedded with Dolomite		309.70	18	100%			90	J,I,R			R6			3/23/95 @ 16:35 Coring completed
			144.40												
	End of Record of Drillhole at 144.4 ft.														
148															
150															
152															
154															
156															
158															
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

Well No. PZ-108-SS

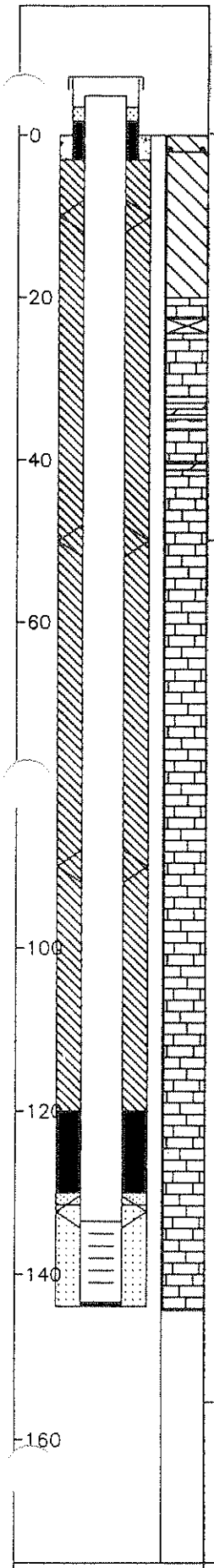
Boring No. X-Ref: PZ-108-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067678 ft. Easting: 515973 ft.

Elevation Ground Level 454.1 ft. NGVD

Top of PVC Casing 456.20 ft. NGVD



Drilling Summary:

Total Depth	143.9 ft.
Borehole Diameter	10 1/4 in. (0.0-20.0 ft.) 5 7/8 in. (20.0-143.9 ft.)
Casing Stickup Height	2.08 ft.
Driller	Layne-Western
	St. Louis, MO
Rig	CME 75, Schramm Portadrill T660H
Bit(s)	6 1/4 in. ID Hollow Stem Auger Bit,
	NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid	Auger-None, NX Core Water,
	Air Rotary
Protective Casing	8x in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/21/95	16:30	3/23/95	16:35
Schramm Rotary	3/29/95	7:30	3/29/95	9:15
Geophys.Logging:				
Casing:	3/29/95	9:30	3/29/95	9:45
Filter Placement:	3/29/95	9:50	3/29/95	10:15
Cementing:				
Development				
Bentonite Grout	3/29/95	11:00	3/29/95	13:15
Bentonite Seal	3/29/95	10:20	3/29/95	11:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.08	-	133.54	C1	456.20	-	320.58
133.54	-	143.35	S1	320.58	-	310.77
143.35	-	143.68	C2	310.77	-	310.44
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 131.5-143.9 ft.

Filter Pack: Less than 50 mesh Silica Sand, 130.0-131.5 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-120.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 120.0-131.5 ft.

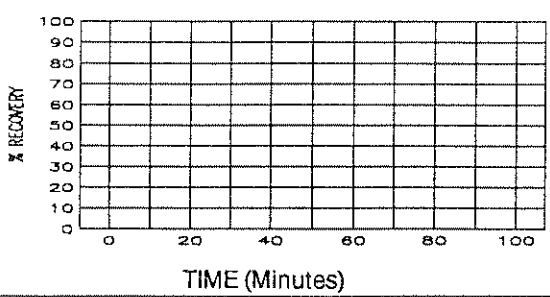
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ108SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 115090	DATE RECEIVED
ROUTE	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	CROSS REFERENCE NO.
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: P2 - 108 - SS

SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: Mo | ZIP CODE: 63044

NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710

ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: Mo. | ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

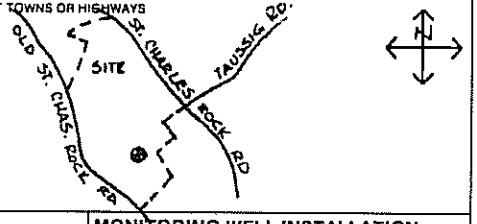
COUNTY: St. Louis
ELEVATION: 454.1
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

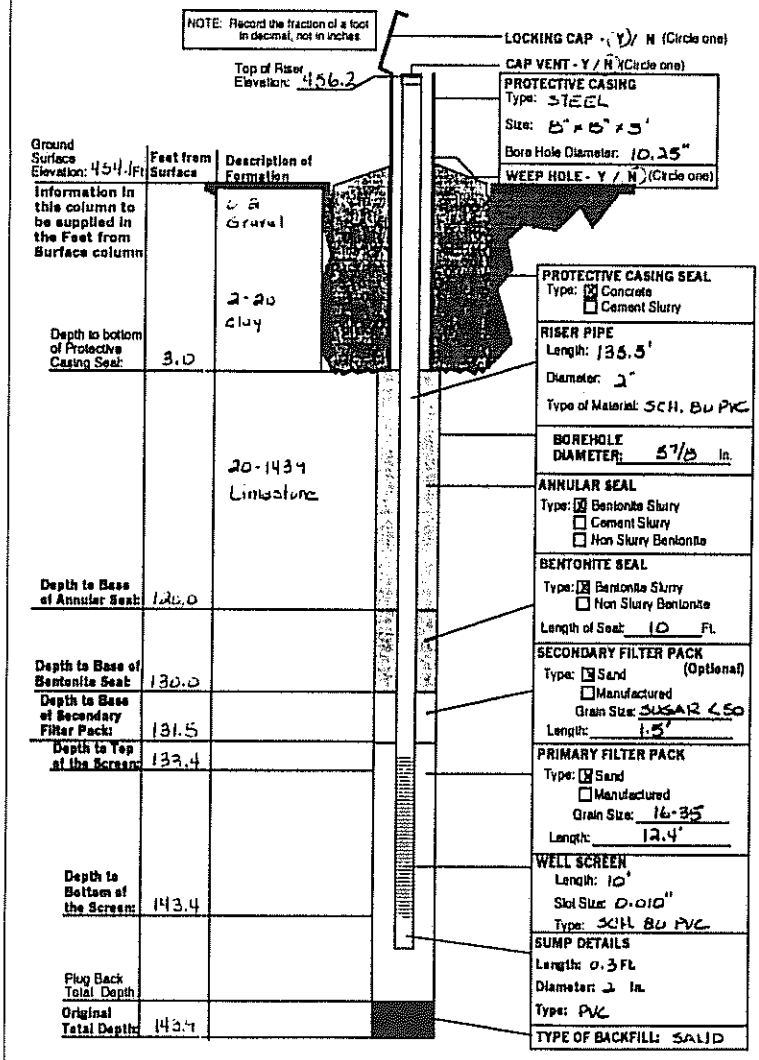
LAT. 38 ° 45 ' 57 " LONG. 90 ° 26 ' 39 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.



DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., INC

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
456.2

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-29-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogl

PERMIT NUMBER	DATE
001256WM1	5-10-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogl

PERMIT NUMBER	DATE
001256WM1	5-10-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-109-SS
			SHEET
	SAMPLING METHOD:		1 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		START / FINISH
	WATER LEVEL		TIME / TIME
	TIME		7:48 / 8:48
	DATE		DATE / DATE
NORTHING: 1068011.70 DATUM EASTING: 516144.36 ELEVATION 456.8	CASING DEPTH		4/7/95 / 4/7/95

DRILL RIG CME 75 - TRUCK MOUNT — SURFACE CONDITIONS

ANGLE -90° BEARING NA

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	1 1 1 2	2.0'/2.0' (100%)			(0.0-2.0 Ft.) Very loose, light olive gray (5Y 6/1), SILT, trace of fine to coarse Gravel, trace very fine Sand, NR, moist, (ML), (FILL)	SP ①	
					(454.8) 2.0		
2	50/4"	0.4'/2.0' (20%)			(2.0-6.0 Ft.) Very dense, light olive gray (5Y 6/1), f-c GRAVEL, little Fines, SR, damp, (GP), (FILL)	SP ②	
3							
4	50/3"	0.2'/2.0' (10%)				SP ③	
5							
					(450.8) 6.0		
6	5 6 8 8	1.8'/2.0' (90%)			(6.0-12.0 Ft.) Stiff, dark yellowish brown (10YR 4/2), mottled CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP ④	
7							
8	5 7 8 11	1.6'/2.0' (80%)				SP ⑤	
9							
10	4 5 6 8	2.0'/2.0' (100%)				SP ⑥	
11							
12	4 3 5 7	1.8'/2.0' (90%)			(12.0-16.0 Ft.) Firm, mottled moderate yellowish brown (10YR 5/4) to light olive gray (5Y 6/1), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP ⑦	
13							
14	4 8 39 50/2"	1.9'/2.0' (95%)			@ 14.5 Ft., little Fine Gravel	SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

DATE 5/31/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ109SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	6.25 inch I.D. Hollow Stem Auger					PZ-109-SS
						SHEET
	SAMPLING METHOD:					2 OF 2
LAIDLAW/OU2 RI-FS/MD	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING
WEST LAKE LANDFILL	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
OPERABLE UNIT 2	WATER LEVEL					TIME / TIME
	TIME					7:48 / 8:48
	DATE					DATE / DATE
NORTHING: 1068011.70	CASING DEPTH					4/7/95 / 4/7/95
DATUM EASTING: 516144.36 ELEVATION 456.8						

DRILL RIG CME 75 - TRUCK MOUNT — SURFACE CONDITIONS

ANGLE -90° BEARING NA

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL		SAMPLER TYPE		REMARKS
16					(12.0-16.0 Ft.) Firm, mottled moderate yellowish brown (10YR 5/4) to light olive gray (5Y 6/1), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	(440.8) 16.0	SP (8)		Top of weathered bedrock encountered @ 15.7 ft.
17					End of Soil Borehole Log at 16.0 ft.				
18					See PZ-109-SS Record of Drillhole for rock descriptions				
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 5/31/95

JOB NO.: 943-2848

FILENAME: PZ109SS

RECORD OF DRILLHOLE PZ-109-SS

Sheet 1 of 8

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 516144.38
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80, 60, 40, 20)	FRACTURES PER FOOT (2, 4, 6, 8, 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 65, 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (HT, 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
0	0.0-15.7 ft. See Soil Borehole Log PZ-109-SS														
2															
4															
6															
8															
10															
12															
14															
16	15.7-20.7 ft. Moderately weathered, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, pyrite and calcite crystals common, stylolitic, abundant clay filled intact joints		441.10 / 15.70	1	100 %										4/7/95 @ 9:47 Begin coring Run 1

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

Sheet 2 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.6
E: 518144.38
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	15.7-20.7 ft. Moderately weathered, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, pyrite and calcite crystals common, stylolitic, abundant clay filled intact joints								J,PL,SM (2)						
									J,I,R (2)						
									J,I,R (2)						
18									J,PL,SM						
									J,I,R (2)						
									J,U,R						
	19.8-20.0 ft.														
20	Layer of brown chert			1	100 %				J,PL,R (2)						
	20.7-31.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, stylolitic, pyrite and calcite crystals common, abundant argillaceous partings								J,PL,R						
									J,I,R						
22															
24			432.30												
			24.50						J,I,R						4/7/95 @ 10:47 Begin coring Run 2
	25.0-25.5 ft. Bioclastic Limestone								J,I,CL						
	25.5-27.2 ft. Microcrystalline Limestone								J,U,SM (2)						
									J,I,R						
28									J,I,R (3)						
									J,PL,R (3)						
									J,I,CL (2)						
26				2	100 %				J,I,CL (2)						
									J,I,R						
									J,I,CL (2)						
	29.9-31.3 ft. Dark greenish gray (5GY 4/1), intraclastic Limestone								J,I,CL (3)						
30	31.3-31.4 ft. Layer of dark greenish yellow clay								J,I,R						
									J,I,CL						
	31.5-32.5 ft. Fresh, thinly bedded, greenish black (5G 2/1), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Large (3 mm.) calcite veins		425.30 31.50						J,I,CL (2)						
32									J,I,CL						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

Sheet 3 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DL SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: UW FR, HW, HW CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32			424.30						J,I,R						
	32.5-34.9 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Little argillaceous partings, pyrite crystals present		32.50	2	100 %				J,PL,CL J,I,CL						
34			422.30												4/7/95 @ 12:55 Begin coring Run 3
	34.9-40.5 ft. Slightly weathered, thickly bedded, grayish orange (10YR 7/4) to light olive gray (5Y 6/1), f-m grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs up to 2 mm., calcite crystals and veins up to 3 mm. present, little pyrite crystals		34.50												
36	35.0-38.7 ft. Very porous material								J,I,R						
									J,I,CL						
	39.0-39.2 ft. Layer of brown chert			3	99%				J,I,R						
40									J,I,CL						
	40.5-45.6 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, chert nodules common, abundant argillaceous partings, calcite veins up to 8 mm., pyrite crystals scattered														
42									J,I,R						
44			412.30												4/7/95 @ 13:50 Begin coring Run 4
	45.6-58.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to microcrystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, abundant calcite crystals and veins up to 2 mm., little pyrite crystals		44.50						J,I,CL						
46				4	99%				J,I,CL						
									J,I,R (2)						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

Sheet 4 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.6
E: 516144.38
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	48.5-51.6 ft. Abundant argillaceous partings and clay filled intact open joints 48.9-53.8 ft. *Highly brecciated Limestone*, cemented with a greenish gray clayey material							90	J,I,R						
50				4	99%			90	J,I,CL						
								80	J,I,CL						
52	52.0-53.3 ft. Intraclastic Limestone							90	J,PL,SM						
			403.00					90	J,I,R						
54	53.8-54.2 ft. Greenish black (5G 2/1), fine grained Dolomite		53.60 402.60 54.20												
			402.30 54.50												4/7/95 @ 14:42 Begin coring Run 5
	54.9-55.3 ft. Intraclastic Limestone 55.5-58.2 ft. Fossiliferous Limestone, abundant argillaceous partings														
58															
	58.2-74.6 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Little fossils, vugs up to 8 mm., calcite veins with pyrite common, some calcite crystals 58.2-62.3 ft. Limestone shows high porosity							90	J,I,CL (2)						
								90	J,I,R						
				5	100 %										
60															
								90	J,I,R						
62								90	J,I,R						
								90	J,I,R						
								80	J,I,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066011.70
AZIMUTH: 0

COLLAR ELEV: 458.8
E: 518144.38
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64															
			382.30 / 64.50	5	100 %										4/7/95 @ 15:30 Begin coring Run 6
	65.0-69.4 ft. Apparent low porosity Limestone, vugs <1 mm.														
	65.7-66.7 ft. Stylolitic Limestone, becomes medium strong														
68									J,I,R						
	69.4-72.8 ft. Apparent moderate porosity Limestone, vugs 1-2 mm.			6	100 %				J,PL,SM						
70									J,I,R						
									J,I,R						
									J,I,R						
									J,I,CL						
72	72.0-73.2 ft. Large (25 mm.) calcite crystals observed														
	72.8-74.3 ft. Apparent high porosity Limestone, vugs up to 8 mm.														
									J,I,CL						
74									J,I,R						
	74.6-75.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION) Oolitic, little fossils, abundant calcite crystals, little chert		382.30 / 74.50						J,I,CL (2)						4/7/95 @ 16:21 Begin coring Run 7
									J,I,R						
76	75.7-77.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs up to 5 mm., abundant calcite crystals, glauconite in defined places, Limestone has an apparent moderate to high porosity			7	100 %										
78	77.8-80.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to microcrystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossils, little chert, stylolites, large calcite crystals, some pyrite								J,I,CL						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	80.0-82.4 ft. Some intact joings filled with clayey material								J,I,CL						
	81.1-82.6 ft. Interbedded layers of argillaceous Limestone (5 mm.)								J,I,CL						
									J,PL,CL						
82				7	100 %										
	83.0-84.2 ft. Argillaceous Limestone, large calcite crystals, vugs up to 1 mm., relative low porosity								J,I,R						
84									J,I,R						4/7/95 @ 15:05 Stop coring
			372.30												
			84.50												4/8/95 @ 8:00 Begin coring Run 8
	85.5-87.3 ft. Limestone with numerous argillaceous partings and intact joints filled with clayey material								J,I,R						
86															
	87.3-88.2 ft. Argillaceous Limestone, bioturbated top 2 in.														
88															
	88.2-89.0 ft. Limestone, stylolitic microcrystalline								J,PL,CL						
	89.4-90.8 ft. Medium bluish gray (5B 5/1), fine grained, Argillaceous Limestone			8	100 %				J,I,R						
90									J,PL,SM						
									J,I,R						
	90.8-93.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,CL						
92	interbedded with Argillaceous Limestone and bluish gray Limestone, stylolites present, calcite veins and pyrite crystals observed								J,I,CL						
	93.3-95.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
94	Few layers (up to 20 mm.) of Dolomitic Limestone, argillaceous partings present, pyrite and calcite common								J,I,CL						
			362.30												
			94.50												4/8/95 @ 9:04 Begin coring Run 9
				9	100 %										
	95.3-99.8 ft. (see next page)								J,PL,SM						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

Sheet 7 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1088011.70
AZIMUTH: 0

COLLAR ELEV: 456.6
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (HT 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	95.3-99.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to microcrystalline, strong LIMESTONE, (ST. LOUIS FORMATION) Stylolites not common, pyrite and calcite veins <1 mm. observed, argillaceous partings common, few open joints filled with clayey material								J,PL,CL						
98									J,PL,CL						
									J,I,CL						
									J,I,CL						
100	99.8-104.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs up to 2 mm. present, bioturbated in places, calcite crystals common			9	100 %										
102															
									J,U,CL						
104			352.30												
	104.7-107.9 ft. Fresh, thickly bedded, olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Pyrite and calcite veins common, few large calcite crystals		104.50												4/8/95 @ 9:52 Begin coring Run 10
106	106.5-106.6 ft. Layer of olive black (5Y 2/1), clayey material, folliated 106.9-107.9 ft. Fossils common								J,C,R						
108	107.9-111.0 ft. Fresh, thickly bedded, olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites present, vugs up to 1 mm., bioturbated in places, calcite crystals are common, more porous in bottom foot			10	100 %				J,PL,CL						
110	111.0-116.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, little fossils, abundant pyrite and calcite crystals, abundant argillaceous partings, intra-clasts common								J,I,CL						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 518144.38
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, X-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	111.0-118.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, little fossils, abundant pyrite and calcite crystals, abundant argillaceous partings, intraclasts common			10	100%										
			343.10 / 113.70												4/8/95 @ 10:55 Begin coring Run 11
114															
	115.3-115.6 ft. Layer of grayish green (10G 4/6) Shale, intraclastic							30	J,I,CL						
									J,I,CL						
116									J,I,CL						
	116.5-117.1 ft. Slightly weathered Limestone							50	J,I,CL						
									J,I,R						
									J,I,R						
									J,I,R						
118	118.0-123.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Banded with fine to medium grained Limestone, large crystals of calcite, few calcite veins and little pyrite			11	100%				J,PL,CL						
120															
									J,I,CL						
122															
			333.60												
	123.2-130.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to microcrystalline, strong to medium strong, LIMESTONE, (SALEM FORMATION) Stylolites observed, abundant fossils, oolitic, chert nodules common, large calcite crystals, little pyrite crystals scattered, calcite veins present but not abundant 125.4-125.5 ft. Bed of chert		123.20 / 333.10 / 123.70						J,PL,SM						123.2 ft. Top of SALEM FORMATION encountered
124															4/8/95 @ 12:50 Begin coring Run 12
									J,I,R						
									J,I,R						
126				12	99%										
									J,I,R						
	127.6-128.3 ft. Intraclastic Limestone cemented with dark greenish gray (5GY 4/1) clayey material														
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 516144.38
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R5 R6, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 10, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	129.0-129.3 ft. Intraclastic Limestone and chert cemented with dark greenish gray (5Y 4/1) clayey material							30	J,I,CL						
								60	J,PL,SM						
								30	J,PL,SM						
130	130.0-135.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (SALEM FORMATION)			12	99%			30	J,PL,R						
	Chert nodules and layers up to 15 mm. are abundant, abundant calcite crystals, pyrite common, some very thin calcite veins							30	J,PL,SM (2)						
								30	J,I,R						
132								30	J,PL,SM						
								30	J,PL,SM						
								30	J,PL,R						Fragmented rock may be drill induced
			323.10												
			133.70												
134								30	J,PL,SM						
								60	J,PL,SM						
				13	100%			30	J,I,CL						
								30	J,I,R						4/8/95 @ 15:30 Coring completed
	321.10		321.10												
	End of Record of Drillhole at 135.7 ft. 135.70		135.70												
136															
138															
140															
142															
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

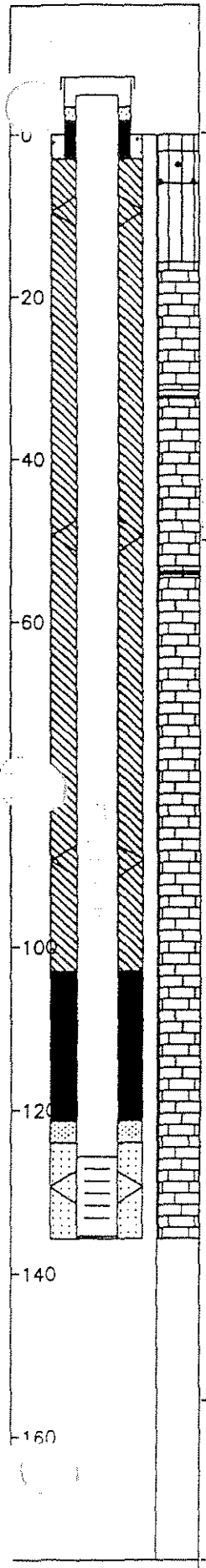
LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

Well No. PZ-109-SS

Boring No. X-Ref: PZ-109-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068012 ft.
Easting: 516144 ft.

Elevation Ground Level 456.8 ft. NGVD
Top of PVC Casing 458.50 ft. NGVD

Drilling Summary:

Total Depth 135.7 ft.
Borehole Diameter 10 1/4 in. (0.0–15.0 ft.) 5 7/8 in. (15.0–135.7 ft.)
Casing Stickup Height 1.73 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/7/95	7:48	4/8/95	15:30
Schramm Rotary	4/25/95	9:30	4/25/95	11:40
Geophys.Logging:				
Casing:	4/25/95	12:00	4/25/95	12:10
Filter Placement:	4/25/95	12:10	4/25/95	12:20
Cementing:				
Development				
Bentonite Grout	4/25/95	12:45	4/25/95	13:15
Bentonite Seal	4/25/95	12:20	4/25/95	12:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.73	-	125.70	C1	458.50	-	331.07
125.70	-	135.50	S1	331.07	-	321.27
135.50	-	135.83	C2	321.27	-	320.94

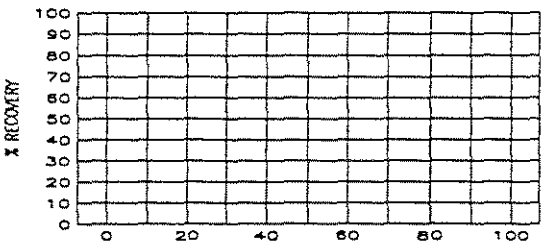
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 124.0-135.7 ft.
Filter Pack: Less than 50 mesh Silica Sand, 121.3-124.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-103.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 103.0-121.3 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by D. Alloway
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ109SS

6 1574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122485	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-109-SS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

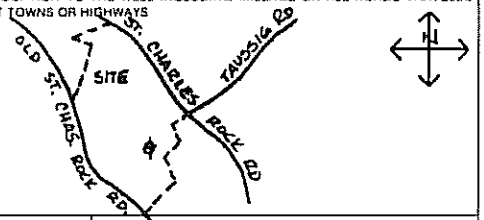
COUNTY ST. LOUIS
ELEVATION
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. TWN. 47 N.RNG. 5 (E) OR W

LAT. 38 ° 46 ' 00 " LONG. 90 ° 26 ' 36 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation:

LOCKING CAP - (Y) N (Circle one)
CAP VENT (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-2' silt
		2'-6' silt & gravel
Depth to bottom of Protective Casing Seal:	3.0	
		6'-14' silt
		6'-135.7' Limestone
Depth to Base of Annular Seal:	103	
Depth to Base of Bentonite Seal:	121.3	
Depth to Base of Secondary Filter Pack:	124.0	
Depth to Top of the Screen:	125.4	
Depth to Bottom of the Screen:	135.4	
Plug Back Total Depth:		
Original Total Depth:	135.7	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 127.1'
Diameter: 2"
Type of Material: Sch. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 18.3 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: < 50
Length: 2.7'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16/35
Length: 11.7

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: Sch. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
[ ] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 4 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-25-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl

PERMIT NUMBER	DATE
001256WM	6-02-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl

PERMIT NUMBER	DATE
001256WM	6-02-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION

LAIDLAW\RI-FS\MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068336.09
DATUM EASTING: 515919.72 ELEVATION 456.8

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-110-SS

SHEET 1 OF 5

	DRILLING START	DRILLING FINISH
WATER LEVEL		
TIME	13:30	14:00
DATE	3/13/95	3/14/95
CASING DEPTH		

DRILL RIG SCHRAMM - ROTADRILL

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON DATE 3/13/95 CHK'D BY W. HENSEL

JOB NO.: 943-2848

FILENAME: PZ110SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	7 9 21 19	0.4'/2.0' (20%)			(0.0-4.0 ft.) Dense, pale yellowish brown (10YR 6/2), SANDY CLAY, little Gravel, damp, SR, (CL), (FILL)	SP ①	
2	10 11 12 18	0.6'/2.0' (30%)				SP ②	
3					(452.8) 4.0		
4	5 6 7 8	1.7'/2.0' (85%)			(4.0-12.0 Ft.) Stiff, mottled medium gray (N5) to moderate yellowish brown (10YR 5/4), CLAYEY SILT, trace Fine Sand, trace Gravel, SR, damp, (CL-ML), (LOESS)	SP ③	
5							
6	8 8 7 7	1.3'/2.0' (65%)				SP ④	
7							
8	4 3 4 4	0.3'/2.0' (15%)				SP ⑤	
9							
10	4 4 4 5	1.3'/2.0' (65%)				SP ⑥	
11							
12					(444.8) 12.0		
13	5 8 9 16	1.3'/2.0' (65%)			(12.0-15.8 Ft.) Compact, pale yellowish brown (10YR 6/2), SILTY Fine SAND, trace Fine Gravel, SR, moist, (SM), (ALLUVIAL)	SP ⑦	
14	3 6 6 5	1.5'/2.0' (75%)				SP ⑧	

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION

LAIDLAW\RI-FS\MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068336.09
DATUM EASTING: 515919.72 ELEVATION 456.8

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

BORING NO. PZ-110-SS

SHEET 2 OF 5

DRILLING

START	FINISH
TIME 13:30	TIME 14:00
DATE 3/13/95	DATE 3/14/95

DRILL RIG SCHRAMM - ROTADRILL

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

DATE 3/13/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ110SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL			SAMPLER TYPE	REMARKS
16	3 5 6 4	1.9' / 2.0' (95%)			(12.0-15.8 ft.) Compact, pale yellowish brown (10YR 6/2), SILTY Fine SAND, trace Fine Gravel, SR, moist, (SM), (ALLUVIAL)	(441.0)	15.8	SP 8	
17					(15.8-16.8 ft.) Stiff, dark yellowish brown (10YR 4/2), CLAYEY SILT, little Fine Sand, NR, damp, (CL-ML), (LOESS) from 16.8-16.9 ft., moist, silty Fine Sand layer	(439.9)	16.9	SP 9	
18	3 4 5 3	1.5' / 2.0' (75%)			(16.9-18.3 ft.) Stiff, grayish black (N2), CLAY, trace organics consisting of fine roots, NR, damp, (CL), (LOESS)	(438.5)	18.3	SP 10	
19					(18.3-20.3 ft.) Stiff, olive gray (5Y 4/1), CLAYEY SILT, trace very fine Sand, NR, damp to moist, (CL-ML), (LOESS)				
20	3 4 5 7	2.0' / 2.0' (100%)				(436.5)	20.3		
21					(20.3-24.5 ft.) Stiff, medium gray (N5), SILTY CLAY, NR, damp, (CL)			SP 11	
22	1 3 3 3	2.0' / 2.0' (100%)			@ 21.7 ft., silty clay becomes moist				
23					@ 22.3 ft., thin wet zone (<1 inch)			SP 12	
24	1 2 2 3	1.6' / 2.0' (80%)				(432.3)	24.5		
25					(24.5-26.0 ft.) Soft, olive gray (5Y 4/1), SILT, trace Clay, NR, wet, (ML), (LOESS)			SP 13	
26	3 9 19 20	1.2' / 2.0' (60%)			(26.0-28.0 ft.) Compact, olive gray (5Y 4/1), SILTY Fine SAND, NR, wet, (SM), (LOESS)	(430.8)	26.0		
27								SP 14	@ 26.0 Feet First groundwater encountered in borehole
28	26 46 46 46	1.3' / 2.0' (65%)			@ 28.0 ft., silty Fine sand becomes very dense and color changes to dark yellowish brown (10YR 4/2)				
29					(28.0-46.0 ft.) Very dense to compact, dark yellowish brown (10YR 4/2), SILTY Fine SAND, NR, wet, (SM), (ALLUVIAL)			SP 15	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-110-SS
			SHEET 3 OF 5
	SAMPLING METHOD:		DRILLING START / FINISH
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		
LAIDLAW\RI-FS\MD WEST LAKE LANDFILL OPERABLE UNIT 2	WATER LEVEL		TIME: 13:30 / 14:00
	TIME		
	DATE		DATE: 3/13/95 / 3/14/95
NORTHING: 1068336.09 DATUM EASTING: 515919.72 ELEVATION 456.8	CASING DEPTH		

DRILL RIG SCHRAMM - ROTADRILL — SURFACE CONDITIONS

ANGLE — BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	26 49 >50	1.0'/2.0' (50%)			(28.0-46.0 Ft.) Very dense to compact, dark yellowish brown (10YR 4/2), SILTY Fine SAND, NR, wet, (SM), (ALLUVIAL)	SP (16)	
32	4 10 10	1.0'/2.0' (50%)				SP (17)	
33	12						
34	21 50 >50	1.2'/2.0' (60%)				SP (18)	
35							
36	7 7 15	1.1'/2.0' (55%)				SP (19)	
37							
38	7 9 9	1.2'/2.0' (60%)				SP (20)	
39							
40	6 18 30	1.4'/2.0' (70%)				SP (21)	
41							
42	7 9 9	1.2'/2.0' (60%)			@ 42.0 Ft., color changes to olive gray (5Y 4/1)	SP (22)	
43							
44	7 11 12	0.7'/2.0' (35%)				SP (23)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 3/13/95

JOB NO.: 943-2848

FILENAME: PZ110SS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION

LAIDLAW\RI-FS\MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068336.09
DATUM EASTING: 515919.72 ELEVATION 456.8

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					DRILLING START	DRILLING FINISH
WATER LEVEL						
TIME					13:30	14:00
DATE					3/13/95	3/14/95
CASING DEPTH						

BORING NO. PZ-110-SS

SHEET 4 OF 5

DRILL RIG SCHRAMM - ROTADRILL

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

DATE 3/13/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ110SS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46					(28.0-46.0 Ft.) Very dense to compact, dark yellowish brown (10YR 4/2), SILTY fine SAND, NR, wet, (SM), (ALLUVIAL) (410.8) 46.0	SP (23)	
47	7 9 13	1.0' 2.0' (50%)			(46.0-48.3 Ft.) Compact, medium light gray (N6), fine to medium SAND, trace silt, trace fine Gravel, NR, wet, (SP), (ALLUVIAL)	SP (24)	
48	7 11 15	1.3' 2.0' (65%)			(408.5) 48.3 (48.3-59.0 Ft.) Compact, olive gray (5Y 4/1), SILTY fine SAND, trace fine Gravel, NR, wet, (SM), (ALLUVIAL)	SP (25)	
49							
50	11 25 41	1.4' 2.0' (70%)				SP (26)	
51							
52	12 23 35	1.2' 2.0' (60%)			from 52.0-52.5 ft., silty medium grained sand layer	SP (27)	
53							
54	12 19 23	0.0' 2.0' (0%)				SP (28)	
55							
56	9 13 30	1.3' 2.0' (65%)				SP (29)	
57							
58	4 2 40	1.6' 2.0' (80%)			(59.0-59.5 Ft.) Very stiff, olive gray (5Y 4/1), CLAY, trace Silt, NR, moist, grayish black (N2), fibrous wood piece at 59.5 ft., (CL), (ALLUVIAL) (397.3) 59.5	SP (30)	
59					(59.5-60.5 Ft.) Hard, light olive gray (5Y 6/1), highly weathered LIMESTONE, SR, (BEDROCK), (ST. LOUIS LIMESTONE)		

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
	6.25 inch I.D. Hollow Stem Auger					PZ-110-SS	
						SHEET	
	SAMPLING METHOD:					5 OF 5	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
LAIDLAW\RI-FS\MD WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					13:30	14:00
	DATE					DATE	DATE
NORTHING: 1068336.09 DATUM EASTING: 515919.72 ELEVATION 456.8	CASING DEPTH					3/13/95	3/14/95

DRILL RIG SCHRAMM - ROTADRILL	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
61	50	0.5' 0.5' (100%)			(59.5-60.5 ft.) Hard, light olive gray (5Y 6/1), highly weathered LIMESTONE, SR, (BEDROCK), (ST. LOUIS LIMESTONE) (396.3) 60.5 End of Soil Borehole Log at 60.5 ft. See PZ-110-SS Record of Drillhole for rock descriptions	SP	(31)	
62								
63								
64								
65								
66								
67								
68								
69								
70								
71								
72								
73								
74								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON DATE 3/13/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ110SS

RECORD OF DRILLHOLE PZ-110-SS

Sheet 1 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/24/95-3/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1088336.1
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 515918.7
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-60.0 ft. See Soil Borehole Log PZ-110-SS														
50															
52															
54															
56															
58															
60	396.80		396.80												
	60.0-70.4 ft. 60.00 Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE. (ST. LOUIS FORMATION) Calcite veins and crystals observed throughout core run 61.6-63.0 ft. Porous/vuggy (up to 2 mm.)		60.00	1	85%				J,PL,SM J,I,R J,I,R J,I,R J,I,R J,I,R						3/24/95 @ 15:25 Began coring Run 1
62															
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

RECORD OF DRILLHOLE PZ-110-SS

Sheet 2 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/24/95-3/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068336.1
AZIMUTH: 0

COLLAR ELEV: 456.6
E: 515918.7
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	60.0-70.4 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Calcite veins and crystals observed throughout core run								J,I,R (3)						
	65.0 ft. A 2 mm. pyrite layer								J,I,R						
66									J,I,R						
				1	65%				J,I,R (2)						
									J,I,R						
68			388.60												
			68.00						Core Loss						Core Loss Reason unknown
			387.40												
	69.4-70.4 ft. Porous/vuggy, voids up to 3 mm., abundant veins of pyrite/calcite		69.40						J,I,R						3/24/95 @ 16:15 Began coring Run 2
70									J,I,R						
	70.4-70.9 ft. Light olive brown (5Y 4/4), Claystone														
	70.9-75.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Abundant 1-2 mm. pyrite veins, porous, some small <1 mm. calcite crystals, iron staining in places								J,I,R						
72									J,I,R						
									J,PL,SM (2)						
74															
				2	100%				J,I,R						
			381.80						J,I,R						
	75.0-80.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Abundant pyrite crystals and calcite veins up to 3 mm., stylolites common		75.00						J,I,R (2)						
76									J,I,R (2)						
									J,I,R (3)						
78									J,I,R (3)						
									J,I,R						
									J,I,R						
			377.60												
	79.7-80.8 ft. Highly weathered, Dolomitic Limestone with very large calcite crystals (up to 15 mm.)		79.20												3/24/95 @ 17:15 Began coring Run 3
				3	100%				J,I,R (2)						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

RECORD OF DRILLHOLE PZ-110-SS

Sheet 3 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/24/95-3/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1088338.1
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 515918.7
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	79.7-80.8 ft. Highly weathered, Dolomitic Limestone with very large calcite crystals (up to 15 mm.) 376.00 / 80.80								J,I,CL						
	80.8-93.4 ft. Slightly weathered, thickly bedded, olive gray (5Y 4/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, some pyrite crystals in clay filled joints, abundant argillaceous partings								J,I,CL J,I,R J,I,R J,I,R J,I,CL J,I,CL J,I,R						
84									J,I,R						
				3	100 %				J,I,CL (2)						
									J,I,R J,I,R						
88	87.0-89.4 ft. Interbedded layers of Argillaceous Limestone and Arenaceous Limestone								J,I,R J,I,CL						
	89.2-90.8 ft. Abundant calcite veins (1-2 mm.) and abundant pyrite crystals		367.60 / 89.20						J,I,R (2)						3/25/95 @ 8:15 Began coring Run 4
90									J,I,R J,I,CL						
	90.7-92.8 ft. Fossiliferous with abundant argillaceous partings								J,I,CL J,I,R J,I,CL						
92									J,I,R						
				4	100 %				J,I,R (2)						
94	93.4-98.4 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few calcite veins and some calcite crystals Few interbedded layers of Dolomitic Limestone								J,PL,SM						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

RECORD OF DRILLHOLE PZ-110-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/24/95-3/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1088336.1
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 515819.7
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

Depth SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR RW IRV CW	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	93.4-98.4 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few calcite veins and some calcite crystals Few interbedded layers of Dolomitic Limestone			4	100 %	80 60 40 20	2 4 6 8 10	0 30 60 90	J,I,CL		SW FR RW IRV CW	R5 R6 R4 R3 R2 R1	R1 R2 R3 R4 R5 R6		
98	98.4-112.8 ft. Fresh, medium to thickly bedded, light olive gray (5Y 6/1), fine grained, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common		357.80 99.20						J,I,R						3/25/95 @ 9:10 Began coring Run 5
100	99.7-102.0 ft. Abundant calcite crystals up to 3 mm. 100.4-100.7 ft. Argillaceous partings								J,I,R J,I,CL (3)						
102									J,I,R J,I,R (2)						
104	103.6-107.5 ft. Slightly weathered Limestone			5	99%				J,I,R J,PL,SM						
106	104.8-106.8 ft. Abundant pyrite and quartz veins up to 2 mm. 105.0-109.0 ft. Few calcite veins <2 mm., but large (5-10 mm.) calcite crystals		347.60						J,I,CL J,I,R J,I,R (3)						
108			347.60 109.20												
	End of Record of Drillhole at 109.2 ft.														
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

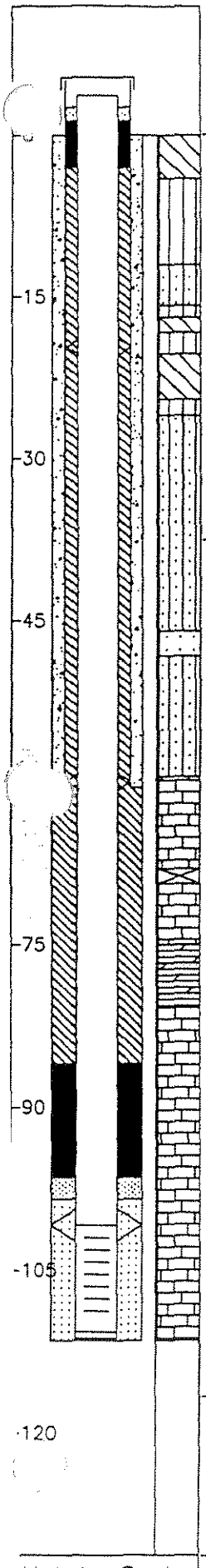
LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

Well No. PZ-110-SS

Boring No. X-Ref: PZ-110-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068336 ft. Easting: 515920 ft.

Elevation Ground Level 456.8 ft. NGVD

Top of PVC Casing 458.91 ft. NGVD

Drilling Summary:

Total Depth 111.5 ft.

Borehole Diameter 10 in. (0.0-61.0 ft.) 5 7/8 in. (61.0-111.5 ft.)

Casing Stickup Height 2.07 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. and 10 1/4 in. ID Hollow Stem Auger Bits, NX Core, 5 7/8 in. and 10.0 in. Button Bits

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
Schramm (augers)	3/13/95	13:30	3/13/95	14:00
CME 75 (Core)	3/24/95	15:25	3/23/95	13:15
Schramm Rotary	5/20/95	7:50	5/20/95	8:45
Geophys.Logging:				
Casing:				
2" PVC	5/20/95	9:05	5/20/95	9:15
6" Steel	5/19/95	11:30	5/19/95	15:00
Filter Placement:	5/20/95	9:20	5/20/95	10:05
Cementing:				
Development				
Bentonite Grout	5/20/95	10:15	5/20/95	10:45
Bentonite Seal	5/20/95	10:45	5/20/95	11:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.07	-	100.90	C1	458.91	-	355.94
100.90	-	110.70	S1	355.94	-	346.14
110.70	-	111.30	C2	346.14	-	345.54
+ 0.50	-	61.00	C3	457.30	-	395.84
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 98.5-111.5 ft.

Filter Pack: Less than 50 mesh Silica Sand, 96.5-98.5 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-86.0 ft., Neat cement, 3.0-61.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 86.0-96.5 ft.

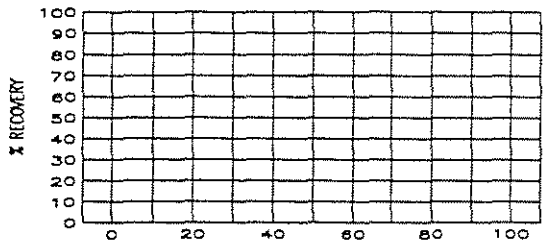
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ110SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115097	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	P2-110-55

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO.	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO.	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

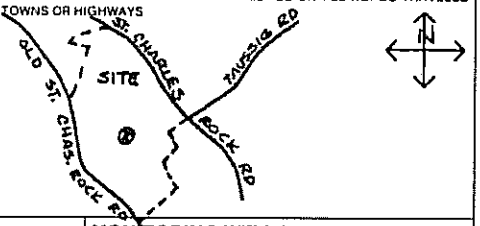
COUNTY ST. LOUIS
ELEVATION USGS MAP 456.8
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38 ° 46 ' 03 " LONG. 90 ° 26 ' 34 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
458.7

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

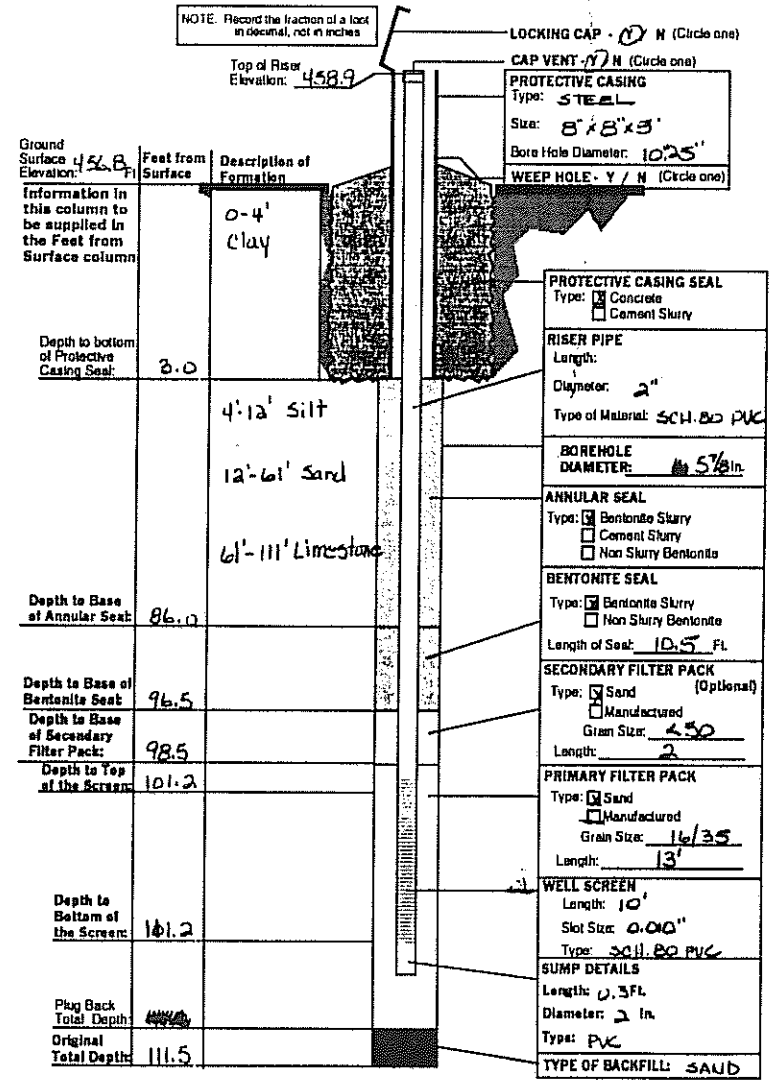
MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM1 DATE 6-02-95
SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM1 DATE 6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches



MO 780-1315 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

RECORD OF DRILLHOLE PZ-111-KS

Sheet 1 of 19

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.76
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP rel CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
60	0.0-79.5ft. No sampling conducted See Foth & Van Dyke log F-1-D dated 9/1/90 79.5-80.0 ft. No samples collected														0.0-84.0 ft. Borehole advanced with 14 3/4 in. tricone bit using mud rotary, then 10 in. steel casing set in borehole to seal off saturated alluvial deposits. Extremely weathered bedrock encountered @ ~79.0 ft. and bedrock encountered @ 84.0 ft.
82															
84	374.60		374.60												
	84.6-86.8 ft. 84.60 Slightly weathered, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) 85.1-85.3 ft. Limestone 85.7 ft. Calcite crystals		84.60						Broken Zone J,U,SM						3/15/95 @ 7:45 Began coring
86	372.40 86.8-91.5 ft. 86.80 Fresh, medium bedded, light olive gray (5Y 5/2), very fine grained, strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)			1	96%				J,PL,SM						
88									J,PL,SM J,I,R J,PL,SM,CL						
			369.80 89.40						J,I,R						End core Run 1 @ 8:20
90	90.4-90.5 ft. Argillaceous partings								J,I,SM (2)						
	367.70 91.5-96.8 ft. 91.50 Fresh, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) 92.1-93.6 ft. Slightly porous/vuggy, some calcite crystals			2	100 %										
92															
94															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 8/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	362.40												
	96.8-99.5 ft. 96.80 Fresh, medium bedded, light olive gray (5Y 5/2), very fine grained, strong DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)		2	100 %				J,U,SM					
98								J,PL,SM					
	98.7-98.9 ft. Argillaceous partings							J,PL,SM,CL (2)					
	359.70	359.80											
	99.5-103.7 ft. 99.50 Fresh, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Some calcite filled veins, pyrite crystals	99.40											End core Run 2 @ 9:20
100													
102													
	355.50												
104	103.7-106.9 ft. 103.70 Fresh, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Some stylolites, argillaceous partings		3	98%				J,I,SM,CL					
106								J,I,R					
	106.9-110.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)												
108	108.1-108.5 ft. Slightly weathered, some stylolites, argillaceous partings							J,U,SM J,I,SM,CL (2)					
		349.80											
		109.40						J,I,SM (2)					
110	110.0-112.1 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)		4	100 %									End Core Run 3 @ 10:25
112													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 8/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

Sheet 3 of 19

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068820.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

LENGTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	347.10														
	112.1-115.8 ft. 112.10 Fresh, medium bedded, light olive gray (5Y 6/1), very fine grained, weak, ARGILLACEOUS DOLOMITE, (ST. LOUIS FORMATION)								J,I,SM						
114															
	343.40			4	100 %										
116	115.8-120.6 ft. 115.80 Fresh, medium bedded, olive gray (5Y 4/1), fine grained, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)														
118															
	119.0-119.4 ft. Some calcite filled vugs (<2 mm)		339.60												
	119.4-120.3 ft. Argillaceous, weak		119.40												
120															
	120.6-127.0 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystals								J,I,SM J,I,SM J,I,R J,PL,SM,CL						
122															
	123.0-127.0 ft. Thinly laminated argillaceous partings								J,U,SM,CL						
				5	96%				J,PL,SM						
124															
									J,PL,SM						
									J,PL,SM J,I,R						
126															
	127.0-136.9 ft. 332.20 Fresh, medium bedded, light olive gray (5Y 6/1), fine to medium grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) 127.00														127.0 ft. Inferred top of SALEM FORMATION encountered
128	127.0-128.5 ft. Numerous chert zones														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSKO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066620.76
AZIMUTH: 0

COLLAR ELEV: 458.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	127.0-136.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine to medium grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION)			5	98%										
			329.60												
			129.40												
130															
								90	J,PL,SM						
132															
								90	J,I,SM (2)						
								90	J,I,SM (2)						
134															
	134.4-135.4 ft. Chert zones (<1/2 in. thick)			6	99%										
								90	B,P,SM (2)						
136	136.9-144.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		322.00												
	137.2-137.7 ft. ARGILLACEOUS DOLOMITE layer		137.20												
								90	J,I,R,CL						
	137.0 ft. Stylolites							60	J,PL,R						
138	138.0-139.4 ft. Numerous stylolites							90	J,I,SM,CL						
								90	J,I,R						
			319.80												
	139.4-141.8 ft. Four chert zones (1-5 in. thick)		139.40					90	B,PL,SM						139.4-141.8 ft. Very slow drilling
140															
				7	100 %			90	J,I,SM (2)						3/15/95 @ 15:00 Stop drilling for the day 3/20/95 @ 7:30 Began Run 8
			317.40												
			141.80												
142								90	B,I,R						
								90	B,U,SM						
	142.9 and 143.6 ft. Light olive gray (5Y 6/1), arenaceous DOLOMITE layers (<4 in. thick)			8	92%										
								60	J,I,R						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	314.60		314.90	8	92%										
	144.30 144.3-147.5 ft. Fresh, thinly bedded, olive gray (5Y 4/1), fine grained, strong, CHERT, (SALEM FORMATION) Arenaceous		144.30					90	J,I,SM						
146	146.5 and 146.8 ft. Thin olive gray (5Y 4/1), arenaceous Dolomite layers (<3 in. thick)			9	100 %			90	J,I,R						
	311.70 147.50 147.5-157.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (SALEM FORMATION) Some chert nodules (5-10 mm. dia.), some thin chert layers (<2 in. thick)							90	J,I,R						
148								90	J,I,R						
			309.90 149.30												
	149.3-149.6 ft. Chert layers 149.7 ft. Coarse calcite crystals (<1/2 in. dia.)							90	B,PL,SM						
150								90	B,I,R						
								90	J,I,R (2)						
152								90	J,I,SM						
	152.5-153.5 ft. Porous zone, open vugs (<1 in. dia.)														
	153.4 and 154.2 ft. Chert layers (<5 in.)														
154				10	100 %			90	J,C,SM						
	155.6 and 156.9 ft. Chert layers (<5 in.)							90	J,I,R						
156								90	J,I,R						
								90	J,I,R						
	157.5-174.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (SALEM FORMATION) Few chert nodules, (~5 mm.), scattered chert (thin layers of chert <3 mm.)							90	J,PL,SM						
158								90	J,PL,SM						
			299.70 159.50												
	159.5-159.8 ft. Chert layer			11	100 %										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/R-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX [psi] (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	157.5-174.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (SALEM FORMATION) Few chert nodules, (~5 mm.), scattered chert (thin layers of chert <3 mm.)														Most fractures observed are characterized as drill induced
162	160.5-160.7 ft. Chert layer 161.5-161.7 ft. Chert layer			11	100 %				J,PL,SM (3)						
164	163.3-163.6 ft. Calcite crystals layer (large crystals)								J,I,R (2)						
			294.70						J,I,R						
	294.20		164.50												
	165.0-167.0 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)	165.00													165.1-169.5 ft. 4-6 breaks per foot that were drill incuded
168															
				12	100 %										
170	Scattered chert clasts throughout the sample 170.0-171.5 ft. Zone showing moderate porosity, open vugs (<2 mm.)														
172	172.8-173.2 ft. Conglomerate limestone with shale fragments 173.2-174.5 ft. Abundant fossil fragments replaced by silica														
174			284.70												
	174.5-176.6 ft. Fresh, thickly bedded, pale olive (10Y 6/2), fine to medium crystalline, strong, ARGILACEOUS LIMESTONE, (SALEM FORMATION) Abundant fossil fragments		174.50	13	100 %										
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068820.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

Depth Scale (Feet)	Description	Graphic Log	Elev / Depth (Ft)	Run No.	Core Recovery	RQD (80, 60, 40, 20)	Fractures per foot (2, 4, 6, 8, 10)	Discontinuity Data: Dip wrt Core Axis (0, 30, 60, 90)	Type and Surface Description	Graphic Log	Weathering Index (SW FR, KW, HW, CW)	Strength Index (R5, R4, R3, R2, R1)	Point Load Index (psi) (R6, R5, R4, R3, R2, R1)	Test Orientation	Notes: Water Levels, Instrumentation
176															
	176.6-179.1 ft. Fresh, medium bedded, pale olive (10Y 6/2), fine to medium grained, strong, SILICEOUS LIMESTONE, (SALEM FORMATION) Abundant fossil fragments														
178															
	179.1-184.5 ft. Fresh, thickly bedded, pale olive (10Y 6/2), fine to medium coarse, strong, ARENACEOUS LIMESTONE, (SALEM FORMATION) Abundant fossil fragments Some layers of grayish yellow (5Y 8/4), clay material			13	100 %										
180															
182															
184															
	184.5-188.5 ft. Fresh, medium bedded, yellowish gray (5Y 7/2), f-c grained, strong ARENACEOUS LIMESTONE, (SALEM FORMATION) Some fossil fragments, and some grayish yellow (5Y 2/4), clay material layers		274.70 / 184.50												
186															
188				14	100 %										
	188.5-194.5 ft. Slightly weathered, pale olive (10Y 6/2), medium bedded, very coarse, strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION) Few chert nodules, few stylolites in bottom 4 ft., abundant layers of grayish yellow (5Y 8/4) clay, fossiliferous								B,PL,SM B,PL,SM						Stopped drilling for the day
190															
192															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	188.5-194.5 ft. Slightly weathered, pale olive (10Y 6/2), medium bedded, very coarse, strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION) Few chert nodules, few stylolites in bottom 4 ft., abundant layers of grayish yellow (5Y 8/4) clay, fossiliferous			14	100 %										
194	194.5-197.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Few chert nodules stylolitic, abundant fossil fragments		264.70 / 194.50												3/21/95 @ 7:30 Water level = 20.1 ft. BGS
196															
198	197.5-204.5 ft. Fresh, thinly bedded, light olive gray (5Y 4/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Few chert nodules, few stylolites, abundant fossil fragments and abundant layers of grayish yellow (5Y 8/4) clay throughout sample			15	100 %										
200															
202															
204	204.5-210.8 ft. Fresh, thinly bedded, dark greenish gray (5GY 4/1), f-c grained, medium strong, LIMESTONE, (SALEM FORMATION) Few chert nodules, stylolites, few clay layers of a grayish yellow color, <3 mm. vugs, with calcite crystals		254.70 / 204.50												
206				16	100 %										
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

Sheet 9 of 18

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068820.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 38 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
208	204.5-210.8 ft. Fresh, thinly bedded, dark greenish gray (5GY 4/1), f-c grained, medium strong, LIMESTONE, (SALEM FORMATION) Few chert nodules, stylolites, few clay layers of a grayish yellow color, <3 mm. vugs, with calcite crystals														
210	248.40 / 210.80														
	210.8-212.8 ft. Fresh, thickly bedded, dark greenish gray (5GY 4/1) to greenish black (5GY 2/1), very fine grained, weak, SILTSTONE, (WARSAW FORMATION)			18	100 %										210.8 ft. Encountered top of WARSAW FORMATION
212	246.40 / 212.80														
	212.8-219.7 ft. Fresh, thinly bedded, light olive gray, fine to coarse grained, medium strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Fossiliferous, few chert nodules, stylolites		244.70 / 214.50												
214															
216				17	100 %										
218															3/21/95 @ 11:00 End Run 17 Drilling stopped until surface casing installed to top of WARSAW FORMATION 4/9/95 Borehole reamed out to 84.0 ft. with 14 3/4 in. tricone bit and mud rotary then 10 in. casing set in hole
	239.50 / 219.70		239.50 / 219.70												
220	220.2-224.3 ft. Slightly weathered, thickly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, DOLOMITE, (WARSAW FORMATION)								J,PL,SM,CL						
222				16	100 %										4/9/95 6 in. steel casing set to 215.3 ft. and sealed with neat cement. A 10 in. air rotary bit was used to drill borehole. 4/22/95 @ 11:02 Begin drilling Run 18 with NX core
									J,U,SM-calcite						
224															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068820.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224															
	234.90														
	224.3-227.4 ft. 224.30 Fresh, thickly bedded, light brownish gray (5YR 6/1) to medium gray (N5), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Not porous, sandy, fine fossil debris, clast supported								J,I,SM						
226				18	100 %				J,U,SM,CL						
	231.80														
	227.4-231.6 ft. 227.40 Slightly weathered, thickly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, DOLOMITE, (WARSAW FORMATION) Porous-vuggy, crystallized, numerous calcite filled vugs and veins								J,I,R						
228			230.10												
			229.10												
230															
	227.60								J,I,R						
	231.6-233.3 ft. 231.60 Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Bioturbated														
232									J,I,SM,CL						
	233.3-236.1 ft. Fresh, thickly laminated, medium dark gray (N4), very fine grained, weak, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Bioturbated, almost Claystone			19	100 %										
234															
	223.10														
	236.1-239.4 ft. 236.10 Fresh, thickly laminated to thinly bedded, medium gray (N5), very fine grained, medium strong, ARGILLACEOUS CALCAREOUS DOLOMITE, (WARSAW FORMATION) Stylolitic, greenish clay infilled vug and vein @ 238.6 ft.								J,PL,SM,CL						
236															
238															
	239.4-243.5 ft. Fresh, thickly bedded, medium dark gray (N4), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Few stylolites, <0.1 ft. clay seams		220.10						J,PL,R-calcite						
	219.80 239.40		239.10												
				20	100 %				J,I,SM,CL						
240															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068820.78
AZIMUTH: 0

COLLAR ELEV: 458.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP WRT CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240													
242													
		215.70											
244	243.5-244.0 ft. Fresh, thickly bedded, medium dark gray (N4). fine grained, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION)	243.50 / 215.20 / 244.00	20	100									
246	244.0-250.3 ft. Fresh, thickly bedded, medium dark gray (N4), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) 246.1-246.5 ft. Argillaceous Limestone, stylolitic							J,PL,SM,CL					
248													
		210.00											
		249.20											
250													
		208.50											
	250.7-251.3 ft. Fresh, thinly to thickly laminated, medium gray (N5), very fine grained, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION)	250.70 / 207.90 / 251.30						J,I,SM,CL					
252	251.3-256.5 ft. Fresh, thickly bedded, medium light gray (N6) to light olive gray (5Y 2/1), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)		21	100									
254													
	Fossil fragments at 255.6 ft., few Clay partings, some porosity, vugs in lower 2 in.							J,I,SM					
256													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068820.76
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
256	ROCK TYPE										SW FR MW HW CW	R6 R5 R4 R3 R2 R1	R1 R2 R3 R4 R5 R6		
			202.70						J,I,R,CL						
	256.5-260.1 ft. 256.50 Slightly weathered, thickly bedded, medium gray (N5), very finely crystalline, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION)			21	100%				J,PL,SM,CL						
258															
	Some porosity, large vug @ 258.8 ft., some smaller vugs elsewhere, some calcite filled, black organic laminae		200.10												
			259.10												4/22/95 @ 17:45 End Run 21 Quit drilling for the day 4/23/95 @ 7:30 Begin Run 22
260	260.1-265.5 ft. Fresh, thinly to thickly laminated, greenish black (5GY 2/1), very fine grained, weak, DOLOMITIC SILTSTONE, (WARSAW FORMATION)								J,I,SM,CL						
262															
264				22	98%										
			193.70						J,PL,SM,CL						
	265.5-269.0 ft. 265.50 Fresh, thickly bedded, medium light gray (N6) to light olive gray (5Y 6/1), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)														
266															
268															
			190.20												
	269.0-272.8 ft. 269.00 Fresh, thickly laminated to thinly bedded, medium dark gray (N4), very fine grained, medium strong, DOLOMITIC SILTSTONE, (WARSAW FORMATION) Abundant 0.1-0.4 ft. interbeds of coarse crystalline arenaceous Dolomite		190.10												
			269.10												
270				23	98%										
									J,PL,SM,CL						
272															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 8/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

Sheet 13 of 19

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066820.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
272	186.40								J,PL,SM,CL						
	272.8-274.0 ft. 272.80 Fresh, thickly laminated, greenish black (5GY 2/1), very fine grained, weak, CLAYSTONE, (WARSAW FORMATION) 185.20								J,PL,SM,CL (2)						
274	274.0-290.2 ft. 274.00 Fresh, thickly laminated to medium bedded, medium light gray (N6) to medium dark gray (N4), vf-m grained, weak to medium strong, SILTSTONE, (WARSAW FORMATION) Calcite filled vugs, interbeds of Silty to Sandy Dolomitic Siltstone			23	98%				J,U,SM,CL						
276															
278			180.20 279.00												
280															
282				24	100 %										
284									J,I,SM						
286															
288															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 8/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 458.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
Pl-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
288	274.0-290.2 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6) to medium dark gray (N4), vf-m grained, weak to medium strong, SILTSTONE, (WARSAW FORMATION) Calcite filled vugs, interbeds of Silty to Sandy Dolomitic Siltstone		170.30	24	100 %										
			288.90	25	100 %										
290			169.00												
	290.2-293.7 ft. Fresh, thickly laminated to thinly bedded, medium gray (N5), finely crystalline, medium strong, ARENACEOUS DOLOMITE, (WARSAW FORMATION) Dark gray (N3) argillaceous laminae, bioturbated		290.20												
292			165.50												
	293.7-295.2 ft. Fresh, thinly laminated, medium dark gray (N8), very fine grained, weak, SILTSTONE, (WARSAW FORMATION)		293.70												
294			164.00	26	100 %										
	295.2-306.8 ft. Fresh, thickly laminated to thinly bedded, medium gray (N5), finely crystalline, medium strong, ARENACEOUS DOLOMITE, (WARSAW FORMATION) Argillaceous laminae, no porosity		295.20						J,U,SM						
296															
298															
			160.20												
300			299.00												
				27	100 %										
302	302.8-303.6 ft. Fossiliferous Dolomite interbed														
304															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/6/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1088620.78
AZIMUTH: 0

COLLAR ELEV: 458.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
304	295.2-306.8 ft. Fresh, thickly laminated to thinly bedded, medium gray (N5), finely crystalline, medium strong, ARENACEOUS DOLOMITE, (WARSAW FORMATION) Argillaceous laminae, no porosity														
306	152.40 306.80			27	100 %										
308	306.8-315.2 ft. Fresh, thickly laminated to thinly bedded, very light gray (N8) to dark greenish gray (5GY 4/1), f-m grained, medium strong, FOSSILIFEROUS LIMESTONE and DOLOMITIC SILTSTONE, (WARSAW FORMATION) Interbedded fossiliferous beds and shaley beds		150.30 308.90												
310									J,PL,SMC,L						
312									J,PL,SM,CL						
314				28	100 %				J,PL,SM,CL						
316	315.2-328.7 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6) to olive gray (5Y 4/1), ? to medium sand, medium strong, FOSSILIFEROUS LIMESTONE and CALCAREOUS SILTSTONE, (WARSAW FORMATION)								J,PL,SM						
318									J,PL,SM,CL						4/23/95 @ 15:02 End Run 28 Quit drilling for the day 4/24/95 @ 12:00 Begin Run 29
.0			140.10 319.10	29	100 %										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

Sheet 18 of 19

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.75
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): RT 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
320	315.2-328.7 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6) to olive gray (5Y 4/1), medium sand, medium strong, FOSSILIFEROUS LIMESTONE and CALCAREOUS SILTSTONE, (WARSAW FORMATION)								J,PL,R						
322	Calcareous Shale interbeds <0.1-0.5 ft. thick, some lithographic textures, commonly silicified														
324				29	100 %										
326															
328	328.7-330.8 ft. Fresh, thickly laminated, light gray (N7) to light olive gray (5Y 6/1), clay sized to coarse silt sized, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Chert common, calcite vugs		130.10 / 329.10						J,I,SM,CL						
330	330.8-336.4 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6), clay sized to very coarse sand sized, medium strong, LITHOCLASTIC LIMESTONE and CALCAREOUS SILTSTONE, (WARSAW FORMATION) Interbedded <0.1-0.3 lithoclastic beds with clayey shales, silicification common, few stylolites														
332				30	100 %										
334									J,I,R-open						
336									J,U,SM						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

Sheet 17 of 19

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2845
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
336	336.4-343.7 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6), clay sized to very coarse sand sized, medium strong, ARENACEOUS LIMESTONE and ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Highly silicified, some lithographic textures								J,PL,SM						
338				30	100 %				J,U,SM,CL						
			120.10												
			339.10												
340															
342															
			115.50												
	343.7-368.8 ft. Fresh, thickly laminated to medium bedded, very light gray (N8) to medium light gray (N6), fine silt sized to coarse silt sized, medium strong, SILICEOUS LIMESTONE and ARENACEOUS LIMESTONE, (KEOKUK FORMATION) Diseminated chert abundant, calcareous dolomitic, silty Clay interbeds, differential compaction features		343.70												343.7 ft. Top of KEOKUK FORMATION encountered
344				31	100 %										
346															
									J,I,R						
348			110.60												
			348.60												
350				32	100 %										
	350.5-350.9 ft. Porous								J,I,R						
	351.6-363.8 ft. Porous, vuggy														
352															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: S. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 458.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V, Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
352	343.7-368.8 ft. Fresh, thickly laminated to medium bedded, very light gray (N8) to medium light gray (N6), fine silt sized to coarse silt sized, medium strong, SILICIOUS LIMESTONE and ARENACEOUS LIMESTONE, (KEOKUK FORMATION) Disseminated chert abundant, calcareous dolomitic, silty Clay interbeds, differential compaction features														
354				32	100 %										
356															
358									J,I,R (2)						
			100.40 / 358.80												
360									J,I,VR						
									J,I,VR						
362									J,PL,VR						
				33	100 %				J,PL,R						
364									J,I,R						
366															
368															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP w/r CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
368				33	100 %										4/24/95 @ 18:45 End Run 33
	90.40		90.40												
	End of Record of Drillhole at 368.8 ft. 368.80		368.80												
370															
372															
374															
376															
378															
380															
382															
384															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

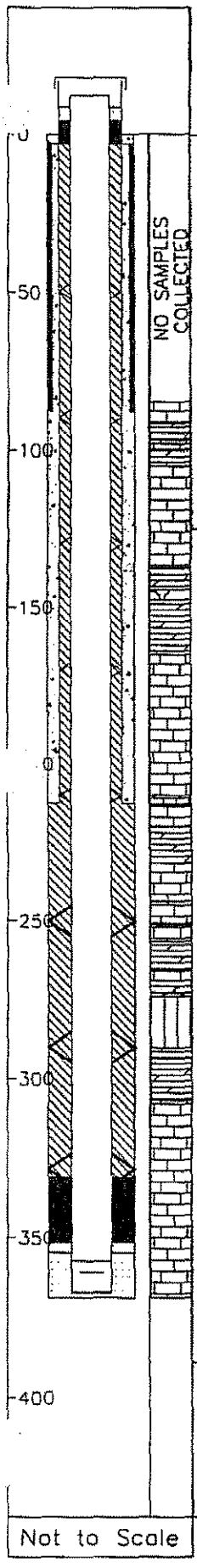
LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

Well No. PZ-111-KS

Boring No. X-Ref: PZ-111-KS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068821 ft. Easting: 515850 ft.

Elevation Ground Level 459.2 ft. NGVD

Top of PVC Casing 460.87 ft. NGVD

Drilling Summary:

Total Depth 368.8 ft.

Borehole Diameter See comments

Casing Stickup Height 1.69 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 14 3/4 in. Tricone Bit, 10 in. and 5 7/8 in. Button Bits

Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/15/95	7:45	4/24/95	16:45
Schramm Rotary	4/26/95	8:20	4/26/95	10:30
Geophys.Logging:				
Casing:				
2" PVC	5/6/95	7:30	5/6/95	9:00
6" Steel	4/9/95	11:00	4/9/95	15:15
10" Steel	4/8/95	8:00	4/8/95	11:00
Filter Placement:	5/6/95	9:00	5/6/95	10:15
Cementing:				
Development				
Bentonite Grout	5/6/95	10:30	5/6/95	12:30
Bentonite Seal	5/6/95	10:15	5/6/95	10:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.69	-	357.15	C1	460.87	-	102.03
357.15	-	366.96	S1	102.03	-	92.22
366.96	-	367.30	C2	92.22	-	91.88
+ 0.50	-	83.80	C3	459.70	-	375.38
+ 1.00	-	215.30	C4	460.20	-	243.88
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3&C4-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 354.7-368.8 ft.

Filter Pack: Less than 50 mesh Silica Sand, 351.4-354.7 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-330.97 ft., Neat cement, 3.0-215.3 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 330.97-351.4 ft.

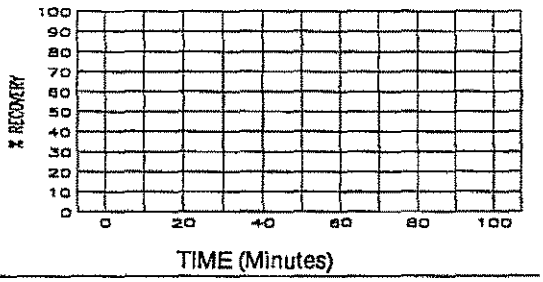
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: 14 3/4 in. (0.0-84.0 ft.), 10 in. (84.0-215.5 ft.), 5 7/8 in. (215.5-368.8 ft.)

Surface Casing C3: 10 in. ID / 10 7/8 in. OD Steel Casing

Surface Casing C4: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by D. Alloway

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ111KS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122481	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

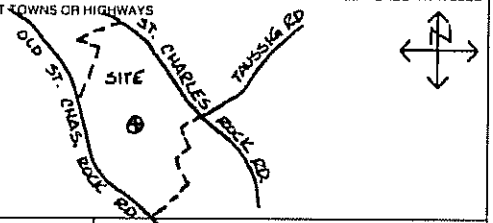
INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: P2-111-KS
SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: Mo. | ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710
ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: Mo. | ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL (SHOW LOCATION IN SECTION PLAT)
COUNTY: ST. LOUIS
ELEVATION: 459.2
AREA NO.:
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 ° 46 ' 06 " LONG. 90 ° 26 ' 40 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 460.87

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A. [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 10 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

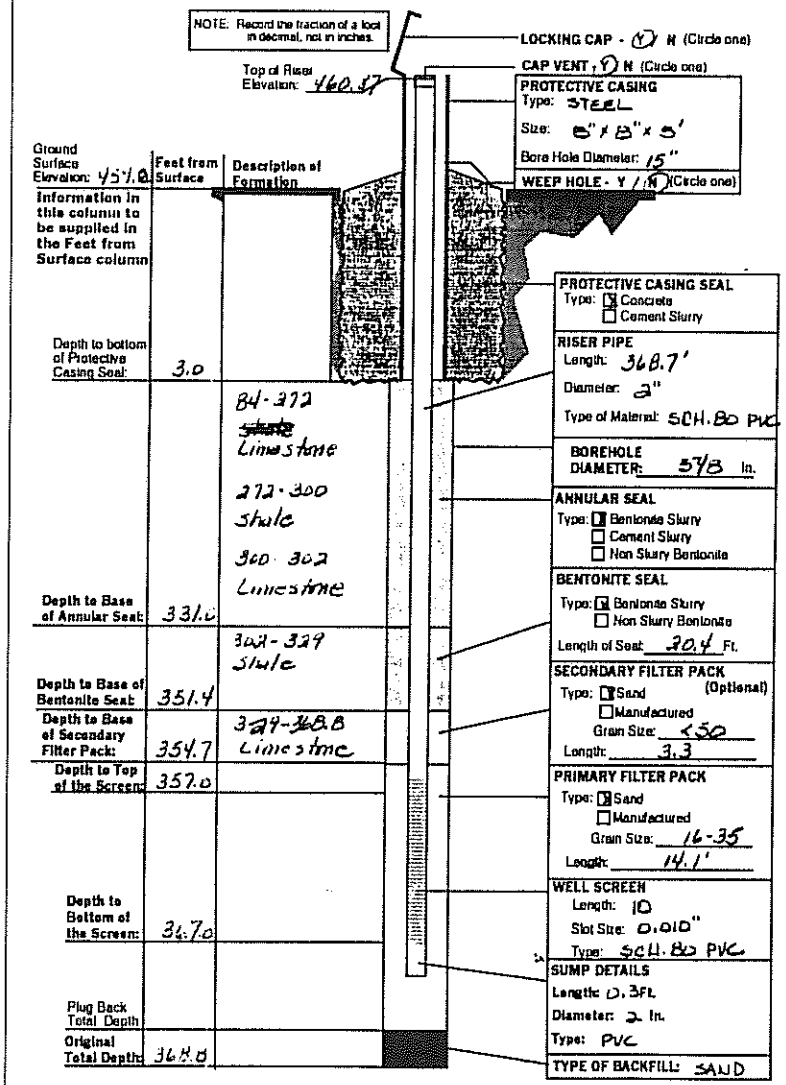
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM | DATE: 6-02-95
SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM | DATE: 6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches.



MO 780-1415 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER
GOLDENROD-COPY TO DEPARTMENT OF NATURAL RESOURCES P.O. BOX 250 ROLLA, MO 65401

RECORD OF DRILLHOLE PZ-111-SD

Sheet 1 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/11/95
DRILL RIG: Schramm

DATUM: MSL
COORDINATES N: 1068636.1
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515834.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R6 >10 R5 4-10 R4 2-4 R3 1-2 R2 0.5-1 R1 <0.5)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	0.0-199.9 ft. No sampling conducted See Record of Drillhole for PZ-111-KS														0.0-98.0 ft. On 4/10/95 borehole advanced with 9 7/8 in. bit using mud rotary then 6 in. steel casing grouted in annulas with neat cement, at 91.0 ft. component bedrock encountered
194															
196															
198															
		259.30	259.30												
200	199.9-209.9 ft. 199.90 Fresh, very thickly bedded, medium gray (N5), coarsely crystalline, medium strong, FOSSILIFEROUS LIMESTONE Upper 0.1 ft. abundantly fossiliferous Argillaceous, arenaceous, abundantly fossiliferous, few stylolites, few calcite filled vugs		199.90						J,PL,SM (3) J,PL,R						4/11/95 @ 10:24 Began Run 1
202															
204				1	99%										
206															
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: J. MILLER
CHECKED: S. TILTON
DATE: 5/24/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-SD

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/11/95
DRILL RIG: Schramm

DATUM: MSL
COORDINATES N: 1068638.1
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515834.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
208	199.9-209.9 ft. Fresh, very thickly bedded, medium gray (N5), coarsely crystalline, medium strong, FOSSILIFEROUS LIMESTONE Upper 0.1 ft. abundantly fossiliferous			1	99%										4/11/95 @ 12:08 End Run 1
	249.30		249.30												
210	End of Record of Drillhole at 209.9 ft. 209.90		209.90												
212															
214															
216															
218															
220															
222															
224															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: J. MILLER
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

Well No. PZ-111-SD

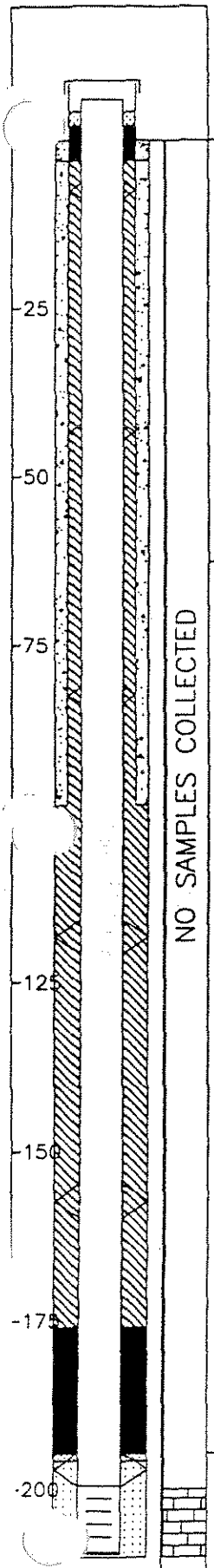
Boring No. X-Ref: PZ-111-SD

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1068638 ft. Easting: 515835 ft.

Elevation Ground Level 459.2 ft. NGVD

Top of PVC Casing 461.55 ft. NGVD



Drilling Summary:

Total Depth 210.0 ft.

Borehole Diameter 10 in. (0.0-98.0 ft.) 5 7/8 in. (98.0-210.0 ft.)

Casing Stickup Height 2.33 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core 5 7/8 in. Button Bit and 9 7/8 in. Tricone Bit

Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	4/10/95	9:45	4/11/95	13:38
Geophys.Logging:	4/14/95	13:00	4/14/95	16:00
Casing:				
2" PVC	4/21/95	8:00	4/21/95	8:18
8" Steel	4/10/95	14:05	4/10/95	16:21
Filter Placement:	4/21/95	8:32	4/21/95	9:12
Cementing:				
Development				
Bentonite Grout	4/21/95	9:20	4/21/95	9:50
Bentonite Seal	4/21/95	9:15	4/21/95	9:18

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.33	-	199.40	C1	461.55	-	259.82
199.40	-	209.20	S1	259.82	-	250.02
209.20	-	209.50	C2	250.02	-	249.72
+ 0.50	-	98.00	C3	459.70	-	361.22
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 195.8-210.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 194.7-195.8 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-176.0 ft., Neat cement, 3.0-98.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 176.0-194.7 ft.

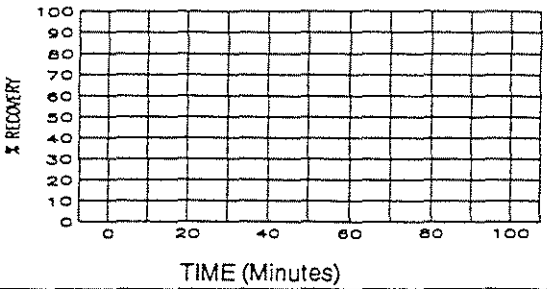
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Not to Scale

Supervised by J. Miller

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ111SD

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122482	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-111-SD
SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo.
ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

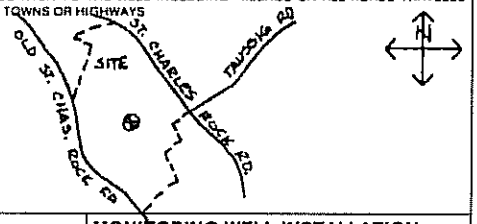
COUNTY: ST. LOUIS
ELEVATION: 459.2
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38 ° 46 ' 06 " LONG. 90 ° 26 ' 39 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.55

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☐ AUGER TYPE
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 5 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-21-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

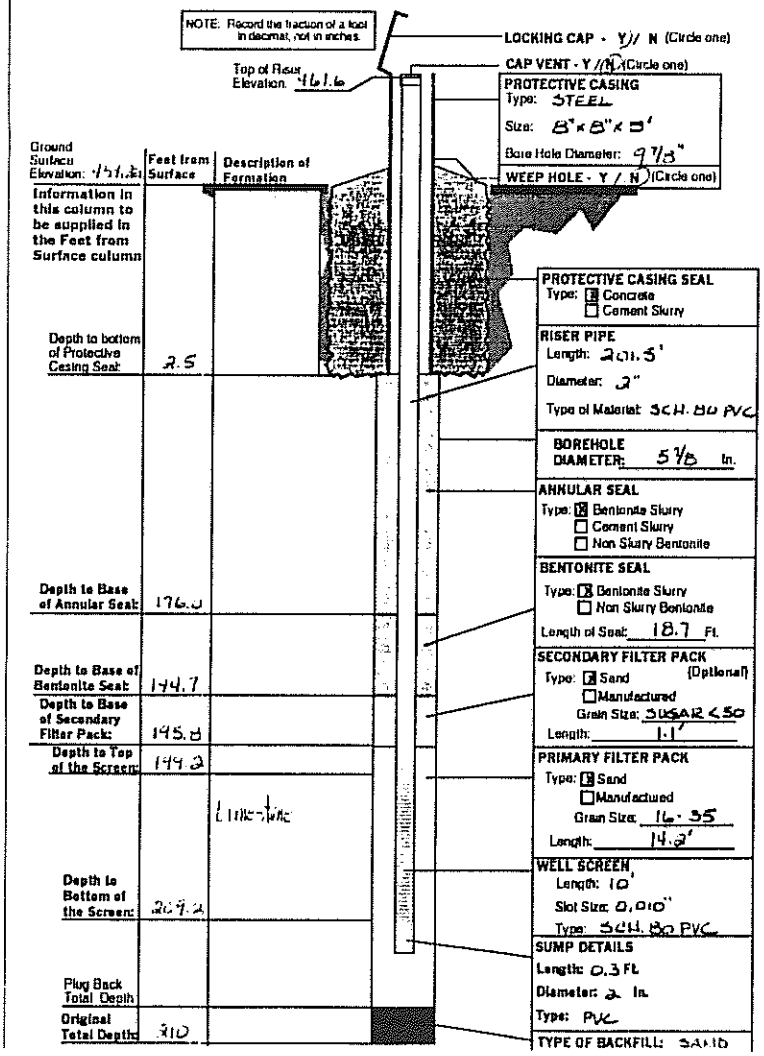
SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE
001256WM	5-10-95

SIGNATURE (DRILLING CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE

NOTE: Record the fraction of a foot in decimal, not in inches.



LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger		BORING NO. PZ-112-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		SHEET 1 OF 3
			DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH		TIME 13:20 / TIME 15:29
			DATE 4/10/95 / DATE 4/10/95
DATUM NORTHING: 1069002.00 EASTING: 515674.01	ELEVATION 457.9		
DRILL RIG CME 75	SURFACE CONDITIONS		
ANGLE VERTICAL	BEARING		
SAMPLE HAMMER 140 lbs.			

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CUSID DATE 5/31/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ112AS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 2 7	1.1'/2.0' (55%)			(0.0-4.0 ft.) Loose to compact, moderate yellowish brown (10YR 5/4) to dark greenish gray (5G 4/1), SILT, trace Fine Gravel, NR, damp, (ML), (FILL)	SP ①	
2	5 12 7	0.0'/2.0' (0%)					
3	6					SP ②	
4	6 50/6"	0.8'/2.0' (40%)			(453.9) 4.0 (4.0-8.5 Ft.) Very dense, medium bluish gray (5GY 5/1), f-c SAND, trace of Fine Gravel, SR, damp, (SP), (FILL)	SP ③	
5							
6					@ 5.0 ft., cobbles and rock encountered		Drilling very hard from 5.0-8.0 ft. Split Spoons not collected
7							
8	6 7	1.6'/2.0' (80%)			(449.4) 8.5		
9	11 9				(8.5-10.0 ft.) Waste	SP ④	
10	3 4	0.6'/2.0' (30%)			(447.9) 10.0 (10.0-10.6 Ft.) Compact, medium bluish gray (5B 5/1), f-c SAND, trace of Fine Gravel, SR, moist, (SP), (FILL) (447.3) 10.6	SP ⑤	
11	9 5				(10.6-20.0 ft.) Waste		
12	4 20	0.8'/2.0' (40%)				SP ⑥	
13	14 9						
14	3 3	0.2'/2.0' (10%)				SP ⑦	
	8 18						

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
	4.25 inch I.D. Hollow Stem Auger					PZ-112-AS	
						SHEET	
	SAMPLING METHOD:					2 OF 3	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					13:20	15:29
	DATE					DATE	DATE
NORTHING: 1069002.00 DATUM EASTING: 515674.01 ELEVATION 457.9	CASING DEPTH					4/10/95	4/10/95

DRILL RIG CME 75 | SURFACE CONDITIONS

ANGLE VERTICAL BEARING

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	9 10 11 25	0.8'/2.0' (40%)			(10.6-20.0 Ft.) Waste	SP (7)	
17						SP (8)	
18	50/5"	0.1'/2.0' (5%)				SP (9)	
19							
20	5 3 3 3	1.5'/2.0' (75%)			(437.9) 20.0 (20.0-20.5 Ft.) Firm, greenish black (5G 2/1), CLAYEY SILT, NR, damp, (CL-ML), (FILL) (437.4) 20.5	SP (10)	
21					(20.5-22.0 Ft.) Loose, medium light gray (N6), f-c SAND, NR, damp to moist, (SP), (FILL)		
22	3 4 6 8	0.4'/2.0' (20%)			(435.9) 22.0 (22.0-24.0 Ft.) Stiff, greenish black (5G 2/1), CLAYEY SILT, NR, wet, (CL-ML), (ALLUVIUM)	SP (11)	First water encountered @ 23.0 Ft.
23							
24	12 17 16 15	2.0'/2.0' (100%)			(433.9) 24.0 (24.0-26.0 Ft.) Dense, dark greenish gray (5GY 4/1), fine SAND, NR, wet, (SP), (ALLUVIUM)	SP (12)	
25							
26	4 2 3 7	1.8'/2.0' (90%)			(431.9) 26.0 (26.0-28.0 Ft.) Loose, olive gray (5Y 4/1), CLAYEY fine SAND, NR, wet, (SC), (ALLUVIUM)	SP (13)	
27							
28	3 3 10 21	1.3'/2.0' (65%)			(429.9) 28.0 (28.0-36.0 Ft.) Compact to dense, olive gray (5Y 4/1), fine SAND, NR, wet, (SP), (ALLUVIUM)	SP (14)	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 5/31/95

JOB NO.: 943-2848

FILENAME: PZ112AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1069002.00
DATUM EASTING: 515674.01 ELEVATION 457.9

DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL					
TIME					
DATE					
CASING DEPTH					

BORING NO. PZ-112-AS

SHEET 3 OF 3

DRILLING START	DRILLING FINISH
TIME 13:20	TIME 15:29
DATE 4/10/95	DATE 4/10/95

DRILL RIG CME 75

ANGLE VERTICAL BEARING

SAMPLE HAMMER 140 lbs.

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	10 30 50/6"	1.2'/2.0' (60%)			(28.0-36.0 Ft.) Compact to dense, olive gray (5Y 4/1), Fine SAND, NR, wet, (SP), (ALLUVIUM)	SP (15)	
32	9 11 11 16	1.0'/2.0' (50%)			from 32.0-34.0 ft., sand becomes f-m grained	SP (16)	
33							
34	10 13 15 20	2.0'/2.0' (100%)			from 34.0-36.0 ft., sand becomes f-c grained	SP (17)	
35							
36					(421.9) 36.0 End of Soil Borehole Log at 36.0 ft.		
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSID CHK'D BY W. HINST

DATE [illegible]

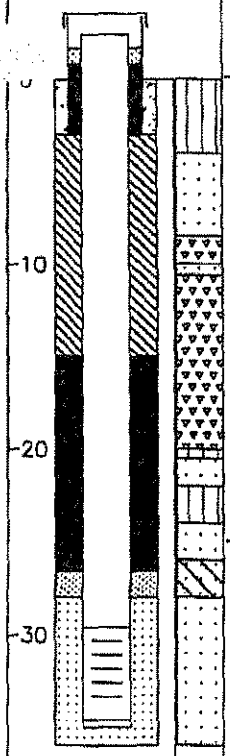
JOB NO.: 943-2848

FILENAME: [illegible]

Well No. PZ-112-AS

Boring No. X-Ref: PZ-112-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1069002 ft.
Easting: 515674 ft.

Elevation Ground Level 457.9 ft. NGVD
Top of PVC Casing 459.83 ft. NGVD

Drilling Summary:

Total Depth 36.0 ft.
Borehole Diameter 8 1/4 in.
Casing Stickup Height 1.90 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75
Bit(s) 4 1/4 in. ID Hollow Stem Auger Bit

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/10/95	13:20	4/10/95	15:45
Schramm Rotary				
Geophys. Logging:				
Casing:	4/10/95	16:30	4/10/95	16:40
Filter Placement:	4/10/95	16:40	4/10/95	16:59
Cementing:				
Development				
Bentonite Grout	4/10/95	17:15	4/10/95	17:40
Bentonite Seal	4/10/95	17:12	4/10/95	17:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.90	-	29.60	C1	459.83	-	428.33
29.60	-	34.40	S1	428.33	-	423.53
34.40	-	34.73	C2	423.53	-	423.20
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 28.0-36.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 26.6-28.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-15.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 15.0-26.6 ft.

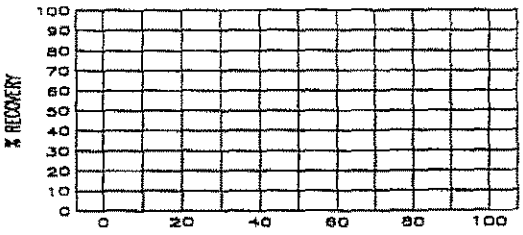
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by S. Cosio
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ112AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122489	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-112-AS
SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-341-3710
ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo
ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

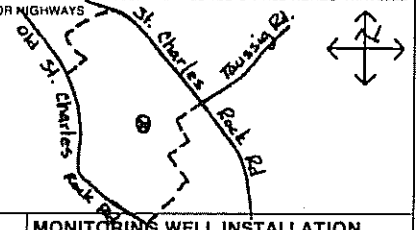
COUNTY: ST. LOUIS
ELEVATION: 457.9
AREA NO.:

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38 ° 46 ' 10 " LONG. 90 ° 36 ' 42 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
457.83

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☐ YES, AT
☐ STAINLESS STEEL
☐ OTHER
☒ NO

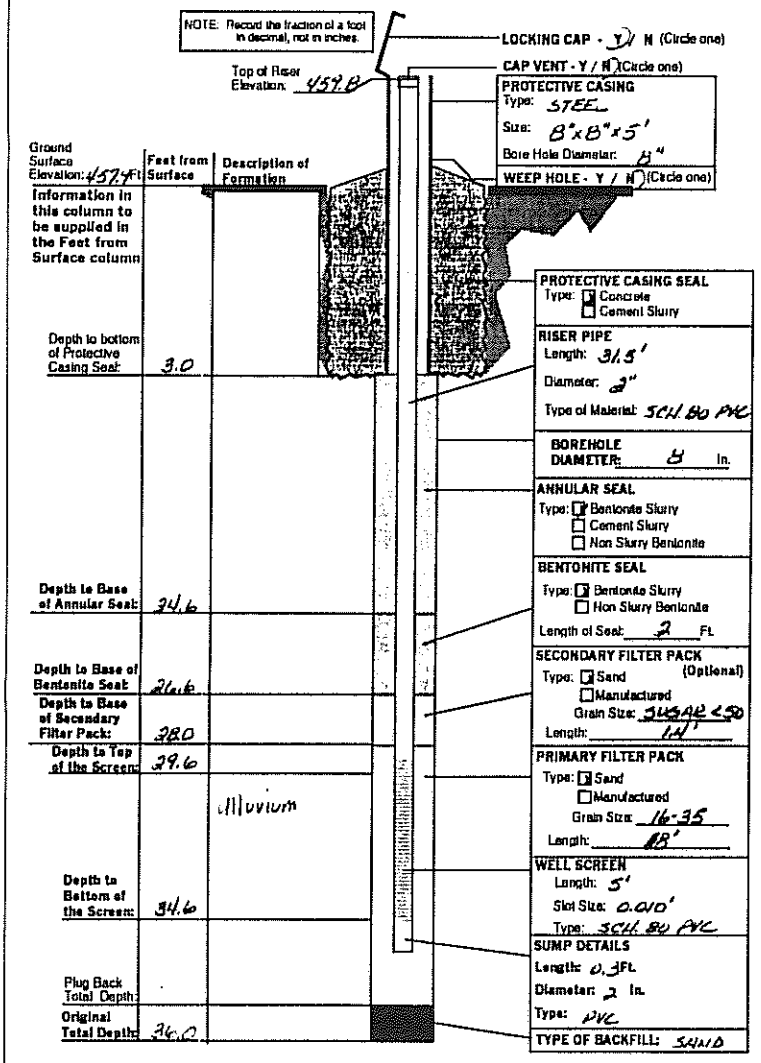
MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-10-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
PERMIT NUMBER 00125BWPM1 DATE 5-10-95

SIGNATURE (DRILLING CONTRACTOR)
PERMIT NUMBER 00125BWPM1 DATE 5-10-95



LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1069233.33
DATUM EASTING: 515759.85 ELEVATION 459.9

DRILLING METHOD:
0.0-40.0 ft.: 4.25 inch I.D. Hollow Stem Auger
40.0-108.3 ft.: 3.875 inch Mud Rotary (Tricone)
SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

BORING NO. PZ-113-AD
SHEET 1 OF 7

DRILLING START	DRILLING FINISH
TIME 11:03	TIME 15:50
DATE 4/26/95	DATE 4/27/95

DRILL RIG CME 75 - TRUCK MOUNT
SURFACE CONDITIONS Paved road
ANGLE VERTICAL BEARING NA
SAMPLE HAMMER 140

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16					(0.0-20.0 ft.) No samples collected, see Soil Borehole Log PZ-113-AS for descriptions		
17							
18							
19							
20	2 5 9	0.9' 1.5' (60%)			(439.9) 20.0		
21					(20.0-27.0 ft.) Stiff, olive gray (5Y 4/1), SILTY CLAY, trace very fine Sand, NR, moist, (CH), (ALLUVIUM)	SP 1	
22	6 8 13	1.0' 1.5' (67%)				SP 2	
23	5 7 7	1.5' 1.5' (100%)				SP 3	
24							
25	2 7 7	1.3' 1.5' (87%)				SP 4	
26	4 6 8	1.2' 1.5' (80%)				SP 5	
27					(432.9) 27.0		
28					(27.0-40.0 ft.) Compact, dark greenish gray (5GY 4/1), fine SAND, some Clay, NR, wet, (SC), (ALLUVIUM)		
29							

DRILLING CONTR LAYNE-WESTERN
LOGGED BY J. MILLER CHK'D BY W. HERST
DATE 6/21/95
JOB NO.: 943-2848
FILENAME: PZ113AD

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	0.0-40.0 Ft.: 4.25 inch I.D. Hollow Stem Auger 40.0-108.3 Ft.: 3.875 inch Mud Rotary (Tricone)
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)
BORING NO.	PZ-113-AD
SHEET	2 OF 7
DRILLING START TIME	11:03
DRILLING FINISH TIME	15:50
DRILLING START DATE	4/26/95
DRILLING FINISH DATE	4/27/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DATUM	NORTHING: 1069233.33 EASTING: 515759.85
ELEVATION	459.9
DRILL RIG	CME 75 - TRUCK MOUNT
SURFACE CONDITIONS	Paved road
ANGLE	VERTICAL
BEARING	NA
SAMPLE HAMMER	140

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31					(27.0-40.0 Ft.) Compact, dark greenish gray (5GY 4/1), fine SAND, some Clay, NR, wet, (SC), (ALLUVIUM)		
32							
33							
34							
35							
36							
37							
38							
39							
40	4 8 9	0.5' 1.5' (33%)			(419.9) 40.0 (40.0-41.5 Ft.) Compact, light brown (5YR 5/6) to pale yellowish brown (10YR 6/2), medium SAND, trace very fine Sand, NR, wet, (SP), (ALLUVIUM)	SP 6	
41					(418.4) 41.5		
42	6 6 8	0.3' 1.5' (17%)			(41.5-44.0 Ft.) Compact, light brown (5YR 5/6) to light brown (5YR 6/4), fine GRAVEL, NR, wet, (GW), (ALLUVIUM)	SP 7	
43	4 7 11	0.9' 2.0' (45%)			(415.9) 44.0	SP 8	
44	13				(44.0-48.5 Ft.) Compact, dark yellowish brown (10YR 4/2), medium SAND, trace coarse Sand, trace fine Sand, NR, wet, (SP), (ALLUVIUM)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 6/21/95

JOB NO.: 943-2848

FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

DATUM NORTHING: 1069233.33 EASTING: 515759.85 ELEVATION 459.9

DRILLING METHOD:
0.0-40.0 ft: 4.25 inch I.D. Hollow Stem Auger
40.0-108.3 ft: 3.875 inch Mud Rotary (Tricone)

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

BORING NO. PZ-113-AD

SHEET 3 OF 7

DRILLING

START	FINISH
TIME 11:03	TIME 15:50
DATE 4/26/95	DATE 4/27/95

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Paved road

ANGLE VERTICAL BEARING NA

SAMPLE HAMMER 140

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 6/21/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ113AD

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	5 6 9 2	0.7' 2.0' (35%)			(44.0-48.5 ft.) Compact, dark yellowish brown (10YR 4/2), medium SAND, trace coarse Sand, trace Fine Sand, NR, wet, (SP), (ALLUVIUM)	SP 9	
47	8 13 15 19	1.1' 2.0' (55%)				SP 10	
48							
49	10 10 10 11	0.9' 2.0' (45%)			(48.5-49.5 ft.) Compact, olive gray (5Y 4/1), Fine SAND, some medium Sand, NR, wet, (SP), (ALLUVIUM)	SP 11	
50					(49.5-53.0 ft.) Compact, olive gray (5Y 4/1), medium SAND, trace Fine Sand, trace coarse Sand and Fine Gravel, trace Silt, NR, wet, (SP), (ALLUVIUM)		
51	6 7 9 7	0.9' 2.0' (45%)				SP 12	
52							
53	3 6 5 6	0.9' 2.0' (45%)			(406.9) 53.0 (53.0-61.5 ft.) Compact, olive gray (5Y 4/1), medium SAND, little Sand, trace Fine Gravel, trace Fine Sand and Silt, NR, wet, (SW), (ALLUVIUM)	SP 13	
54							
55	6 4 5 6	0.9' 2.0' (45%)				SP 14	
56							
57	4 4 5 6	0.9' 2.0' (45%)				SP 15	
58							
59	5 6 6 7	1.0' 2.0' (50%)				SP 16	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	0.0-40.0 Ft: 4.25 inch I.D. Hollow Stem Auger 40.0-108.3 ft: 3.875 inch Mud Rotary (Tricone)
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)
BORING NO.	PZ-113-AD
SHEET	4 OF 7
DRILLING	START / FINISH
WATER LEVEL / TIME	11:03 / 15:50
DATE	4/26/95 / 4/27/95
CASING DEPTH	
DATUM	NORTHING: 1069233.33 EASTING: 515759.85
ELEVATION	459.9
DRILL RIG	CME 75 - TRUCK MOUNT
SURFACE CONDITIONS	Paved road
ANGLE	VERTICAL
BEARING	NA
SAMPLE HAMMER	140

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
61	6 10 10 12	0.9'/2.0' (45%)			(53.0-61.5 Ft.) Compact, olive gray (5Y 4/1), medium SAND, little Sand, trace Fine Gravel, trace fine Sand and Silt, NR, wet, (SW), (ALLUVIUM)	SP 16	
					(398.4) 61.5		
62					(61.5-65.0 Ft.) Compact, dark greenish gray (5GY 4/1), >95% fine to medium grained subrounded SAND, <5% Silt, NR, saturated, (SP), (ALLUVIUM), grades finer	SP 17	
63	10 20 27 45	1.2'/2.0' (60%)				HD 18	
64							
65		1.7'/2.0' (85%)			(65.0-92.0 Ft.) Compact to very dense, dark greenish gray (5GY 4/1), 75% Fine SAND, 20% medium Sand, 5% Silt, NR, saturated, (SP), (ALLUVIUM)	SP 19	
66							
67	7 20 25 28	0.9'/2.0' (45%)				SP 20	
68							
69	10 15 26 26	1.4'/2.0' (70%)				HD 21	
70							
71	8 10 14 22	1.2'/2.0' (60%)				SP 22	
72							
73	6 10 13 17	1.2'/2.0' (60%)				SP 23	
74							

DRILLING CONTR: LAYNE-WESTERN

LOGGED BY: J. MILLER

DATE: 6/21/95

CHK'D BY: W. HENRY

JOB NO.: 943-2848

FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	0.0-40.0 Ft: 4.25 inch I.D. Hollow Stem Auger	PZ-113-AD
	40.0-108.3 Ft: 3.875 inch Mud Rotary (Tricone)	SHEET 5 OF 7
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:	DRILLING
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	START / FINISH
	SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)	
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME: 11:03 / 15:50
NORTHING: 1069233.33 DATUM EASTING: 515759.85 ELEVATION 459.9		DATE: 4/26/95 / 4/27/95
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Paved road	
ANGLE VERTICAL BEARING NA		
SAMPLE HAMMER 140		

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
76	17 25 35 36	1.1'/2.0' (55%)			(65.0-92.0 Ft.) Compact to very dense, dark greenish gray (5GY 4/1), 75% fine SAND, 20% medium Sand, 5% Silt, NR, saturated, (SP), (ALLUVIUM)	HD (24)	
77	17 25 34 39	1.8'/2.0' (90%)				HD (25)	
78							
79	22 28 28 31	1.3'/2.0' (65%)				SP (26)	
80							
81	15 24 24 36	1.2'/2.0' (60%)				SP (27)	
82							
83	20 48 48 60	1.5'/2.0' (75%)				HD (28)	
84							
85	12 24 34 38	1.0'/2.0' (50%)				SP (29)	
86							
87	18 22 32 50+	1.2'/2.0' (60%)				SP (30)	
88							
89	48 50	0.6'/0.8' (75%)				HD (31)	

LOGGED BY J. MILLER DATE 6/21/95 CHK'D BY W. HERST

JOB NO.: 943-2848 FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	0.0-40.0 Ft: 4.25 inch I.D. Hollow Stem Auger					PZ-113-AD
	40.0-108.3 Ft: 3.875 inch Mud Rotary (Tricone)					SHEET 6 OF 7
	SAMPLING METHOD:					DRILLING
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					START / FINISH
	SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)					TIME / TIME
	WATER LEVEL					11:03 / 15:50
	TIME					DATE / DATE
	DATE					4/26/95 / 4/27/95
NORTHING: 1069233.33 DATUM EASTING: 515759.85 ELEVATION 459.9	CASING DEPTH					

DRILL RIG CME 75 - TRUCK MOUNT | SURFACE CONDITIONS Paved road

ANGLE VERTICAL BEARING NA

SAMPLE HAMMER 140

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
91					(65.0-92.0 Ft.) Compact to very dense, dark greenish gray (5GY 4/1), 75% fine SAND, 20% medium Sand, 5% Silt, NR, saturated, (SP), (ALLUVIUM)		
					(367.9) 92.0		
92					(92.0-108.3 Ft.) Dense, dark greenish gray (5GY 4/1), Fine to coarse subrounded to well rounded SAND, NR, saturated, (SW), (ALLUVIUM)		
93							
94	10 15 20 22	1.0'/1.0' <100%>				SP (32)	
95							
96							
97							
98							
99	9 13 17 23	1.1'/2.0' <55%>				SP (33)	
100							
101							
102							
103							
104	10 11 14 12	0.6'/2.0' <30%>				SP (34)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 6/21/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	0.0-40.0 ft: 4.25 inch I.D. Hollow Stem Auger 40.0-108.3 ft: 3.875 inch Mud Rotary (Tricone)
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)
BORING NO.	PZ-113-AD
SHEET	7 OF 7
DATUM	NORTHING: 1069233.33 EASTING: 515759.85
ELEVATION	459.9
DRILLING START TIME / DATE	11:03 / 4/26/95
DRILLING FINISH TIME / DATE	15:50 / 4/27/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG	CME 75 - TRUCK MOUNT
ANGLE	VERTICAL
BEARING	NA
SAMPLE HAMMER	140
SURFACE CONDITIONS	Paved road

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
106					(92.0-108.3 ft.) Dense, dark greenish gray (5GY 4/1), fine to coarse subrounded to well rounded SAND, NR, saturated, (SW), (ALLUVIUM)	SP		
107						(34)		
108					(351.6) 108.3			
109					End of Soil Borehole Log at 108.3 ft. See PZ-113-AD Record of Drillhole for rock descriptions			
110								
111								
112								
113								
114								
115								
116								
117								
118								
119								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 6/21/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ113AD

Well No. PZ-113-AD

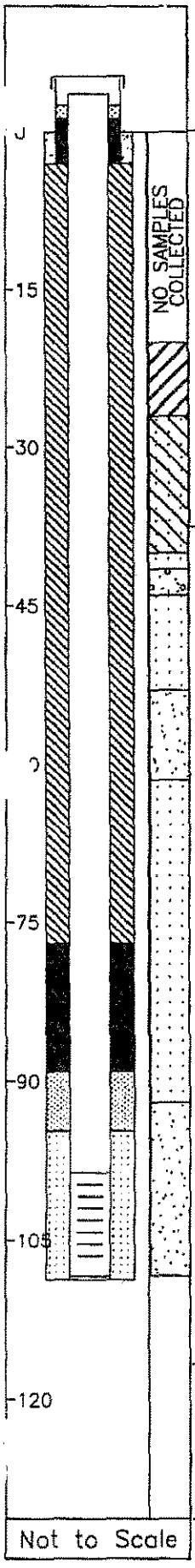
Boring No. X-Ref: PZ-113-AD

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1069233 ft. Easting: 515760 ft.

Elevation Ground Level 459.9 ft. NGVD

Top of PVC Casing 461.46 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 108.7 ft.
Borehole Diameter 10 1/4 in.
Casing Stickup Height 1.60 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/3/95	8:00	5/3/95	9:30
Schramm Rotary				
Geophys.Logging:				
Casing:	5/3/95	13:20	5/3/95	13:30
Filter Placement:	5/3/95	13:30	5/3/95	15:10
Cementing:				
Development				
Bentonite Grout	5/3/95	15:30	5/3/95	15:30
Bentonite Seal	5/3/95	15:10	5/3/95	15:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.60	-	98.60	C1	461.46	-	361.26
98.60	-	108.40	S1	361.26	-	351.46
108.40	-	108.73	C2	351.46	-	351.13
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 94.7-108.7 ft.

Filter Pack: Less than 50 mesh Silica Sand, 89.1-94.7 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-77.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 77.0-89.1 ft.

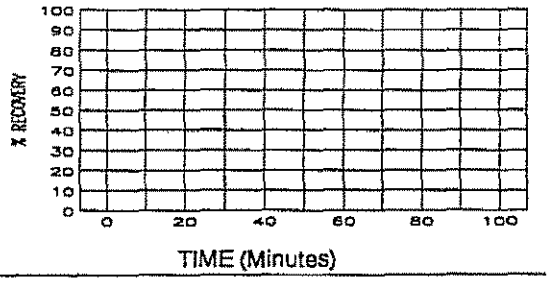
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by D. Alloway

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ113AD

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

REF. NO. 122527	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: P2-113-AD	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-291-3700	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

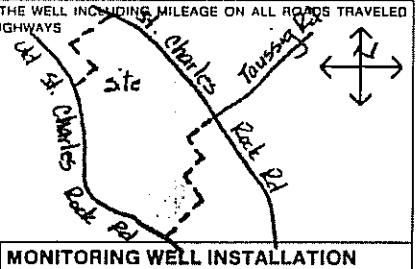
COUNTY: St. Louis
ELEVATION: 459.9
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ LARGEST ¼ ____ ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

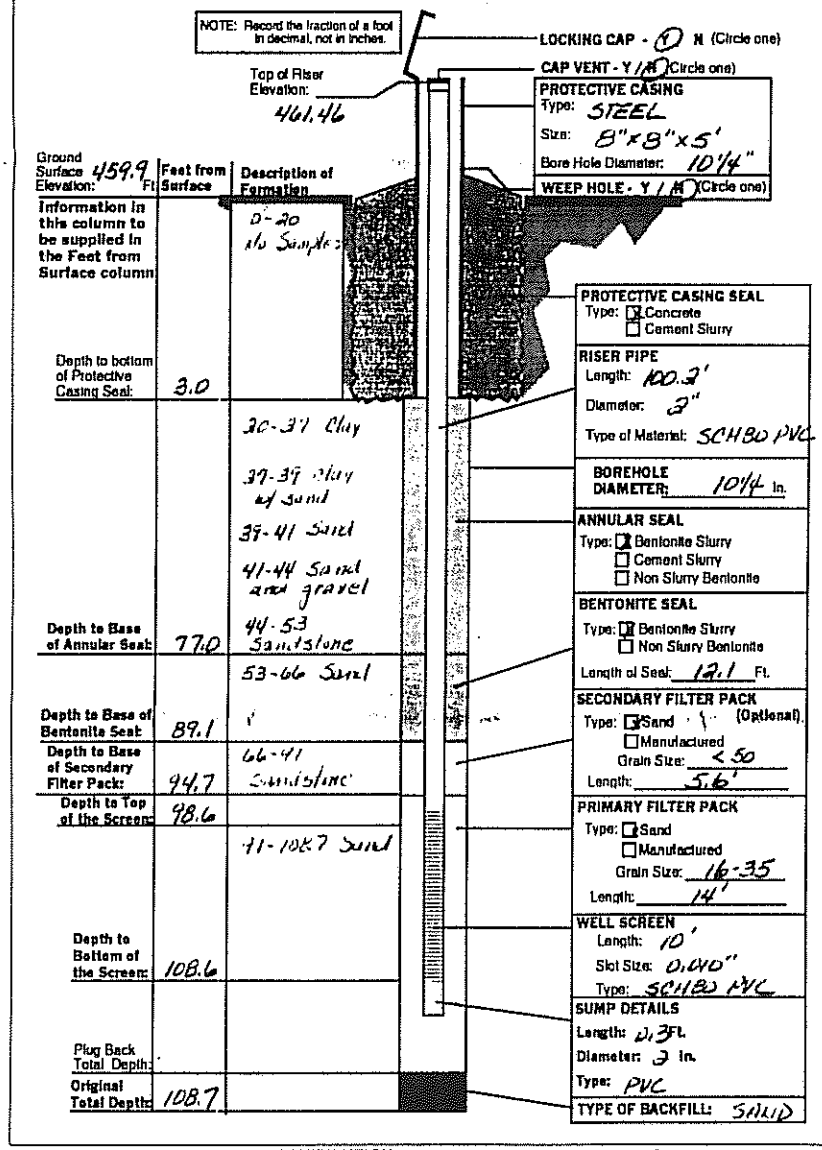
LAT. 38 ° 46 ' 12 " LONG. 90 ° 26 ' 41 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN Co., Inc.



DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co., Inc.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 461.46

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 2 TOTAL ☒ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-03-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Leman N. Mahurin Jr.

PERMIT NUMBER	DATE
001258 WPM	7-31-95

SIGNATURE (DRILLING CONTRACTOR): Leman N. Mahurin Jr.

PERMIT NUMBER	DATE
001258WPM	7-31-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65401

RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1069224.31
DATUM EASTING: 515747.72 ELEVATION 459.9

DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

BORING NO. PZ-113-AS

SHEET 1 OF 3

DRILLING START	DRILLING FINISH
TIME 11:07	TIME 14:55
DATE 4/11/95	DATE 4/11/95

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE VERTICAL BEARING NA
SAMPLE HAMMER 140 lbs.
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1					(0.0-2.5 Ft.) Asphalt		
2					(457.4) 2.5		
3	10 11 11	1.5' 1.5' (100%)			(2.5-4.0 Ft.) Compact, light olive gray (5Y 6/1), CLAYEY GRAVEL, little f-c Sand, SR, damp, (GC), (FILL)	SP ①	
4					(455.9) 4.0		
	6 10 11	1.7' 2.0' (85%)			(4.0-4.8 Ft.) Compact, olive gray (5Y 4/1), SILTY fine SAND, mottled NR, damp, (SM), (FILL)	SP ②	
5	13				(455.1) 4.8 (4.8-10.0 Ft.) Stiff, mottled, light olive gray (5Y 6/1) to greenish black (5GY 2/1), CLAYEY SILT, mottled, NR, damp, (CL-ML), (LOESS)		
6	5 8	1.7' 2.0'				SP ③	
7	7 9	(85%)					
8	2 3	1.2' 2.0'				SP ④	
9	5 6	(60%)					
10					(449.9) 10.0		
	3 3	1.4' 2.0'			(10.0-18.0 Ft.) Loose, light olive gray (5Y 4/1), mottled SILT, NR, damp, (ML), (LOESS)	SP ⑤	
11	3 4	(70%)					
12	3 2	1.3' 2.0'				SP ⑥	
13	3 6	(65%)					
14	4 3	1.3' 2.0'				SP ⑦	
	3 3	(65%)					

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 4/24/95

JOB NO.: 943-2848

FILENAME: P7113AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	4.25 inch I.D. Hollow Stem Auger		PZ-113-AS
			SHEET 2 OF 3
	SAMPLING METHOD:		DRILLING START / FINISH
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		
	WATER LEVEL		TIME 11:07 / TIME 14:55
	TIME		
	DATE		DATE 4/11/95 / DATE 4/11/95
NORTHING: 1069224.31 DATUM EASTING: 515747.72 ELEVATION 459.92	CASING DEPTH		

DRILL RIG CME 75 - TRUCK MOUNT — SURFACE CONDITIONS

ANGLE VERTICAL BEARING NA

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	2 2 2 3	1.6'/2.0' (80%)			(10.0-18.0 Ft.) Loose, light olive gray (5Y 4/1), SILT, mottled, NR, damp, (ML), (LOESS)	SP (7)	
17						SP (8)	
(441.9) 18.0							
18	1 2 4 2	2.0'/2.0' (100%)			(18.0-21.3 Ft.) Firm to soft, dark greenish gray (5GY 4/1), mottled CLAYEY SILT, NR, moist, (CL-ML), (ALLUVIUM)	SP (9)	
19							
20	0 0 3 6	2.0'/2.0' (100%)				SP (10)	
(438.6) 21.3							
21					(21.3-26.2 Ft.) Firm to stiff, greenish black (5GY 2/1), CLAY, NR, moist, (CH), (ALLUVIUM)		
22	5 6 8 9	1.6'/2.0' (80%)				SP (11)	
23							
24	2 3 4 8	1.9'/2.0' (95%)				SP (12)	First water encountered @ 24.5 Ft.
25							
(433.7) 26.2							
26	7 9 12 14	2.0'/2.0' (100%)			(26.2-40.0 Ft.) Compact to dense, dark greenish gray (5GY 4/1), fine SAND, trace Silt, NR, wet, (SP), (ALLUVIUM)	SP (13)	
27							
28	8 11 11 18	1.8'/2.0' (90%)				SP (14)	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 1/25/95

JOB NO.: 943-2848

FILENAME: PZ113AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.			
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger					PZ-113-AS			
						SHEET 3 OF 3			
	SAMPLING METHOD:					DRILLING			
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					START		FINISH	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					TIME		TIME	
	WATER LEVEL					11:07		14:55	
	TIME					DATE		DATE	
NORTHING: 1069224.31 DATUM EASTING: 515747.72 ELEVATION 459.92	DATE					4/11/95		4/11/95	
	CASING DEPTH								

DRILL RIG CME 75 - TRUCK MOUNT — SURFACE CONDITIONS

ANGLE VERTICAL BEARING NA

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	10 14 18 21	1.8' 2.0' (90%)			(26.2-40.0 ft.) Compact to dense, dark greenish gray (5GY 4/1), fine SAND, trace Silt, NR, wet, (SP), (ALLUVIUM)	SP (15)	
32	8 12 17 15	1.2' 2.0' (60%)			From 32.0-34.0 ft., color changes to pale yellowish brown (10YR 6/2)	SP (16)	
33							
34	8 10 15 16	2.0' 2.0' (100%)			From 34.0-34.5 ft., sand becomes fine to medium grained	SP (17)	
35							
36	6 7 7 10	1.9' 2.0' (95%)			From 37.5-38.0 ft., some coarse sand	SP (18)	
37							
38							From 38.0-40.0 ft., unable to collect split spoon samples due to heaving sands
39							
40					(419.9) 40.0 End of Soil Borehole Log at 40.0 ft.		
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER DATE 1/25/95 CHK'D BY W. HERST

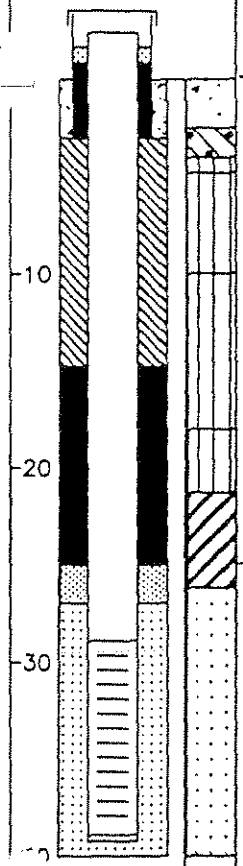
JOB NO.: 941-2849

FILENAME: PZ113AS

Well No. PZ-113-AS

Boring No. X-Ref: PZ-113-AS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1069224 ft. Easting: 515748 ft.

Elevation Ground Level 459.9 ft. NGVD

Top of PVC Casing 461.42 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.

Borehole Diameter 8 1/4 in.

Casing Stickup Height 1.50 ft.

Driller Layne-Western
St. Louis, MO

Rig CME 75

Bit(s) 4 1/4 in. ID Hollow Stem Auger Bit

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/11/95	11:07	4/11/95	14:58
Schramm Rotary				
Geophys.Logging:				
Casing:	4/11/95	15:00	4/11/95	15:10
Filter Placement:	4/11/95	15:12	4/11/95	15:29
Cementing:				
Development				
Bentonite Grout	4/11/95	15:48	4/11/95	16:20
Bentonite Seal	4/11/95	15:40	4/11/95	15:48

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.50	-	28.90	C1	461.42	-	431.02
28.90	-	38.70	S1	431.02	-	421.22
38.70	-	39.03	C2	421.22	-	420.89
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 27.0-40.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 25.0-27.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-15.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 15.0-25.0 ft.

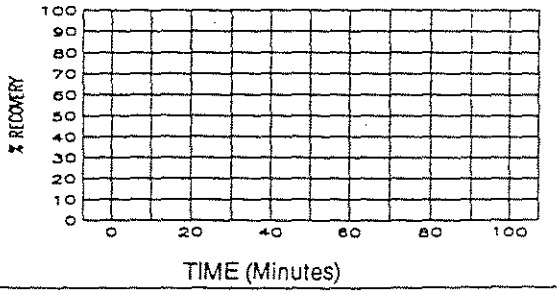
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by S. Cosio

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ113AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122488	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LANDLAND BRIDGETON SANITARY LANDFILL	P2-113-AS

SITE ADDRESS	CITY	STATE	ZIP CODE
51 CHARLES ROCK RD	BRIDGETON	MO	63044

NAME	TELEPHONE
LANDLAND WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1434 N MACKENZIE	ST. LOUIS	MO	63132

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

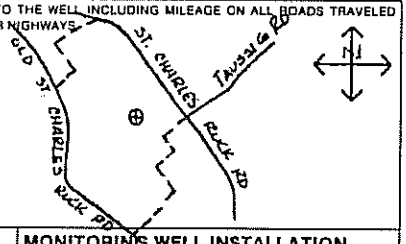
COUNTY ST. LOUIS
ELEVATION 454.9
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38 ° 46 ' 13 " LONG 90 ° 26 ' 41 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.42

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☐ YES, AT
☐ STAINLESS STEEL
☐ OTHER
☒ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-11-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

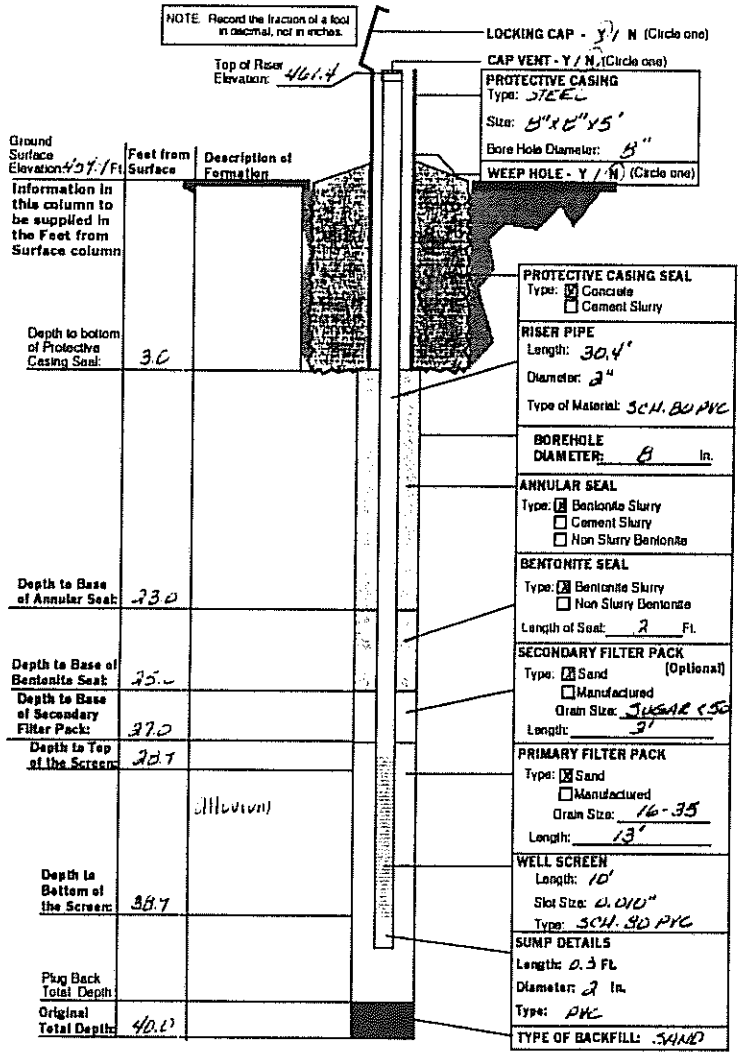
SIGNATURE (MONITORING WELL CONTRACTOR)
Terrence A. Tidwell Jr.

PERMIT NUMBER	DATE
OD1253WPM	5-10-95

SIGNATURE (DRILLING CONTRACTOR)
Terrence A. Tidwell Jr.

PERMIT NUMBER	DATE
OD1253WPM	5-10-95

NOTE: Record the fraction of a foot in decimal, not in inches.



DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK OWNER

RECORD OF DRILLHOLE PZ-113-SS

Sheet 1 of 3

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069242.39
AZIMUTH: 0

COLLAR ELEV: 460.0
E: 515776.57
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20 0)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (ST 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	0.0-114.6 ft. See Soil Borehole Log PZ-113-AD														0.0-114.5 ft. Borehole advanced using 9 7/8 in. diameter mud rotary bit then 6 in. casing sealed in borehole with neat cement
114	345.40		345.40												
	114.6-120.2 ft. Fresh, thickly to medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong LIMESTONE, (ST. LOUIS FORMATION) Trace fossils, trace silicious zones		114.60						J,PL,SM J,PL,R J,PL,R						5/9/95 @ 9:30 Began coring
116									J,C,R,CL J,C,R,CL						
	117.1-118.5 ft. Increase grain size and clay fraction, medium light gray (N6)			1	71%				J,PL,R J,PL,R,CL						
118	118.5-120.0 ft. Medium light gray (N6) to light gray (N7)								J,C,VR (3) J,C,VR (2) J,C,VR J,ST,R (2) Core Loss						5/9/95 @ 9:50 End of Run 1
120			340.00 120.00												
	120.2-142.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Scattered 1 in. thick chert nodules								J,PL,R (4)						
122									J,PL,R (4) J,PL,SM J,PL,R (3) J,PL,R,CL						
124				2	100 %				J,PL,SM (5) J,PL,SM						
126									J,PL,SM J,PL,R						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-113-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069242.39
AZIMUTH: 0

COLLAR ELEV: 460.0
E: 515778.57
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	120.2-142.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Scattered 1 in. thick chert nodules		330.60	2	100 %				J,PL,R						5/9/95 @ 11:00 End of Run 2
			129.40												
130									B,PL,SM (4)						
									B,PL,SM						
132				3	100 %										
134	134.2-134.8 ft. Coarse grained		325.60												5/9/95 @ 11:50 End of Run 3
			134.40												
	134.8-135.4 ft. Occasional stylolites present, fine to medium grained														
136									J,C,SM						
									J,I,R						
138	137.8-139.1 ft. Silty Claystone interbedded with Limestone								J,PL,R						
				4	100 %				B,I,R,CL						
									B,PL,SM (3)						
140															
	141.4-142.3 ft. Chert zone								J,PL,SM						
142			317.70												
	142.3-159.4 ft. Fresh, thickly bedded, light olive gray (5Y 5/2) to pale yellowish brown (10YR 6/2), very fine grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) Scattered 1/2 in. -1 in. chert nodules, vuggy		142.30												142.3 ft. Inferred top of SALEM FORMATION encountered
144															5/9/95 @ 12:40 End of Run 4

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-113-SS

Sheet 3 of 3

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069242.39
AZIMUTH: 0

COLLAR ELEV: 460.0
E: 515776.57
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	142.3-159.4 ft. Fresh, thickly bedded, light olive gray (5Y 5/2) to pale yellowish brown (10YR 6/2), very fine grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) Scattered 1/2 in. - 1 in. chert nodules, vuggy		315.60 / 144.40	4	100 %										5/9/95 @ 12:40 End of Run 4
146															
148															
150	149.7-150.2 ft. Increased percentage of Dolomite 150.2-150.7 ft. Chert zone			5	99%										
152	152.9-155.5 ft. Fresh, thickly bedded, medium dark gray (N4), vf-f grained, medium strong, LIMESTONE, (SALEM FORMATION)		305.60 / 154.40												5/9/95 @ 14:30 End of Run 5
154															
156	304.50 / 155.5 — 155.5-155.8 ft. Fresh, thinly bedded, medium dark gray (N4), very weak, CLAYSTONE, (SALEM FORMATION) 304.20 / 155.80														
158	155.8-159.4 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, strong, DOLOMITIC LIMESTONE with abundant chert nodules 157.0-159.4 ft. Scattered chert nodules			6	100 %				B,PL,SM (2) J,PL,R						
	300.60		300.60												5/9/95 @ 15:40 Ended coring
160	End of Record of Drillhole at 159.4 ft. 159.40		159.40												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 8/15/95

Golder Associates

Well No. PZ-113-SS

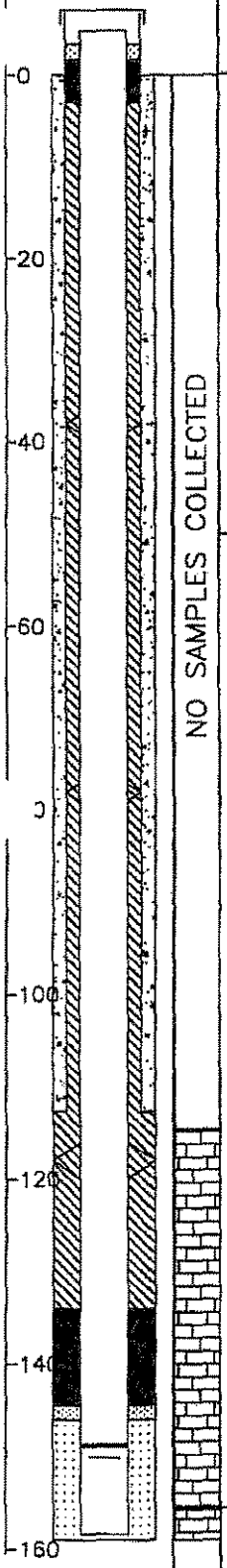
Boring No. X-Ref: PZ-113-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1069242 ft. Easting: 515777 ft.

Elevation Ground Level 460.0 ft. NGVD

Top of PVC Casing 461.77 ft. NGVD



Drilling Summary:

Total Depth 159.0 ft.

Borehole Diameter 9 3/4 in. (0.0–115.0 ft.) 6 7/8 in. (115.0–159.0 ft.)

Casing Stickup Height 1.81 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 9 3/4 in. Tricone Bit

Drilling Fluid Auger–None, NX Core Water, Air and Mud Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/9/95	9:30	5/9/95	15:40
Schramm Rotary	5/20/95	13:30	5/20/95	14:30
Geophys.Logging:				
Casing:				
2" PVC	5/20/95	14:35	5/20/95	14:45
6" Steel	5/7/95	7:30	5/7/95	16:00
Filter Placement:	5/20/95	14:50	5/20/95	15:40
Cementing:				
Development				
Bentonite Grout	5/20/95	16:05	5/20/95	16:30
Bentonite Seal	5/20/95	15:55	5/20/95	16:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.81	-	148.57	C1	461.77	-	311.39
148.57	-	158.37	S1	311.39	-	301.59
158.37	-	158.70	C2	301.59	-	301.26
+ 0.50	-	115.00	C3	460.40	-	344.96
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16–35 mesh Silica Sand, 146.0–159.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 144.5–146.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0–134.0 ft., Neat cement, 3.0–115.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 134.0–144.5 ft.

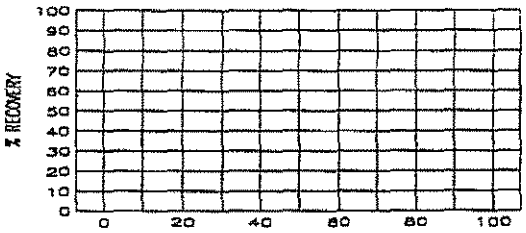
Concrete: 0.0–3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Not to Scale

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ113SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122509	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

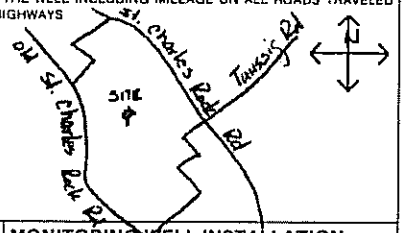
INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW WASTE SYSTEMS SANITARY LANDFILL
WELL NUMBER: PZ-1135S
SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
ADDRESS: 1038 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY ST. LOUIS
ELEVATION 459.4
AREA NO.
SMALLEST ¼ LARGEST ¼
SEC. TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 ° 46 ' 13 " LONG. 90 ° 26 ' 41 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co., INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 461.8

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 5 TOTAL ☒ STAINLESS STEEL ☐ OTHER ☐ NO

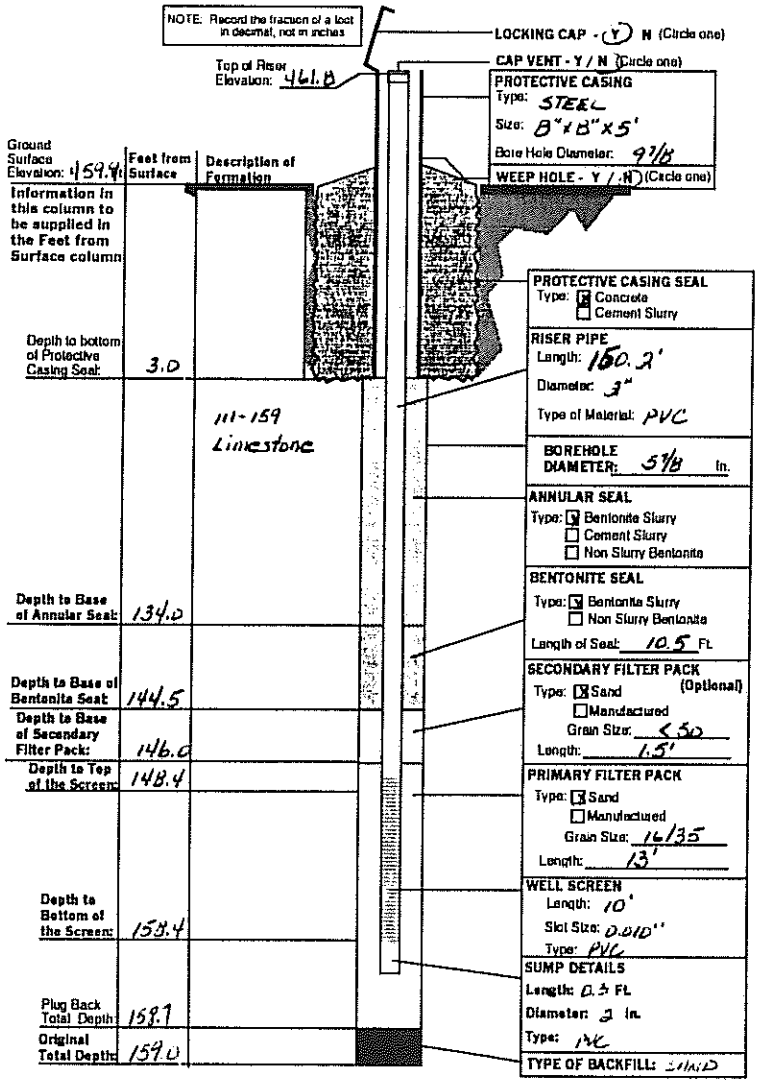
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM DATE: 6-02-95
SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM DATE: 6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches



MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1069418.88
DATUM EASTING: 516768.25 ELEVATION 449.8

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL					TIME	TIME
TIME					11:50	12:40
DATE					DATE	DATE
CASING DEPTH					4/20/95	4/20/95

BORING NO. PZ-114-AS

SHEET 1 OF 2

DRILLING

DRILL RIG CME 75

SURFACE CONDITIONS Grassy

ANGLE -90° BEARING NA

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 4 8 9	1.7' 2.0' (85%)			(0.0-2.0 Ft.) Compact, dark yellowish brown (10YR 4/2), f-m SAND, some clayey Silt, NR, moist, (SM), (FILL)	SP ①	
					(447.8) 2.0		
2	8 14 10 5	1.3' 2.0' (65%)			(2.0-4.0 Ft.) Concrete, (FILL)	SP ②	
3							
					(445.8) 4.0		
4	2 7 7 5	1.3' 2.0' (65%)			(4.0-6.0 Ft.) Loose, moderate gray (N5), moist, f-c subrounded SAND, some clayey Silt, (SM), (FILL), lower 0.3 Ft. is concrete	SP ③	
5							
					(443.8) 6.0		
6	1 2 1 3	0.7' 2.0' (35%)			(6.0-8.0 Ft.) Soft to firm, medium dark gray (N4) to olive gray (5Y 4/1), clayey SILT, some fine and medium Sand, trace subrounded coarse Sand, (ML), (FILL)	SP ④	
7							
					(441.8) 8.0		
8	2 2 3 3	0.7' 2.0' (35%)			(8.0-12.0 Ft.) Soft, greenish black (5GY 2/1) to medium gray (N5), silty CLAY, little fine Sand, NR, moist, (CL), (FILL)	SP ⑤	
9							
10	1 1 2 2	2.0' 2.0' (100%)				SP ⑥	
11							
12	1 3 4 6	1.8' 2.0' (90%)			(12.0-15.5 Ft.) Firm, medium dark gray (N4), SILTY CLAY, little fine Sand, NR, moist, (CL), (ALLUVIUM)	SP ⑦	
13					below 14.0 Ft., grades sandier with depth		
14	1 3 4 2	1.9' 2.0' (95%)				SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY

DATE 4/20/95

CHKD BY W. HEINST

JOB NO.: 943-2848

FILENAME: PZ114AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-114-AS
			SHEET 2 OF 2
	SAMPLING METHOD:		DRILLING
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		
	WATER LEVEL		TIME 11:50 / TIME 12:40
	TIME		
	DATE		DATE 4/20/95 / DATE 4/20/95
NORTHING: 1069418.88 DATUM EASTING: 516768.25 ELEVATION 449.8	CASING DEPTH		

DRILL RIG CME 75 | SURFACE CONDITIONS Grassy

ANGLE -90° BEARING NA

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	0 1 3 4	2.0' / 2.0' (100%)			(12.0-15.5 ft.) Firm, medium dark gray (N4), SILTY CLAY, little Fine Sand, NR, moist, (CL), (ALLUVIUM)	SP 8	
					(15.5-17.4 ft.) Firm, medium gray (N5), SILTY CLAY, some F-m Sand, NR, moist to wet, (CL), (ALLUVIUM), grades sandier	SP 9	
17					(432.4) 17.4		
18	3 3 5 2	1.2' / 2.0' (60%)			(17.4-18.5 ft.) Loose, medium gray (N5), F-m SAND, some silty Clay, NR, wet, (SP), (ALLUVIUM), grades sandier and coarser		
19					(18.5-30.0 ft.) Loose to compact, medium gray (N5), F-m SAND, trace fines, thin layers of mica (<1/4" thick), NR, moist, (SP), (ALLUVIUM)	SP 10	
20	2 3 3 3	1.8' / 2.0' (90%)				SP 11	
21							
22	3 2 5 3	1.3' / 2.0' (65%)				SP 12	
23							
24	4 7 8 13	1.5' / 2.0' (75%)			@ 23.7 ft. color changes to moderate brown (5YR 4/4) and moderate yellowish brown (10YR 5/2)	SP 13	
25							
26	9 7 4 3	0.3' / 2.0' (15%)				SP 14	
27							
28	2 6 6 7	1.6' / 2.0' (80%)				SP 15	
29					@ 29.1-29.6 ft., organics present, bits of wood and grass		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY CHK'D BY W. HERST

DATE 4/20/95

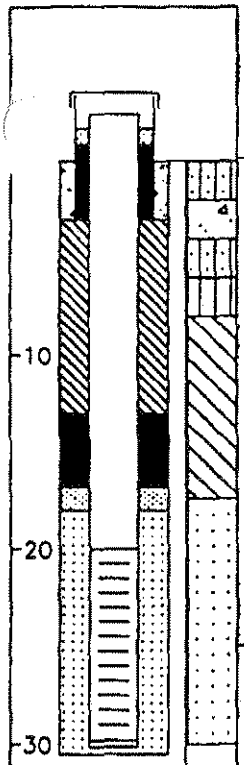
JOB NO.: 943-2848

FILENAME: PZ114AS

Well No. PZ-114-AS

Boring No. X-Ref: PZ-114-AS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1069419 ft. Easting: 516768 ft.

Elevation Ground Level 449.8 ft. NGVD

Top of PVC Casing 451.31 ft. NGVD

Drilling Summary:

Total Depth 30.5 ft.

Borehole Diameter 10 1/4 in.

Casing Stickup Height 1.53 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/20/95	11:50	4/20/95	12:40
Schramm Rotary				
Geophys.Logging:				
Casing:	4/20/95	13:00	4/20/95	13:30
Filter Placement:	4/20/95	13:15	4/20/95	14:00
Cementing:				
Development				
Bentonite Grout	4/20/95	13:45	4/20/95	14:45
Bentonite Seal	4/20/95	13:30	4/20/95	13:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.53	-	19.90	C1	451.31	-	429.88
19.90	-	29.70	S1	429.88	-	420.08
29.70	-	30.03	C2	420.08	-	419.75

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 18.0-30.5 ft.

Filter Pack: Less than 50 mesh Silica Sand, 16.8-18.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-13.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 13.0-16.8 ft.

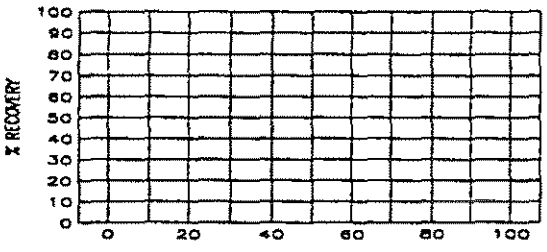
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by D. Alloway

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ114AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122487	DATE RECEIVED
ROUTE	CHECK NO
STATE WELL NUMBER	TRANSMITTAL NO
CHECKED BY	CROSS REFERENCE NO
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME		WELL NUMBER	
LAIDLAW BRIDGETON SANITARY LANDFILL		PZ-114-AS	
SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD	BRIDGETON	MO	63044
NAME		TELEPHONE	
LAIDLAW WASTE SYSTEMS, INC.		314-241-3710	
ADDRESS	CITY	STATE	ZIP CODE
13.9E N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

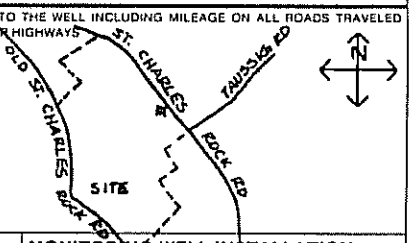
COUNTY ST. LOUIS
ELEVATION 447.8
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38° 46' 14" LONG. 90° 26' 38"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, Inc.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, Inc.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
451.31

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☒ AUGER TYPE 8¼ HSA
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☐ YES, AT
☐ STAINLESS STEEL
☐ OTHER
☒ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

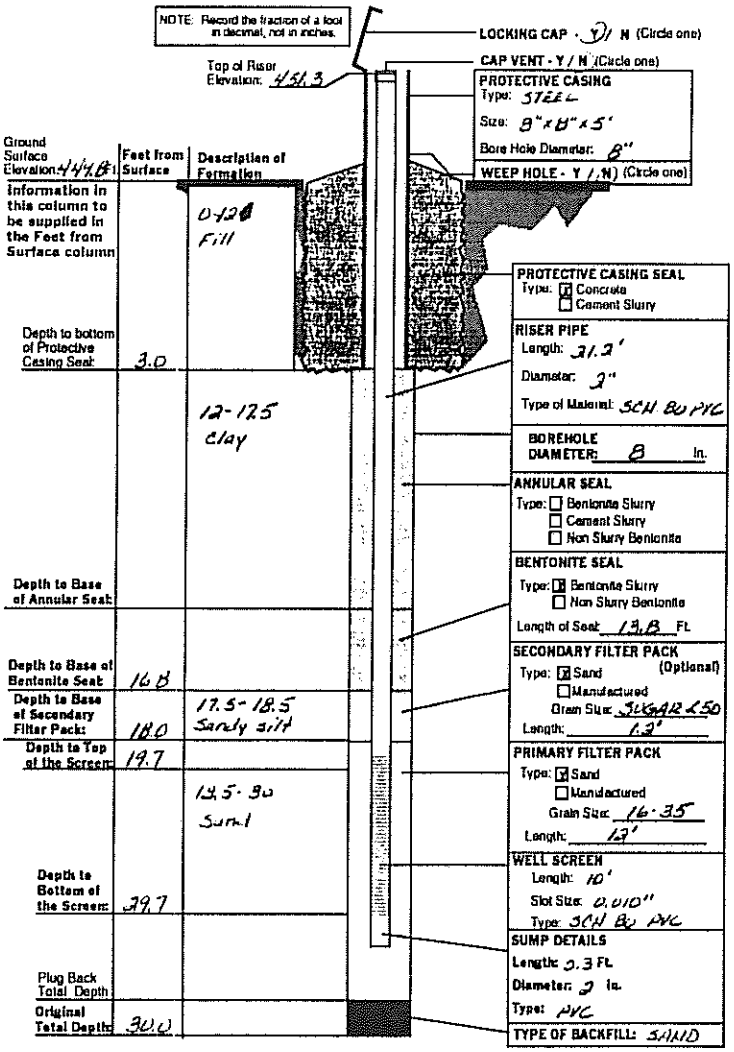
SIGNATURE (MONITORING WELL CONTRACTOR) Herman H. Nicholson Jr

PERMIT NUMBER 001258 WIPM — DATE 5-10-95

SIGNATURE (DRILLING CONTRACTOR) Herman H. Nicholson Jr

PERMIT NUMBER 001259 WIPM — DATE 5-18-95

NOTE: Record the fraction of a foot in decimal, not in inches.



MO 780-1415 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER
MAIL WHITE COPY TO DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65401

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	4.25 inch I.D. Hollow Stem Auger 4.0 inch Tricone Bit with Bentonite
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-115-SS
SHEET	1 OF 1
DRILLING START / FINISH	
WATER LEVEL / TIME	
TIME	8:30 / 9:55
DATE	5/5/95 / 5/5/95
CASING DEPTH	
NORTHING: 1069408.54 DATUM EASTING: 516755.35 ELEVATION 450.6	
DRILL RIG	CME 75 - TRUCK MOUNT
ANGLE -90° BEARING NA	
SAMPLE HAMMER	
SURFACE CONDITIONS	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	6 7 7 6	1.0' 2.0' (50%)			(0.0-30.0 Ft.) No samples collected, see Soil Borehole Log PZ-114-AS for descriptions (30.0-33.5 Ft.) Compact, olive gray (5Y 4/1), SILTY f-m SAND, wet, NR, (SM), (ALLUVIUM)	SP ①	0.0-30.0 ft. Drilling conducted with 4.25-inch augers Below 30.0 Ft. Drilling conducted with mud rotary techniques to control heaving sands.
32	8 8 50/3"	1.0' 1.5' (67%)				SP ②	
33					(417.1) 33.5 End of Soil Borehole Log at 33.5 ft. See PZ-115-SS Record of Drillhole for rock descriptions		
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HURST

DATE 6/21/95

JOB NO.: 943-2848

FILENAME: PZ115SS

RECORD OF DRILLHOLE PZ-115-SS

Sheet 1 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/10/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069408.54
AZIMUTH: 0

COLLAR ELEV: 450.6
E: 516755.35
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-33.5 ft. See Soil Borehole Log PZ-115-SS 33.5-38.0 ft. No samples collected														3/9/95 9 7/8 in. mud rotary bit used to drill into bedrock then 6 in. steel casing grouted into borehole with neat cement
34															
36															
38	412.60 38.0-47.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		38.00 412.60 38.00	1	98%										5/10/95 @ 8:30 Began drilling
40	40.0-41.8 ft. Scattered silica zones and veins		410.90 39.70						J,PL,VR (2) J,PL,VR (3)						5/10/95 @ 8:50 End of Run 1
42	41.2-47.7 ft. Microcrystalline, pale yellowish brown (10YR 6/2), slightly weathered 41.8-42.8 and 43.6-47.3 ft. Layers of green clay and clay filling around inplace pieces of rock								J,IR,VR (4)						
44				2	97%				J,PL,VR (2) J,IR,VR (3) J,IR,VR (7)						
46									J,IR,VR (6) J,IR,VR (7)						
48	47.7-49.0 ft. Slightly weathered, thickly bedded, pale yellowish brown (10YR 6/2), microcrystalline, strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Vuggy (1 mm. to 5 mm. in diameter), some vugs filled with calcite or quartz								J,I,VR (7)						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-115-SS

Sheet 2 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/10/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069408.54
AZIMUTH: 0

COLLAR ELEV: 450.6
E: 516755.35
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX: SW FR, MW HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	48.8-48.9 ft. Claystone layers 49.0-50.2 ft. Slightly weathered, thickly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Dolomite and clay zones, vuggy		400.90	2	97%	60 40 20	2 4 6 8 10								5/10/95 @ 10:10 End of Run 2
50	50.2-58.5 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		49.70						J,PL,VR						
52	50.2-51.4 ft. Thin clay laminations within rock visible but no preferential breaks or weak zones are associated 53.0-55.1 ft. Thin clay laminations, healed and unhealed bedding partings								B,PL,SM B,PL,SM (3) J,PL,R,CL J,PL,SM						
54				3	100 %										
56	55.1-55.4 ft. Highly weathered, extremely weak Claystone zone 55.4-58.5 ft. Thin clay laminations and healed bedding partings, trace stylolites								J,PL,SM J,PL,SM						
58	58.5-64.6 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), very fine, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vuggy		390.90 59.70						J,PL,SM						5/10/95 @ 11:45 End of Run 3
60															
62				4	100 %										
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-115-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/10/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069408.54
AZIMUTH: 0

COLLAR ELEV: 450.6
E: 516755.35
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	64.6-65.8 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION) Scattered stylolites and silica replacement of stylolites								J,IR,VR J,C,SM						
66	65.8-66.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vuggy			4	100 %				J,PL,VR J,PL,VR J,PL,SM						
68	66.7-69.7 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), f-vf grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Zones of Claystone interbedded (1/2 in. - 1 1/2 in.)		380.90						B,PL,R B,PL,R,CL						5/10/95 @ 12:30 End of Run 4
70	69.7-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline to fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION)		69.70						J,PL,VR						
	69.7-75.7 ft. Fine to medium grained, trace fossils								J,IR,R						
72	72.0-72.2 ft. Highly weathered, weak, Claystone seam 72.2-73.3 ft. Scattered chert								B,PL,SM (2) B,PL,SM						
74				5	100 %				J,C,SM (2) J,PL,SM						
76	76.2 ft. *Void filled with calcite crystals*								J,PL,R						
	77.2-78.0 ft. Abundant stylolites								J,PL,R J,I,R J,I,R						
78									J,PL,SM						
	79.1-84.7 ft. Dolomite content increases, slightly weathered 79.4-81.0 ft. Abundant stylolites		370.90 79.70	6	100 %				J,I,R (2) J,I,R						5/10/95 @ 13:50 End of Run 5
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-115-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/10/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069408.54
AZIMUTH: 0

COLLAR ELEV: 450.6
E: 516755.35
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): I1 30 R2 150 R3 300 R4 600 I5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	69.7-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline to fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
									J,I,R (2)						
82				6	100 %				J,I,R						
									J,I,R (2)						
84	84.2-84.7 ft. Abundant stylolites		365.90						B,PL,R						5/10/95 @ 15:00 End of coring
	End of Record of Drillhole at 84.7 ft.		84.70												
86															
88															
90															
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

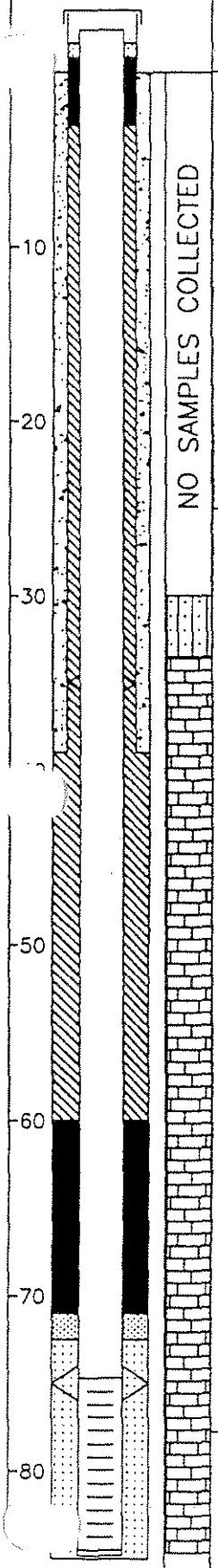
LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

Well No. PZ-115-SS

Boring No. X-Ref: PZ-115-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1069409 ft. Easting: 516755 ft.

Elevation Ground Level 450.6 ft. NGVD

Top of PVC Casing 452.30 ft. NGVD

Drilling Summary:

Total Depth	85.0 ft.
Borehole Diameter	9 7/8 in. (0.0–39.0 ft.) 5 7/8 in. (39.0–85.0 ft.)
Casing Stickup Height	1.69 ft.
Driller	Layne-Western, St. Louis, MO
Rig	CME 75, Schramm Portadrill T660H
Bit(s)	6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 9 7/8 in. Tricone Bit
Drilling Fluid	Auger-None, NX Core Water, Air and Mud Rotary
Protective Casing	8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/5/95	8:30	5/5/95	10:00
Schramm Rotary	5/21/95	8:30	5/21/95	10:00
Geophys.Logging:				
Casing:				
2" PVC	5/21/95	10:15	5/21/95	10:20
6" Steel	5/9/95	9:15	5/9/95	12:00
Filter Placement:	5/21/95	10:40	5/21/95	11:00
Cementing:				
Development				
Bentonite Grout	5/21/95	11:10	5/21/95	11:30
Bentonite Seal	5/21/95	11:00	5/21/95	11:10

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.69	-	74.68	C1	452.30	-	375.93
74.68	-	84.48	S1	375.93	-	366.13
84.48	-	84.81	C2	366.13	-	365.80
+ 1.00	-	39.00	C3	451.60	-	411.81
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 72.5-85.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 71.0-72.5 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-60.0 ft., Neat cement, 3.0-39.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 60.0-71.0 ft.

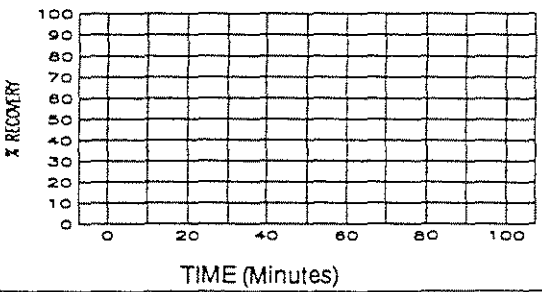
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ115SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
OIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122507	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-1155S

SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: MO | ZIP CODE: 63044

NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-341-3710

ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: MO. | ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

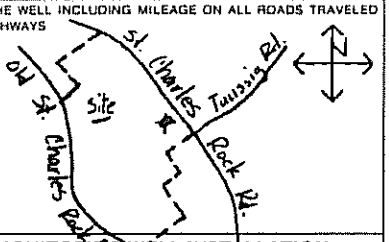
COUNTY: ST. LOUIS
ELEVATION: 450.6
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38° 46' 14" LONG. 90° 26' 29"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWN OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co., INC.

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 452.3
Ground Surface Elevation: 450.6

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	
Depth to bottom of Protective Casing Seal: 3.0	
	33-85 Limestone
Depth to Base of Annular Seal: 60.0	
Depth to Base of Bentonite Seal: 71.0	
Depth to Base of Secondary Filter Pack: 73.5	
Depth to Top of the Screen: 74.7	
Depth to Bottom of the Screen: 84.7	
Plug Back Total Depth:	
Original Total Depth: 85.0	

LOCKING CAP - (Y) N (Circle one)
CAP VENT - (Y) N (Circle one)
PROTECTIVE CASING
Type: STEEL
Size: 8"x6"x5'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 76.4'
Diameter: 2"
Type of Material: Sch. 80 PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 11 Ft.

SECONDARY FILTER PACK (Optional)
Type: [ ] Sand [ ] Manufactured
Grain Size: < 50
Length: 1.5

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16/35
Length: 12.5

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: Sch. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SAND

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co., INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 452.3

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 3 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-21-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM | DATE: 6-02-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM | DATE: 6-02-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK/OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1066410.28
DATUM EASTING: 515843.88 ELEVATION 483.1

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-116-SS

SHEET 1 OF 3

					DRILLING START	DRILLING FINISH
WATER LEVEL						
TIME					12:45	15:00
DATE					6/5/95	6/5/95
CASING DEPTH						

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Edge of haul road and flat fill area.

ANGLE BEARING

SAMPLE HAMMER

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

DATE 6/20/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ116SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(0.0-1.0 ft.) No samples collected, gravel road base encountered (482.1) 1.0		
1	5	0.9' / 2.0' (45%)			(1.0-5.0 ft.) Stiff, dark yellowish brown (10YR 4/2), CLAYEY SILT, trace Gravel, WR, damp, (ML), (FILL)	SP (1)	
2	6						
	4						
3	5						
	2	0.7' / 2.0' (35%)				SP (2)	
4	2						
	4						
5	5						
	3	1.5' / 2.0' (75%)			(5.0-15.0 ft.) Loose, moderate yellowish brown (10YR 5/4), thinly laminated, SILT, SR, (ML), (LOESS)	SP (3)	
6	3						
	5						
7	5						
	3	1.7' / 2.0' (85%)			@ 7.0 ft., color changes to mottled pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4), and silt becomes compact	SP (4)	
8	5						
	8						
9	9						
	7	1.6' / 2.0' (80%)				SP (5)	
10	8						
	8						
11	9						
	5	1.2' / 2.0' (60%)			@ 11.0 ft., color is predominantly pale yellowish brown (10YR 6/2)	SP (6)	
12	8						
	9						
13	10						
	6	1.3' / 2.0' (65%)				SP (7)	
14	7						
	6						

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	6.25 inch I.D. Hollow Stem Auger	PZ-116-SS
		SHEET 2 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING START / FINISH
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	
	WATER LEVEL	TIME 12:45 / TIME 15:00
	TIME	
	DATE	DATE 6/5/95 / DATE 6/5/95
NORTHING: 1066410.28 DATUM EASTING: 515843.88 ELEVATION 493.1	CASING DEPTH	

DRILL RIG: CME 75 - TRUCK MOUNT

SURFACE CONDITIONS: Edge of haul road and flat fill area.

ANGLE: BEARING:

SAMPLE HAMMER:

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	5 6 6 10	1.4' 2.0' (70%)			(15.0-22.8 Ft.) Compact, pale yellowish brown (10YR 6/2), SILT, SR-NR, damp, (ML), (LOESS)	SP (8)	
17	9 5 4	1.3' 2.0' (65%)				SP (9)	
18	6						
19	4 6	1.7' 2.0' (85%)				SP (10)	
20	5 4						
21	1 4	1.6' 2.0' (80%)				SP (11)	
22	6 9				(460.3) 22.8		
23	6 7	2.0' 2.0' (100%)			(22.8-24.2 Ft.) Compact, moderate yellowish brown (10YR 5/4), SILTY Fine SAND, WR, damp, (SM), (ALLUVIUM)	SP (12)	
24	5 6				(458.9) 24.2		
25	8 14	2.0' 2.0' (100%)			(24.2-25.6 Ft.) Compact, medium gray (N5), SILT, trace iron oxide staining, NR, moist, (ML), (LOESS)		
26	22 14				(457.5) 25.6 (25.6-27.0 Ft.) Dense, pale yellowish brown (10YR 6/2), Fine SAND, trace Silt, NR, damp (SP), (ALLUVIUM)	SP (13)	
27	4 11	2.0' 2.0' (100%)			(456.1) 27.0 (27.0-28.0 Ft.) Compact, medium gray (N5), SILT, NR, moist, (ML), (ALLUVIUM)		
28	17 18				(455.1) 28.0 (28.0-32.0 Ft.) Compact, medium light gray (N6), Fine SAND, trace Silt, NR, moist, (SP)	SP (14)	
29	8 9 11 10	2.0' 2.0' (100%)				SP (15)	

DRILLING CONTR: LAYNE-WESTERN

LOGGED BY: B. TILTON CHK'D BY: W. HENRY

DATE: 6/20/95

JOB NO.: 943-2848

FILENAME: PZ116SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1066410.28
DATUM EASTING: 515843.88 ELEVATION 483.1

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					12:45	15:00
DATE					DATE	DATE
CASING DEPTH					6/5/95	6/5/95

BORING NO. PZ-116-SS

SHEET 3 OF 3

DRILLING

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Edge of haul road and flat fill area.

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
31	15 50/5"	0.5' 1.0' (50%)			(28.0-32.0 ft.) Compact, medium light gray (N6), fine SAND, trace Silt, NR, moist, (SP)	SP	15	
					@ 30.8 ft, some black organic material in sand	SP	16	
32					@ 31.5 ft, gravel size pieces of Limestone in Sand, water encountered at 31.0 ft, on top of bedrock (451.1) 32.0			
					End of Soil Borehole Log at 32.0 ft.			
33					See PZ-116-SS Record of Drillhole for rock descriptions			
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. FILTON

DATE 6/20/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ116SS

RECORD OF DRILLHOLE PZ-116-SS

Sheet 1 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.68
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD 80 60 40 20	FRACTURES PER FOOT 2 4 6 8 10	DISCONTINUITY DATA: DIP wrt CORE AXIS 0 30 60 90	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX: SW FR MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-32.0 ft. See Soil Borehole Log PZ-116-SS 32.0-33.4 ft. No samples collected		449.70												
			33.40												RQD of Run 1 was unassesable due to uncertainty in fracture origin. Drill bit was worn, poor quality recovery
34	33.4-60.2 ft. Fresh, thickly laminated, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Occasional 0.5 - 2 mm. pyrite grains, weathered and grading into fresh at depth			1	71%										
			447.10												
36			36.00												
			446.20												
			36.90						J,I,R,Fe						
			445.50												
	37.6-38.7 ft. Stiff, Clay layer, light olive gray (5Y 6/1)		37.60						J,I,R						
38			444.40												
			38.70												
				2	51%										
40									J,I,R (3)						
42			440.90												
			42.20												
			439.90												
	43.2-43.4 ft. Very stiff, Clay layer, light olive gray (5Y 6/1)		439.70	43.20											
			43.40												
44				3	88%				J,PL,R						
									J,PL,R,CL						
									J,I,R						
			436.20												
			44.90						J,I,R						
	45.1-45.3 ft. Soft Clay layer		437.80												6/8/95 @ 13:10 Began Run 4
			45.30												
46									J,I,R,CL						
			436.90												
	46.2-48.0 ft. Highly weathered, thinly bedded, medium light gray (N6), fine grained, weak, BRECCIATED LIMESTONE in medium bluish gray (5B 5/1), clay matrix, (COLLAPSE ZONE)		46.20												
				4	96%										
48			435.10												
			48.00												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

== Golder Associates

RECORD OF DRILLHOLE PZ-116-SS

Sheet 2 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.68
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	435.10														
	48.0-60.2 ft. 48.00 Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic								J,I,R,CL						
				4	96%				J,PL,SM,Fe						
			433.20												
50			49.90						J,PL,R						
									J,U,R						
52									J,PL,R						
									J,PL,R (3)						
									J,PL,R,CL						
54									J,C,R						
									J,PL,R,CL						
				5	100				J,I,R						
56															
									J,PL,R,CL (2)						
									J,PL,R						
									J,PL,R,CL						
58									J,PL,R (3)						
									J,PL,R (2)						
			423.10												
60	422.90		60.00						J,I,R						
	60.2-64.8 ft. 60.20 Fresh, thinly bedded, olive gray (5Y 4/1), fine grained, very strong, DOLOMITE, (ST. LOUIS FORMATION)														
	61.9-62.5 ft. Light olive gray (5Y 6/1), very fine grained Limestone layer			6	100				J,I,R						
62									J,PL,R						
									J,PL,R,CL						
									J,PL,R,CL						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-SS

Sheet 3 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation: PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular: P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough: Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD 80 60 40 20	FRACTURES PER FOOT 2 4 6 8 10	DISCONTINUITY DATA: DIP wrt CORE AXIS 0 30 60 90	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX SW FR MW HW CW	STRENGTH INDEX R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi) R1 10 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64															
	418.30														
	64.8-71.2 ft. 64.80 Fresh, medium bedded, light olive ray (5Y 6/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
66									J,PL,R,CL						
				6	100 %										
									J,PL,R,CL						
68															
70			413.10 70.00												
72									J,PL,R,CL						
									J,PL,R,CL						
	72.4-87.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic 72.6-73.0 ft. Abundant chert zones (<3 in. thick)								B,PL,R						
									J,PL,R,CL						
74															
	408.00 75.1-75.8 ft. 75.10 Hard, Clay layer			7	99%										
	407.30 75.80														
76									J,PL,R,CL (2)						
78									J,PL,R,CL (2)						
									J,I,R,CL						
80			403.10 80.00												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-SS

Sheet 4 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1056410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.86
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW HW, CW	STRENGTH INDEX: R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	72.4-87.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		403.10 80.00						J,C,R						
82	82.2-83.3 ft. Glauconitic intraclasts, argillaceous								J,PL,R (2) B,PL,R						
84				8	100 %				J,U,R,CL J,I,R J,I,R,CL J,PL,R,CL						
86									B,C,R,CL J,I,R,CL						
88	87.0-101.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 87.8-91.3 ft. Porous zone, open vugs (<2 mm. dia.)								J,PL,R,CL J,I,R						
90			393.00 90.10												
92				9	100 %										
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-SS

Sheet 5 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515643.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, SAW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): HT, R2 30, R3 150, R4 300, R5 600, R6 1500	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	97.0-101.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
98				9	100%										
100			383.10 / 100.00												
102	101.3-106.3 ft. Fresh, thickly bedded, light brownish gray (5YR 6/1), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								B,PL,R,CL B,PL,R,CL						
104				10	98%				J,PL,R J,PL,R						
106	105.1-105.7 ft. Abundant, thinly laminated, shaley partings		376.80 / 106.30						J,PL,R (3) J,PL,R,CL J,PL,R,CL						
108	106.3-108.8 ft. Fresh, thinly bedded, light brownish gray (5YR 6/1), fine crystalline, extremely strong, SILICIFIED LIMESTONE, (ST. LOUIS FORMATION)			11	100%				J,I,R,SPUN						
110	108.8-135.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong to strong, LIMESTONE (ST. LOUIS FORMATION) Stylolitic		374.30 / 108.80						J,PL,R J,I,R (2)						
112				12	100%				B,PL,SM B,PL,SM						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM MSL
COORDINATES N: 1068410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP WRT CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	108.8-135.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic			12	100 %			90	J,PL,R,CL (3)						
114			369.10 / 114.00					90	J,PL,R (2)						
116				13	100 %			90	J,PL,R						
								90	J,I,R (2)						
								90	PL,R (6)						
118			364.10 / 119.00												6/9/95 @ 14:30 Completed Run 13 6/14/95 @ 8:00 Began Run 4 Water level in open corehole = 21.1 ft. bgs prior to drilling
								90	J,I,R						
120								90	B,I,R (3)						@ 120.3, 122.8, 123.3, 125.5 and 126.7 ft., possible open intact joints, (<5 breaks/in.)
								90	J,I,R (2)						
	121.2-122.2 ft. Argillaceous Limestone														
122								90	J,I,R						
	@ 122.5 ft. Very stiff, light olive gray (5Y 6/1), Silt layer (< 1/2 in. thick)			14	100 %										
124								90	J,I,SM						
								90	B,I,SM,CL						
	124.7-127.0 ft. Limestone becomes fine to medium crystalline							90	J,I,R						
126															
	126.4-127.0 ft. Moderately weathered zone							90	J,I,R						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: S. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1065410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	108.8-135.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic			14	100 %				J,PL,SM						6/14/95 @ 9:10 Completed Run 14
			354.10 / 129.00												
130									J,PL,SM						
132									J,PL,SM						
									J,I,R (3)						133.0-133.5 ft. Possible open intact joints, highly broken zone
									J,I,R						
134				15	98%				B,I,R,CL						
	134.9-135.7 ft. Limestone becomes fine grained		347.60 / 135.50												
136	135.5-139.1 ft. Fresh, thickly bedded, olive gray (5Y 4/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)														@ 135.5 ft. Inferred top of Salem Formation
138															
			344.10 / 139.00												6/14/95 @ 10:11 Completed Run 15
	139.1-141.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)								B,PL,SM,CL						
140	@ 139.6 ft. Very stiff, olive gray (5Y 4/1), Silt layer (<1 in. thick)														
									J,PL,SM						
				16	92%				J,I,R (2)						
142	141.8-151.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong LIMESTONE, (SALEM FORMATION) Thin layers of glauconite Clay, surrounding Limestone matrix								J,I,R						
									J,I,R,CL (2)						
									B,I,SM						
			339.10 / 144.00												6/14/95 @ 11:00 Completed Run 16 Stopped short as bit plugged, core loss in highly broken rock
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-SS

Sheet 6 of 9

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066410.26
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	141.8-151.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong LIMESTONE, (SALEM FORMATION) Thin layers of glauconite Clay, surrounding Limestone matrix @ 144.7 ft. Vug with calcite crystals (<1/2 in. dia.) 146.0-151.2 ft. Limestone becomes argillaceous		339.10 / 144.00						B,U,R,CL						
									J,I,R (2)						
									J,I,R (3)						
146															
148															
				17	100 %										
150															
	151.2-162.5 ft. Fresh, thinly bedded, olive gray (5Y 4/1), fine crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Thinly laminated, shaley partings common, some chert nodules (<2 in. dia.)								J,I,R						
152															
									J,I,R						
154			329.10 / 154.00												6/14/95 @ 12:00 End Run 17
	154.5-155.2 ft. Limestone becomes argillaceous								J,I,R (2)						
									B,PL,SM,CL						
156															
				18	100 %										@ 157.0 and 158.8 ft. Possible open/intact joints, highly broken zone
									J,I,R (2)						
	157.5-162.5 ft. Abundant chert zones (<2 in. thick)								B,I,SM						
158															
									J,PL,SM						
									B,PL,SM						
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.68
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	151.2-162.5 ft. Fresh, thinly bedded, olive gray (5Y 4/1), fine crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Thinly laminated, shaley partings common, some chert nodules (<2 in. dia.)			18	100 %	80 60 40 20	2 4 6 8 10	0 30 60 90							
162	320.80		320.60												6/14/95 @ 13:25 End Run 18
	End of Record of Drillhole at 162.5 ft. 162.50		162.50												
164															
166															
168															
170															
172															
174															
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

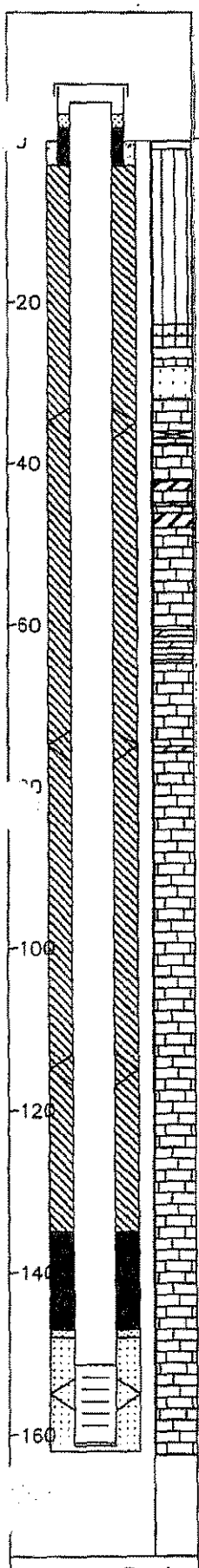
LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

Well No. PZ-116-SS

Boring No. X-Ref: PZ-116-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066410 ft. Easting: 515844 ft.

Elevation Ground Level 483.1 ft. NGVD

Top of PVC Casing 484.87 ft. NGVD

Drilling Summary:

Total Depth 162.0 ft.

Borehole Diameter 10 1/4 in. (0.0–33.0 ft.) 5 7/8 in. (33.0–162.0 ft.)

Casing Stickup Height 1.80 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger–None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	6/5/95	7:30	6/14/95	13:25
Schramm Rotary	6/20/95	8:00	6/20/95	11:45
Geophys.Logging:				
Casing:	6/20/95	12:30	6/20/95	12:50
Filter Placement:	6/20/95	12:55	6/20/95	13:00
Cementing:				
Development				
Bentonite Grout	6/20/95	13:30	6/20/95	15:30
Bentonite Seal	6/20/95	13:15	6/20/95	13:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.80	-	151.40	C1	484.87	-	331.67
151.40	-	161.00	S1	331.67	-	322.07
161.00	-	161.33	C2	322.07	-	321.74

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 148.0–162.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 147.0–148.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0–135.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 135.0–147.0 ft.

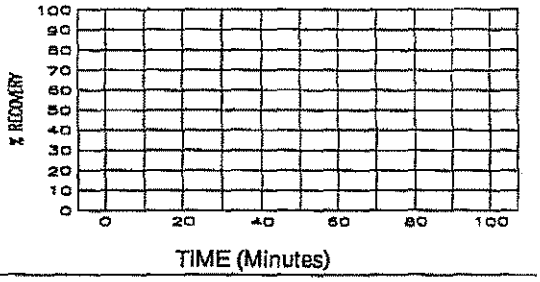
Concrete: 0.0–3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ116SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122519	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-116-55

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-291-3710

ADDRESS	CITY	STATE	ZIP CODE
1238 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

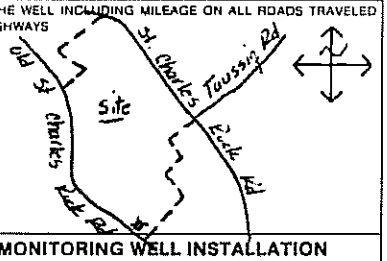
COUNTY ST. LOUIS
ELEVATION 493.07
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ LARGEST ¼ ____

SEC. ____ TWN. 47 N,RNG 5 (E) OR W

LAT. 38 ° 45 ' 44 " LONG. 90 ° 26 ' 40 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
484.07

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 5 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
OW1256WM	7-27-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
OW1256WM	7-27-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 484.07

LOCKING CAP - (Y) N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING Type: STEEL Size: 8"x5'x5' Bore Hole Diameter: 10¼"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 493.07 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-24' Silt
Depth to bottom of Protective Casing Seal:	30	
		24-28 Silt w/Sand
		28-30 Silt
		30-34 Sand
		34-61 Limestone
		61-65 Dolomite
Depth to Base of Annular Seal:	135.0	65-162 Limestone
Depth to Base of Bentonite Seal:	147.0	
Depth to Base of Secondary Filter Pack:	145.0	
Depth to Top of the Screen:	151.0	
Depth to Bottom of the Screen:	161.0	
Plug Back Total Depth		
Original Total Depth:	162.0	

PROTECTIVE CASING SEAL Type: (X) Concrete ( ) Cement Slurry
RISER PIPE Length: 153' Diameter: 3" Type of Material: SCH 80 PVC
BOREHOLE DIAMETER: 5⅞ In.
ANNULAR SEAL Type: ( ) Bentonite Slurry (X) Cement Slurry ( ) Non Slurry Bentonite
BENTONITE SEAL Type: (X) Bentonite Slurry ( ) Non Slurry Bentonite Length of Seal: 12 Ft.
SECONDARY FILTER PACK (Optional) Type: (X) Sand ( ) Manufactured Grain Size: #50 Length: 1'
PRIMARY FILTER PACK Type: (X) Sand ( ) Manufactured Grain Size: 16-35 Length: 14'
WELL SCREEN Length: 10' Slot Size: 0.010 Type: SCH 80 PVC
SUMP DETAILS Length: 0.3 Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: SAND

DISTRIBUTION: WHITE (RECORD) CANARY (MONITORING WELL CONTRACTOR) PINK (OWNER)

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068496.19
DATUM EASTING: 516972.30 ELEVATION 483.6

DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					10:56	14:05
DATE					DATE	DATE
CASING DEPTH					2/10/95	2/10/95

BORING NO. PZ-200-SS

SHEET 1 OF 2

DRILLING

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1							No sample 0.0-2.0 ft., due to gravel pad
(481.6) 2.0							
2	6 8 8 6	0.8'/2.0' (40%)			(2.0-8.1 ft.) Very stiff, dark yellowish brown (10YR 4/2), homogenous, CLAYEY SILT, NR, moist, (CL-ML). (LOESS)	SP (2)	
3							
4	3 8 12 15	1.3'/2.0' (65%)				SP (3)	
5							
6		2.3'/2.0' (115%)				SH (4)	
7							
8	6 8 10 13	2.0'/2.0' (100%)			(8.1-16.5 ft.) Stiff to very stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), homogenous, mottled CLAYEY SILT, NR, damp, (CL-ML). (LOESS)	SP (5)	
9							
10	3 7 11 13	1.7'/2.0' (85%)				SP (6)	
11							
12	8 6 7 8	1.9'/2.0' (95%)				SP (7)	
13							
14		2.3'/2.0' (115%)				SH (8)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/10/95

JOB NO.: 943-2848

FILENAME: PZ200SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D. Hollow Stem Auger	PZ-200-SS
		SHEET 2 OF 2
	SAMPLING METHOD:	
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
	WATER LEVEL	
	TIME: 10:56 / 14:05	
	DATE: 2/10/95 / 2/10/95	
	CASING DEPTH	
DATUM NORTHING: 1068496.19 EASTING: 516972.30 ELEVATION 483.6		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER DATE 2/10/95 CHK'D BY W. HERST

JOB NO.: 943-2848 FILENAME: PZ200SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	4 5 7 9	1.5' / 2.0' (75%)			(8.1-16.5 ft.) Stiff to very stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), homogenous, mottled CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SH (8)	
17					(16.5-19.7 ft.) Stiff, light olive gray (5Y 6/1) to moderate brown (5YR 4/4), homogenous, mottled CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP (9)	
18	3 5 15 18	1.5' / 2.0' (75%)				SP (10)	
19					(463.9) 19.7		
20	5 15 14 12	0.0' / 2.0' (0%)			(19.7-20.5 ft.) Compact, moderate yellowish brown (10YR 5/4), homogenous, fine SAND, trace Silt, NR, dry, (SM), (ALLUVIUM) (463.1) 20.5	SP (11)	
21					(20.5-25.5 ft.) Very stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), stratified, CLAYEY SILT, mottled with black manganese stains, NR, moist, (CL-ML), (ALLUVIUM)		
22	5 6 9 9	1.2' / 2.0' (60%)				SP (12)	
23							
24	8 14 26 28	1.4' / 2.0' (70%)			@ 24.3 ft., <1 inch fine sand lenses	SP (13)	
25					(458.1) 25.5		
26	14 33 40/4"	0.7' / 1.5' (54%)			(25.5-27.6 ft.) Dense, light brown (5YR 5/6), stratified, fine SAND, NR, dry, (SP), (ALLUVIUM)	SP (14)	
27					@ 27.3 ft., <1 inch clayey silt lenses (456.3) 27.3		2/10/95 - 14:05 Finish drilling at 27.3 ft. - hit bedrock
28					End of Soil Borehole Log at 27.3 ft. See PZ-200-SS Record of Drillhole for rock descriptions		End of soil borehole at 27.3 ft.
29							

RECORD OF DRILLHOLE PZ-200-SS

Sheet 1 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068496.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 516972.2
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 650, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-27.3 ft. See Soil Borehole Log PZ-200-SS														
18															
20															
22															
24															
26															2/10/95 @ 16:12 Start Run 1 16:16 Stop-no circulation, pull core, quit for the day at 16:30
			456.31												
28	27.3-44.5 ft. 27.30 Slightly weathered, medium bedded, light olive gray (5Y 6/1), medium crystalline, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, iron staining, calcite mineralization, 1 in. clay parting at 30.1 ft.		27.30	1	68%				J,C,R (3) J,I,R,calcite J,PL,R-CL J,PL-J,R J,PL,R (3) J,I,R J,PL,R (3) J,PL,R (2) J,I,R						2/11/95 Measure water level in augers, dry to 27.0 ft.
30			453.11						Core Loss						
			30.50						J,I,R J,PL,R-CL						2/11/95 @ 10:50
32				2	100 %				J,I,R (4) J,I,R (3)						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-SS

Sheet 2 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1058496.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 516972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	27.3-44.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), medium crystalline, weak, LIMESTONE, (ST. LOUIS FORMATION)								J,ST,R						
									J,I,R-calcite						
									J,PL,R-open						
									J,PL,R						
									J,I,R-open						
									J,I,R (4)						
34									J,C,R						
									J,PL,SM (2)						
									J,C,R-CL						
									J,C,R						
									J,I,R						
									J,PL,R						
									J,C,R-CL						
36				2	100 %										
									J,I,R,CL (2)						
									J,I,R-open						
38									J,I,R-CL (2)						
									J,I,R (2)						
									J,PL,R-open						
									J,PL,SM						
40			443.51 / 40.10						J,PL,R (2)						
									J,I,R-CL (2)						
									J,PL,SM-open						
									J,I,R (2)						
									J,I,R (3)						
42									J,I,R-CL-open (5)						
									J,I,R (2)						
44				3	100 %				J,PL,SM-open (3)						
	44.5-68.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
									J,PL,R-open						
									J,I,R (2)						
46									J,I,R						
									J,I,R-open						
									J,I,R (2)						
48									J,I,R-CL						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-SS

Sheet 3 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1058496.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 518972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	ROD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP w/t CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR SlW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R7 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	44.5-68.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			3	100%				J,I,R						
50	Argillaceous laminae, clay partings, stylolitic, brachiopod fossils		433.51 / 50.10												
52									J,PL,SM						
									J,PL,SM						
54									J,PL,SM						
				4	99%										
56									J,PL,SM						
									J,I,R						
									J,I,R						
58									J,I,R						
									J,I,R-CL (3)						
									J,I,R (2)						
									J,PL,SM-open						
									J,PL,SM-CL (3)						
60			423.51 / 60.10												
									J,PL,SM-CL (5)						
									J,PL,R						
									J,PL,R (2)						
									J,PL,SM-CL (2)						
62				5	85%										
									J,PL,R (2)						
									J,ST,R						
									J,PL,R						
64	Argillaceous laminae, clay partings, stylolitic, brachiopods								J,PL,SM						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068498.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 518972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
84	ROCK TYPE														
	44.5-68.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM-CL						
									J,PL,SM-CL						
86				5	85%				J,I,R-open (2)						
									J,PL,SM-CL						
									J,PL,R						
88															
	414.91		415.01												
	68.7-76.0 ft. 68.70 Slightly weathered, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)		68.60						J,I,R-intact						2/11/95 @ 16:30 Quit drilling for the day at 68.6 ft. after Run 5 2/12/95 @ 8:00 Begin coring Run 6
									J,I,R-intact						
70									J,I,R						
	Vuggy, fossiliferous								J,I,R-intact						
72									J,I,R-intact						
									J,PL,SM						
	73.0-74.0 ft. Medium crystalline, non-vuggy								J,I,R						
	Chert at 74.2-74.5 ft., fractured, solutionized immediately below			6	100 %				J,I,R						
74									J,I,R						
									J,I,R						
									J,I,R (2)						
									J,I,R						
	407.81								J,C,R-CL						
76	76.0-78.5 ft. 76.00 Fresh, thinly bedded, light olive gray (5Y 5/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R-intact						
									J,I,SM-CL						
78															
	78.5-86.0 ft. Fresh, thinly bedded, yellowish gray (5Y 7/2), medium crystalline, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		404.91 78.70												
				7	100 %				J,I,R-CL						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-SS

Sheet 5 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068486.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 518972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.5-86.0 ft. Fresh, thinly bedded, yellowish gray (5Y 7/2), medium crystalline, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)							90	J,I,R-CL						
								90	J,I,R						
								90	J,I,R						
								60	J,I,R-calcite						
82								90	J,I,R						
								70	J,I,R						
								80	J,I,R						
								90	J,I,R						
84				7	100 %			90	J,I,R-CL						
								90	J,I,R-CL						
86	86.0-92.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)							90	J,I,R-CL						
								90	J,I,R-CL-intact						
								70	J,PL,SM						
88								90	J,I,R-CL						
			394.81 / 88.70												
	Stylolitic, brecciated, glauconite infillings 89.0-90.2 ft. Moderately weathered							60	J,I,R-CL						
90								90	J,I,R						
								90	J,I,R-CL						
				8	100 %			90	J,PL,SM-CL (2)						
	391.61 / 92.00														
92	92.0-98.7 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)							90	J,PL,SM (2)						
			389.91 / 93.70												
94				9	100 %			90	J,I,R						
96															

2/13/95 @ 12:53
Measure water level at 54.3 ft. below ground surface
2/14/95 @ 8:02
Measure water level at 69.5 ft. below ground surface
2/14/95 @ 17:15
Measure water level at 70.42 ft. below ground surface

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-SS

Sheet 6 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068496.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 518972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 350, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	92.0-98.7 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)			9	100 %				J,I,R J,I,R-CL J,I,R J,I,R-CL J,PL,SM						
98	384.91		384.91												
	End of Record of Drillhole at 98.7 ft. 98.70		98.70												
100															
102															
104															
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

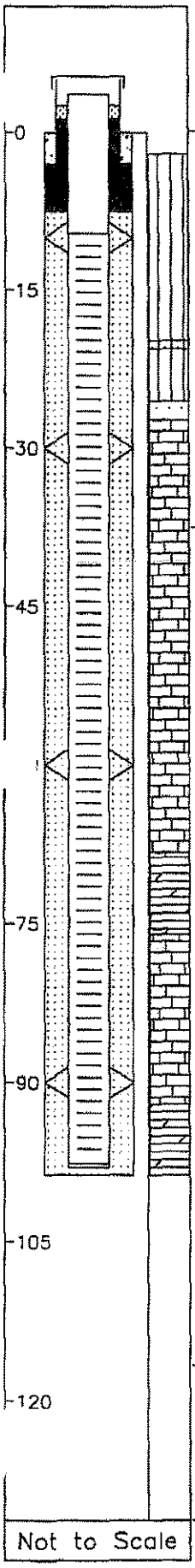
Well No. PZ-200-SS

Boring No. X-Ref: PZ-200-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1068496 ft.
Easting: 516972 ft.

Elevation Ground Level 483.6 ft. NGVD
Top of PVC Casing 485.63 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 98.7 ft.
Borehole Diameter 10 1/4 in. (0.0-27.5 ft.) 5 7/8 in. (27.5-98.3 ft.)
Casing Stickup Height 2.02 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/10/95	10:56	2/10/95	14:05
Schramm Rotary	2/28/95	7:30	2/28/95	9:30
Geophys.Logging:				
Casing:	2/28/95	9:45	2/28/95	10:10
Filter Placement:	2/28/95	10:30	2/28/95	11:30
Cementing:				
Development				
Bentonite Grout Bentonite Seal	2/28/95	11:30	2/28/95	11:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.02	-	9.62	C1	485.63	-	473.99
9.62	-	97.64	S1	473.99	-	385.97
97.64	-	97.97	C2	385.97	-	385.64

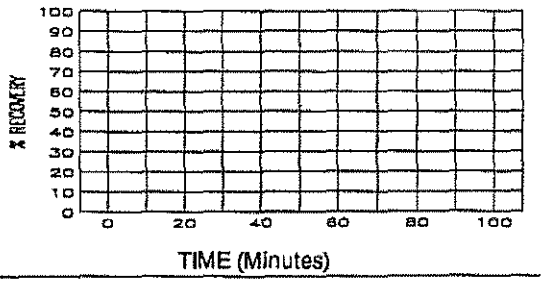
Casing: C1 2 in. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 7.5-98.7 ft.
Filter Pack:
Grout Seal:
Bentonite Seal: Medium Bentonite Chips, 3.0-7.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ200SS

561574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 115084	DATE RECEIVED
ROUTE	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	CROSS REFERENCE NO.
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER	
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-200-55	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC		TELEPHONE: 314-341-3710
ADDRESS: 1183 N. BROADWAY	CITY: ST. LOUIS	STATE: MO. ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL (SHOW LOCATION IN SECTION PLAT)

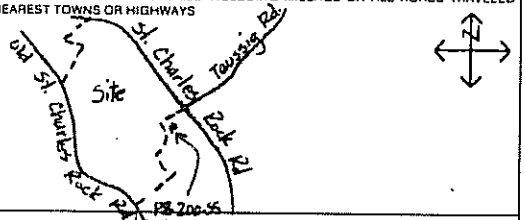
COUNTY: ST. LOUIS
ELEVATION: 493.61
AREA NO:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38 ° 46 ' 07 " LONG. 90 ° 26 ' 26 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS: ☐ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☐ YES, AT 4 TOTAL ☐ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 2-28-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256 WIA DATE: 4-11-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256 WIA DATE: 4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 495.63

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING Type: Size: Bore Hole Diameter:
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 493.61 Ft	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		0-27 Silt
Depth to bottom of Protective Casing Seal:	3	
Depth to Base of Annular Seal:	3	
Depth to Base of Bentonite Seal:	7.5	
Depth to Base of Secondary Filter Pack:		
Depth to Top of the Screen:	9.6	
		27-37 Sandstone
		37-68 Limestone
Depth to Bottom of the Screen:	47.6	68-76 Dolomite
		76-93 Limestone
Plug Back Total Depth:		73-75' Dolomite
Original Total Depth:	95.7	

PROTECTIVE CASING SEAL Type: ☒ Concrete ☐ Cement Slurry
RISER PIPE Length: 11.62' Diameter: 2" Type of Material: SCH80 PVC
BOREHOLE DIAMETER: 5 7/8 In.
ANNULAR SEAL Type: ☐ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite
BENTONITE SEAL Type: ☐ Bentonite Slurry ☒ Non Slurry Bentonite Length of Seal: 4.5 Ft.
SECONDARY FILTER PACK Type: ☐ Sand (Optional) ☐ Manufactured Grain Size: Length:
PRIMARY FILTER PACK Type: ☒ Sand ☐ Manufactured Grain Size: 16-35 Length: 91.2
WELL SCREEN Length: 10' Slot Size: 0.010" Type: SCH80 PVC
SUMP DETAILS Length: 0.3 Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: SAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE DIVISION CANARY: MONITORING WELL CONTRACTOR PINK: OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	4.25 inch I.D. Hollow Stem Auger		PZ-201-SS
			SHEET
	SAMPLING METHOD:		1 OF 3
LAIDLAW\RI-FS\MD	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
WEST LAKE LANDFILL	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START	FINISH
OPERABLE UNIT 2	WATER LEVEL	TIME	TIME
	TIME	8:30	10:30
	DATE	DATE	DATE
NORTHING: 1067819.55	CASING DEPTH	2/15/95	2/15/95
DATUM EASTING: 516862.06 ELEVATION 478.0			

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 3 3	2.0' 2.0' (100%)			(0.0-3.4 Ft.) Firm, dark yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP (1)	
2	2 2 4 5	1.3' 2.0' (65%)				SP (2)	
3							
4	1 2 3 3	2.0' 2.0' (100%)			(3.4-17.4 Ft.) Soft to firm, yellowish brown (10YR 6/2), CLAYEY SILT, trace fine Sand, little iron staining and black organic nodules, NR, moist, (CL-ML), (LOESS)	SP (3)	
5							
6	1 2 3 4	2.0' 2.0' (100%)				SP (4)	Air monitoring 9:00 20% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
7							
8	2 4 3 4	2.0' 2.0' (100%)				SP (5)	
9							
10	1 2 2 2	2.0' 2.0' (100%)				SP (6)	
11							
12	1 1 1 2	2.0' 2.0' (100%)				SP (7)	Air monitoring 9:15 20% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
13							
14	1 1 2 3	2.0' 2.0' (100%)				SP (8)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/15/95

JOB NO.: 943-2848

FILENAME: P720155

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	4.25 inch I.D. Hollow Stem Auger		PZ-201-SS
			SHEET 2 OF 3
	SAMPLING METHOD:		DRILLING
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		
	WATER LEVEL		TIME 8:30 / TIME 10:30
	TIME		
	DATE		DATE 2/15/95 / DATE 2/15/95
NORTHING: 1067819.55 DATUM EASTING: 516862.06 ELEVATION 478.0	CASING DEPTH		

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 5 6 7	1.3' / 2.0' (65%)			(3.4-17.4 Ft.) Soft to Firm, yellowish brown (10YR 6/2), CLAYEY SILT, trace fine Sand, little iron staining and black organic nodules, NR, moist, (CL-ML), (LOESS) @ 15.5-16.0 Ft., CLAYEY SILT becomes wet	SP 8	
17					(460.6) 17.4	SP 9	
18		0.5' / 2.0' (25%)			(17.4-20.5 Ft.) Compact, pale yellowish brown (10YR 5/4), fine SAND, little Silt, NR, damp, (SP), (ALLUVIUM)	SH 10	
19							
20	3 3 5 6	1.5' / 2.0' (75%)			(457.5) 20.5		
21					(20.5-30.0 Ft.) Firm to stiff, olive gray (5Y 4/1) to moderate yellowish brown (10YR 5/4), laminated CLAYEY SILT, NR, moist, (CL-ML), (LACUSTRINE)	SP 11	
22	3 5 6 7	1.2' / 2.0' (60%)				SP 12	
23							
24	3 5 7 8	1.7' / 2.0' (85%)			@ 23.7-24.0 Ft., medium dark gray (N4), SILTY fine sand layer, damp, (SM)	SP 13	
25					@ 24.8, 25.2, and 25.6 Ft., thin silty fine sand layers (<1 inch)		
26		1.8' / 2.0' (90%)				SH 14	
27							
28	13 50/3"	0.6' / 2.0' (30%)				SP 15	
29					@ 29.0 Ft., limestone rock encountered		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 2/15/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ201SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger					PZ-201-SS	
						SHEET	
	SAMPLING METHOD:					3 OF 3	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					8:30	10:30
	DATE					DATE	DATE
NORTHING: 1067819.55 DATUM EASTING: 516862.06 ELEVATION 478.0	CASING DEPTH					2/15/95	2/15/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
31	10 12 6 6	1.5' 2.0' (75%)			(30.0-30.7 ft.) Very stiff, medium gray (N4), CLAYEY SILT, some Fine Gravel, little Fine to coarse Sand, NR, moist, (CL-ML), (ALLUVIUM) (447.3) 30.7	SP	16	Air monitoring 10:30 20% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
32	50/5"	0.3' 1.0' (30%)			(30.7-32.0 ft.) Stiff, dark greenish gray (5G 4/1), SILTY CLAY, trace Fine sand, contains pieces of weathered limestone, NR-SR, damp, (CL), (ALLUVIUM)	SP	17	
33					(445.0) 33.0 End of Soil Borehole Log at 32.0 ft. See PZ-201-SS Record of Drillhole for rock descriptions			
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/15/95

JOB NO.: 943-2848

FILENAME: PZ201SS

RECORD OF DRILLHOLE PZ-201-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/15/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067819.55
AZIMUTH: 0

COLLAR ELEV: 481.05
E: 518582.08
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80, 60, 40, 20)	FRACTURES PER FOOT (2, 4, 6, 8, 10)	DISCONTINUITY DATA: DIP w/rt CORE AXIS (0, 30, 60, 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION
32	0.0-32.8 ft. See Soil Borehole Log PZ-201-SS	448.25						
	32.8-38.7 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1), medium crystalline, weak, CRYSTALLINE LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, calcite crystals (<1 cm.)	32.80	1	94%			90	J,PL,R,CL (2)
34		448.55						
		34.50					90	J,I,R
							90	J,I,R
							90	J,PL,SM-intact
36							90	J,I,R
							90	J,I,R,CL
							90	J,PL,SM,CL-intact
			2	100%			90	J,I,R,CL
							90	J,PL,S,CL
38							90	J,PL,SM,CL
							90	J,I,R,CL
							90	J,PL,SM,CL-intact
	38.7-49.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1) to greenish gray (5GY 6/1), fine crystalline, medium strong, CRYSTALLINE LIMESTONE, (ST. LOUIS FORMATION) Weathered, pyrite nodules (<2 mm.), stylolitic						90	J,I,R,CL (2)
		441.55					90	J,I,R,CL
		39.50					90	J,I,R
40							90	J,I,R,CL
							90	J,I,R
							90	J,I,R,CL
42							90	J,I,R,CL (3)
							90	J,P,SM,CL
							90	J,I,R,CL (2)
							90	J,P,SM,CL (2)
			3	100%			90	J,I,R,CL (3)
44							90	J,PL,SM,CL
							90	J,PL,SM,CL
							90	J,PL,SM,CL
							90	J,PL,SM,CL
							90	J,PL,SM,CL
							90	J,PL,SM,CL (2)
46							90	J,PL,SM,CL
							90	J,PL,SM,CL
							90	J,PL,SM,CL (3)
							90	J,PL,SM,CL (2)
							90	J,PL,SM,CL
48							90	J,PL,SM

WEATHERING INDEX: SW, FR, MW, HW, CW
STRENGTH INDEX: R6, R5, R4, R3, R2, R1
POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6
TEST ORIENTATION
NOTES WATER LEVELS INSTRUMENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-201-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/15/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067819.55
AZIMUTH: 0

COLLAR ELEV: 481.05
E: 516862.08
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	38.7-49.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1) to greenish gray (5GY 6/1), fine crystalline, medium strong, CRYSTALLINE LIMESTONE, (ST. LOUIS FORMATION) Weathered, pyrite nodules (<2 mm.), stylolitic								J,PL,SM,CL						
				3	100				J,PL,SM,CL						@ 49.5 ft. Drilling rate slows down
			431.55												
			49.50						J,I,R (2)						
50	49.5-59.5 ft. Fresh, medium bedded, olive gray (5Y 6/1), micro-crystalline, strong, CRYSTALLINE LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, stylolites								B,I,R						
	50.9-51.8 ft. Argillaceous Limestone @ 51.5 ft. Light olive gray (5Y 6/1), Clay seam (~1/2 in.)								J,P,R						
54	54.0-55.0 ft. Moderately silicified Limestone								B,I,R (3)						
				4	100				J,C-intact						
	55.0-55.1 ft. Light brown (5YR 5/6), chert zone								B,PL,R						
56									B,PL,SM						
									J,PL,SM,CL (2)						
									J,PL,SM,CL (2)						
58									J,I,R						
	@ 58.4 ft. Light brown (5G 6/1), Clay seam (~1/2 in.)								J,P,R						
			421.55												
	59.5-69.5 ft. Fresh, medium to thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, medium grained calcite crystals		59.50												2/15/95 @ 16:00 Stop drilling 2/20/95 @ 8:30 Begin drilling @ 59.5 ft.
60									J,I,VR						
									J,I,VR (3)						
				5	100				J,I,R (3)						
62									J,I,R						
									J,I,R (2)						
									J,I,R (2)						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-201-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/15/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067819.55
AZIMUTH: 0

COLLAR ELEV: 481.05
E: 516882.06
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	59.5-69.5 ft. Fresh, medium to thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, medium grained calcite crystals														
66				5	100 %										
68									J,I,R,CL,Fe						
			411.55												
70	69.5-89.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common		69.50						J,I,R,Fe						
									J,I,R						
72									J,I,R						
									J,I,R						
74									J,I,R						
	@ 75.0 and 76.5 ft. Medium bluish gray (5B 5/1), glauconite zones (less than 1 in.) 75.2-75.6 ft. Medium bluish gray (5B 5/1), chert layer 75.6-77.1 ft. Argillaceous, moderately porous, some open vugs (<2 mm.)			6	100 %				J,U,K,CL						
									B,U,K,CL						
									J,U,SM						
76									B,I,R,CL						
78	78.0-79.5 ft. Moderate to highly weathered fractures								J,I,R						
									J,I,R						
									J,I,R						
			401.55												
			79.50	7	96%				J,I,R						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-201-SS

Sheet 4 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/15/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087819.55
AZIMUTH: 0

COLLAR ELEV: 481.05
E: 516852.06
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	69.5-89.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common 81.3-81.4 ft. Medium dark gray (N4), Claystone laminae @ 81.6 ft. Becoming intermittently siliceous (zones <1 in. thick), some pyritized fractures/vugs								J,U,R,Fe						@ 80.7 ft. Core loss
									J,I,R						
									J,PL,SM						
									J,I,R						
82									J,I,K						
									J,I,R						
				7	96%										
84									J,I,R						
									J,I,R						
									J,I,R						
									J,I,R						
86	@ 85.5 and 86.5 ft. Thin zones of glauconite in fractures								J,I,R,CL						
									J,I,R,CL						
			393.55 87.50												
									J,I,R						
88									J,I,R						
				8	85%										
									J,I,R,CL						
	391.55		391.55												
	End of Record of Drillhole at 89.5 ft. 89.50		89.50												
90															
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/2/95

Golder Associates

Well No. PZ-201-SS

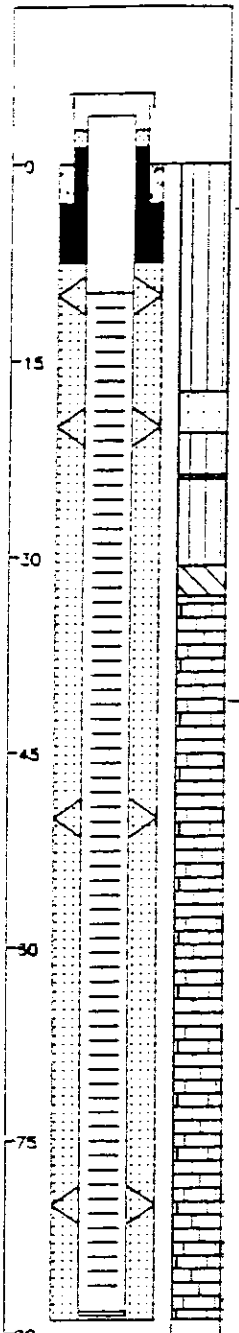
Boring No. X-Ref: PZ-201-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067820 ft. Easting: 516862 ft.

Elevation Ground Level 478.0 ft. NGVD

Top of PVC Casing 480.33 ft. NGVD



Drilling Summary:

Total Depth 89.0 ft.

Borehole Diameter 6 1/4 in. (0.0–33.3 ft.) 5 7/8 in. (33.0–39.0 ft.)

Casing Stickup Height 2.32 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portacrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/15/95	8:30	2/15/95	10:30
Schramm Rotary	3/6/95	15:30	3/6/95	16:00
Geophys.Logging:				
Casing:	3/6/95	16:00	3/6/95	16:15
Filter Placement:	3/6/95	16:00	3/6/95	17:40
Cementing:				
Development				
Bentonite Grout Bentonite Seal	3/6/95	17:40	3/6/95	17:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.32	-	9.75	C1	480.33	-	468.28
9.75	-	88.31	S1	468.26	-	389.70
88.31	-	88.64	C2	389.70	-	389.37
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 7.5-89.0 ft.

Filter Pack:

Grout Seal:

Bentonite Seal: Medium Bentonite Chips, 3.0-7.5 ft.

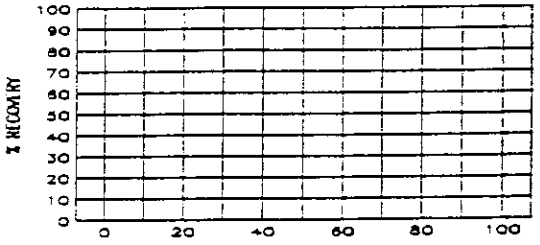
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ201SS

Source: Golder A-

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY		DATE RECEIVED	
REF. NO.	15085	CHECK NO.	
ROUTE		TRANSMITTAL NO.	
STATE WELL NUMBER		CROSS REFERENCE NO.	
CHECKED BY		ENTERED Ph 1 Ph 2 Ph 3	
APPROVED BY		DATE APPROVED	

INFORMATION SUPPLIED BY OWNER

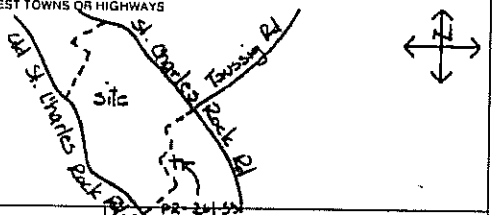
SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ - 201 - SS
SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO.
ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC
TELEPHONE: 314-241-3710
ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO.
ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

COUNTY: ST. LOUIS
ELEVATION: 478.0
AREA NO.:
SMALLEST ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38 ° 45 ' 54 " LONG. 90 ° 26 ' 27 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 481.05
Ground Surface Elevation: 478.01 Ft.

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10.25"

WEEP HOLE - Y / N (Circle one)

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-17.5 Silt
Depth to bottom of Protective Casing Seal:	3	
Depth to Base of Annular Seal:	3	
Depth to Base of Bentonite Seal:	7.5	
Depth to Base of Secondary Filter Pack:		
Depth to Top of the Screen:	9.75	
		17.5-21 Sandstone
		21-31 Silt
		31-33.5 Clay
		33.5-89.5 Limestone
Depth to Bottom of the Screen:	88.25	
Plug Back Total Depth		
Original Total Depth:	91.5	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 12.74
Diameter: 2
Type of Material: SCHED PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [ ] Bentonite Slurry [X] Non Slurry Bentonite
Length of Seal: 4.5 Ft.

SECONDARY FILTER PACK
Type: [ ] Sand [ ] Manufactured (Optional)
Grain Size:
Length:

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 82'

WELL SCREEN
Length: 78.5'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
[ ] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 3 TOTAL
[ ] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P. Vogl
PERMIT NUMBER 001256WIM
DATE 4-11-95

SIGNATURE (DRILLING CONTRACTOR)
Michael P. Vogl
PERMIT NUMBER 001256WIM
DATE 4-11-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE: DIVISION CANARY: MONITORING WELL CONTRACTOR PINK: OWNER

RECORD OF DRILLHOLE PZ-201A-SS

Sheet 1 of 1

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/22/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1067831.8
AZIMUTH: 0

COLLAR ELEV: 478.4
E: 516846.4
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, SW HW, HW CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): HT, R2 30, R3 150, R4 300, R5 600, R6 1500	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	0.0-80.0 ft. 398.20 See Soil Borehole Log PZ-201-SS 80.20 80.0-80.2 ft. Slightly weathered, thinly laminated, dark greenish gray (5GY 4/1), very fine grained, extremely weak, SILTSTONE, (ST. LOUIS FORMATION)		398.40 80.00						B,U,SM-CL						3/22/95 6 1/4 in. ID hollow stem auger advanced to 31.0 ft. then advanced borehole to 80.0 ft. with 5 7/8 in. air rotary bit
82	80.2-88.3 ft. Fresh, thickly bedded, light brownish gray (5YR 6/1), microcrystalline, weak, LIMESTONE, (ST. LOUIS FORMATION)								J,U,VR,CL J,I,VR,CL,Fe J,C,R,CL J,ST,R,CL J,ST,R,CL						4/22/95 @ 13:45 Began coring
84									J,I,R J,ST,R						
				1	97%										
86									J,I,R						
88	88.3-90.0 ft. 88.30 Fresh, thickly bedded, dark yellowish orange (10YR 6/6) grading to moderate yellowish brown (10YR 5/2), very fine grained, extremely weak to very weak, SILTSTONE, (ST. LOUIS FORMATION)		390.10						J,U,ST,CL (3)						
90	Grades stronger with depth 90.00 End of Record of Drillhole at 90.0 ft.		388.40 90.00						B,I,R						4/22/95 @ 16:30 Ended coring
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

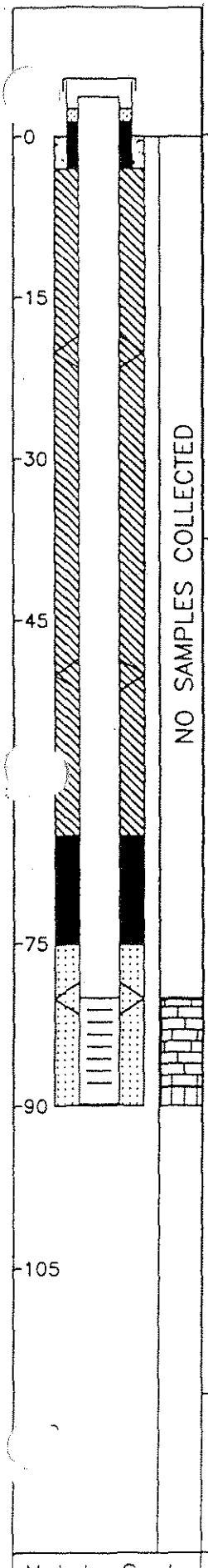
LOGGED: B. TILTON
CHECKED: B. TILTON
DATE: 5/16/95

Golder Associates

Well No. PZ-201A-SS

Boring No. X-Ref: PZ-201A-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067832 ft. Easting: 516746 ft.

Elevation Ground Level 478.4 ft. NGVD

Top of PVC Casing 480.16 ft. NGVD

Drilling Summary:

Total Depth 90.0 ft.

Borehole Diameter 10 1/4 in. (0.0–33.0 ft.) 5 7/8 in. (33.0–90.0 ft.)

Casing Stickup Height 1.81 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	4/22/95	11:00	4/23/95	7:45
Geophys.Logging:				
Casing:	4/23/95	7:50	4/22/95	8:00
Filter Placement:	4/23/95	8:00	4/23/95	9:10
Cementing:				
Development				
Bentonite Grout	4/23/95	9:20	4/23/95	11:00
Bentonite Seal	4/23/95	9:00	4/23/95	9:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.81	-	80.00	C1	480.16	-	398.35
80.00	-	89.80	S1	398.35	-	388.55
89.80	-	90.13	C2	388.55	-	388.22
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 75.1-90.0 ft.

Filter Pack:

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-65.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 65.0-75.1 ft.

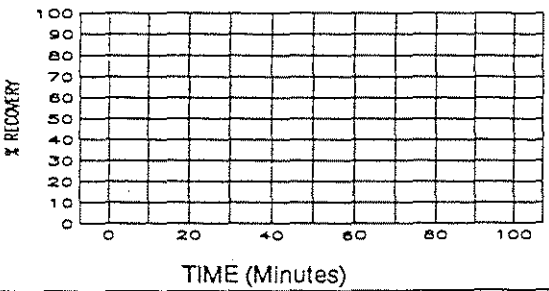
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by D. Alloway

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ201ASS

AL 1574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122484	DATE RECEIVED
ROUTE	CHECK NO
STATE WELL NUMBER	TRANSMITTAL NO
CHECKED BY	CROSS REFERENCE NO
APPROVED BY	ENTERED Pn 1 Pn 2 Pn 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-201-A-SS
SITE ADDRESS: St. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: Mo. ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
ADDRESS: 1638 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

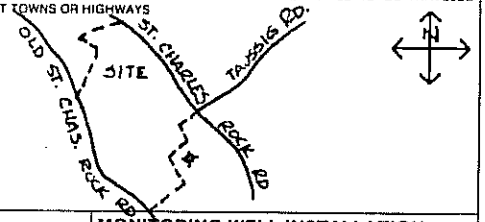
COUNTY: St. Louis
ELEVATION: 472.4
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38 ° 45 ' 58 " LONG. 90 ° 26 ' 28 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☐ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6.25" HSA, NX CORE
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-23-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P. Vogl
PERMIT NUMBER 001256WM DATE 6-02-95

SIGNATURE (DRILLING CONTRACTOR)
Michael P. Vogl
PERMIT NUMBER 001256WM DATE 6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 472.5

Ground Surface Elevation: 472.4 Ft.

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-18' Silt
Depth to bottom of Protective Casing Seal:	3.0	
		18'-21' Sand
		21'-23.5' Silt
		23.5'-24' Sand
Depth to Base of Annular Seal:	65.0	24'-33' Silt
Depth to Base of Bentonite Seal:	75.1	33'-34' clay
Depth to Base of Secondary Filter Pack:		34'-40' Limestone
Depth to Top of the Screen:	79.7	
Depth to Bottom of the Screen:	89.7	
Plug Back Total Depth	N/A	
Original Total Depth:	90'	

LOCKING CAP - (Y) / N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING Type: STEEL Size: 5"x5'x5' Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)
PROTECTIVE CASING SEAL Type: ☒ Concrete ☐ Cement Slurry
RISER PIPE Length: 81.8' Diameter: 2" Type of Material: SCH. 80 PVC
BOREHOLE DIAMETER: 5 7/8 in.
ANNULAR SEAL Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite
BENTONITE SEAL Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite Length of Seal: 9.9 Ft.
SECONDARY FILTER PACK Type: ☐ Sand (Optional) ☐ Manufactured Grain Size: ____ Length: ____
PRIMARY FILTER PACK Type: ☒ Sand ☐ Manufactured Grain Size: 16/35 Length: 14.9'
WELL SCREEN Length: 10' Slot Size: 0.010" Type: SCH. 80 PVC
SUMP DETAILS Length: 0.3 Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: BAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	6.25 inch I.D. Hollow Stem Auger
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-202-SS
SHEET	1 OF 3
DRILLING	START TIME: 07:50 DATE: 2/26/95 — FINISH TIME: 09:45 DATE: 2/26/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
NORTHING: 1067320.25 DATUM EASTING: 517101.58 ELEVATION 479.0	
DRILL RIG	CME 75 - TRUCK MOUNT
SURFACE CONDITIONS	
ANGLE / BEARING	
SAMPLE HAMMER	

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	1 2 2 3	1.6' / 2.0' (80%)			(0.0-4.6 Ft.) Firm, dark yellowish brown (10YR 4/2), homogenous, CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP 1	
2	6 2 2 4	1.4' / 2.0' (70%)				SP 2	
3					@ 3.4 Ft., color changes to dusky yellowish brown (10YR 2/2)		
4	1 3	1.6' / 2.0' (80%)			(474.4) 4.6	SP 3	
5	6 7				(4.6-8.3 Ft.) Stiff, mottled light olive gray (5Y 5/2) and olive gray (5Y 4/1), CLAY, little Silt, trace Gravel, NR, moist, (CL), (LOESS)		
6		0.0' / 2.0' (0%)				SH 4	
7							
8	1	1.7' / 2.0' (85%)			(470.7) 8.3		
9	2 4 4				(8.3-19.1 Ft.) Soft to firm, light olive gray (5Y 6/1), SILTY CLAY, iron stained, NR, moist, (CL-ML), (LOESS)	SP 5	
10	2 4 4	1.6' / 2.0' (80%)				SP 6	
11							
12	2 2 4	1.1' / 2.0' (55%)				SP 7	
13	6				@ 13.5 Ft., becoming increasingly iron stained		
14	weight of hammer for 12"	1.5' / 2.0' (75%)			@ 14.0 Ft., becoming wet, very soft	SP 8	

LOGGED BY M. HIRT

DATE 2/26/95 CHK'D BY V. HERST

JOB NO.: 943-2848

FILENAME: PZ202SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
	6.25 inch I.D. Hollow Stem Auger					PZ-202-SS	
						SHEET	
	SAMPLING METHOD:					2 OF 3	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					07:50	09:45
	DATE					DATE	DATE
NORTHING: 1067320.25 DATUM EASTING: 517101.58 ELEVATION 479.0	CASING DEPTH					2/26/95	2/26/95
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS						
ANGLE BEARING							
SAMPLE HAMMER							

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	weight of hammer for 18"	1.4'/2.0' (70%)			(8.3-19.1 Ft.) Soft to firm, light olive gray (5Y 6/1), SILTY CLAY, iron stained, NR, moist, (CL-ML), (LOESS)	SP (8)	
17	1					SP (9)	
18	weight of hammer for 6"	2.0'/2.0' (100%)				SP (10)	
19	2 3 5				(19.1-19.4 Ft.) Firm, light olive gray (5Y 5/2), SILTY CLAY, NR, moist, (CL-ML), (LOESS)		
20	2 3	1.4'/2.0' (70%)			(19.4-21.9 Ft.) Firm, olive gray (5Y 4/1), SILTY CLAY, iron stained, NR, moist, (CL-ML), (LOESS)	SP (11)	
21	5 6						
22	1 3	0.4'/2.0' (20%)			(21.9-24.5 Ft.) Loose, olive gray (5Y 4/1), fine SANDY SILT, NR, damp, (ML), (LOESS)	SP (12)	
23	4 5						
24	1 5	1.5'/2.0' (75%)			(24.5-25.0 Ft.) Firm, olive gray (5Y 4/1), laminated, SILTY CLAY, NR, damp, (CL-ML), (LOESS) (454.0) 25.0	SP (13)	
25	9 12				(25.0-29.5 Ft.) Compact, olive gray (5Y 4/1), laminated, fine SANDY SILT, NR, dry, (SM), (ALLUVIUM)		
26	2 8	0.1'/2.0' (5%)			@ 25.5 ft., becoming moist	SP (14)	
27	9 9						
28	5 7	1.5'/2.0' (75%)				SP (15)	
29	6 9				(29.5-30.8 Ft.) Compact, olive gray (5Y 4/1), fine SAND interbedded with SILT, NR, moist, (SM), (ALLUVIUM)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT

DATE 2/26/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ202SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-202-SS
			SHEET
	SAMPLING METHOD:		3 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		START / FINISH
	WATER LEVEL		TIME / TIME
	TIME		07:50 / 09:45
	DATE		DATE / DATE
NORTHING: 1067320.25 DATUM EASTING: 517101.58 ELEVATION 479.0	CASING DEPTH		2/26/95 / 2/26/95

DRILL RIG CME 75 - TRUCK MOUNT — SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL		SAMPLER TYPE		REMARKS
31	2 50/2"	0.8" 0.8" (100%)			(29.5-30.8 ft.) Compact, olive gray (5Y 4/1), Fine SAND interbedded with SILT, NR, moist, (SM), (ALLUVIUM)	(448.2) 30.8	SP 16		Split spoon and auger refusal at 30.8 ft.
32					End of Soil Borehole Log at 30.8 ft.				
33					See PZ-202-SS Record of Drillhole for rock descriptions				
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT CHK'D BY W. HERST

DATE 2/26/95

JOB NO.: 943-2848

FILENAME: PZ202SS

RECORD OF DRILLHOLE PZ-202-SS

Sheet 1 of 5

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/26/95 - 2/27/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087320.2
AZIMUTH: 0

COLLAR ELEV: 479.01
E: 517101.8
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (Feet)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (60 50 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R5 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-30.8 ft. See Soil Borehole Log PZ-202-SS														
18															
20															
22															
24															
26															
28															
30	30.8-44.1 ft. 448.21 Slightly weathered, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 30.80 31.4 and 31.9 ft. iron stained clay infilling		448.21 30.80	1	63%				Broken Zone						Some sand in return water; driller says material seems to be very rubbly
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-202-SS

Sheet 2 of 5

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95 - 2/27/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067320.2
AZIMUTH: 0

COLLAR ELEV: 478.01
E: 517101.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	ROCK TYPE 30.8-44.1 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 33.4-34.7 ft. Limestone becomes moderately weathered, grayish orange (10YR 7/4) with dark yellowish orange (10YR 6/6) staining and cross bedded								J,I,R (2) J,U,R J,U,R		SW FR HW MW FW CW	R5 R4 R3 R2 R1	R5 R4 R3 R2 R1 FT 30 150 300 600 1500		
34									J,PL,SM J,PL,SM J,U,R						
36				1	63%				Core Loss						35.6 ft. Drilling is slow due to rubbly conditions 37.0 ft. Water pump keeps shutting down, driller reports that bit is getting plugged off
			441.41 37.60												
38									J,C,SM J,C,SM J,I,R						
40				2	82%				J,C,SM (2) J,PL,SM J,I,R J,I,R,Fe J,C,SM (3) J,C,SM J,I,SM J,C,SM (2)						
42									J,I,SM (3) Core Loss						
44			434.91 44.10												
	44.1-59.1 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) 45.1-46.1 ft. Large pyrite crystals Some calcite crystals								J,I,R (4) J,I,R J,C,R						
46				3	96%				J,U,SM,CL J,I,SM J,I,SM,CL J,I,SM,CL J,I,SM J,C,SM J,PL,SM J,PL,SM,CL J,I,R J,I,SM,CL (2) J,I,SM (2)						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-202-SS

Sheet 3 of 5

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95 - 2/27/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067320.2
AZIMUTH: 0

COLLAR ELEV: 479.01
E: 517101.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	44.1-59.1 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)			3	96%				J,I,SM J,I,SM J,PL,SM,CL						
			429.91 49.10												
	49.4-49.8 ft. Medium to coarse grained								J,I,R,CL J,C,SM,CL J,I,R						
50									J,I,R J,I,SM J,I,R J,C,R						
	51.0 ft. Iron stained nodules 51.0-51.6 ft. 0° healed fractures 51.6-52.4 ft. Slightly weathered, arenaceous, thinly laminated														
52									J,PL,R,CL						
	52.9-53.9 ft. 0° healed fracture														
54				4	99%				J,I,R						
	55.3-56.6 ft. Medium to coarse grained 55.9 ft. Chert filled vein								J,PL,R (2)						
56									J,PL,R						
									J,I,SM,CL						
58									J,I,SM,CL J,I,SM J,I,R,CL						
			419.91 59.10												
	59.1-67.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 60.3-61.3 ft. Stylolitic								J,I,R (4)						
60															
				5	100%				J,I,R J,I,SM J,I,SM (2)						
62									J,I,R J,I,R						
									J,I,SM,CL J,I,R J,I,R						
64	63.8-64.3 ft. 20° healed fracture														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-202-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95 - 2/27/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067320.2
AZIMUTH: 0

COLLAR ELEV: 479.01
E: 517101.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	59.1-67.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 64.5-65.1 ft. Silty interbeds 64.3-66.4 ft. Fine to medium grained								J,I,R						
66				5	100%				J,PL,SM (3)						
			412.01 67.00												
	67.0-69.7 ft. Fresh thickly bedded, light olive gray (5Y 6/1) to greenish gray (5GY 6/1), medium grained, medium strong, DOLOMITE (ST. LOUIS FORMATION)								J,PL,SM (3)						
68	69.0-69.2 ft. Becomes slightly weathered, dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4)								J,I,SM						
			409.91 69.10												
	67.6-67.8 ft. Clay infilling 69.7-78.9 ft. Moderately weathered, medium bedded, dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4), m-c grained, medium strong, ARGILLACEOUS DOLOMITE, (ST. LOUIS FORMATION)														
70				6	94%										
72									J,I,R (3)						
	72.5-76.1 ft. Vuggy, moderately to highly weathered, some calcite crystals								J,I,R J,I,R J,I,R						
74			404.91 74.10						Core Loss						
									J,I,R (2)						
									J,I,R (4)						
76				7	87%				J,I,R						
	76.9-77.2 ft. Chert 77.3-77.4 ft. Highly weathered 78.0-78.1 ft. Highly weathered								J,I,R,CL J,I,R J,PL,R,CL J,I,R						
78			400.91 78.10												
			400.31 78.70						Core Loss J,C,R,CL						
	78.9-89.2 ft. Fresh, medium bedded, yellowish gray (5Y 7/2), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			8	100%				J,U,SM J,I,SM						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-202-SS

Sheet 5 of 5

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/26/95 - 2/27/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067320.2
AZIMUTH: 0

COLLAR ELEV: 479.01
E: 517101.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.9-89.2 ft. Fresh, medium bedded, yellowish gray (5Y 7/2), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM J,PL,SM						
82	82.1-82.2 ft. Porous/vuggy								J,I,SM,CL						
	83.6 ft. 1" thick clay infilling								J,I,R,CL						
84	83.7-84.3 ft. Micrycrystalline			8	100 %				J,I,R (3)						
	85.0-85.2 ft. Moderately weathered between joints 85.6-87.1 ft. Pyrite crystals								J,I,R (2)						
86	85.7-86.4 ft. Slightly weathered, some cross bedding								J,I,SM (2) J,I,SM						
									J,PL,SM J,U,R J,I,R						
88	88.4-88.9 ft. Coarse grained		390.31												
	89.0-89.2 ft. Moderately weathered 389.81		88.70						J,PL,SM						
	89.2-89.9 ft. 89.20 Moderately weathered, thinly laminated, medium dark gray (N4), very fine grained, 389.11 89.90 extremely weak rock, SILTSTONE, with claystone interbeds, (ST. LOUIS FORMATION)														
90				9	97%				J,I,SM,CL						
	89.9-92.0 ft. Fresh, thickly laminated to medium bedded, medium gray (N5), fine grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION) 387.01		387.01												
92	End of Record of Drillhole at 92.0 ft. 92.00		92.00												
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

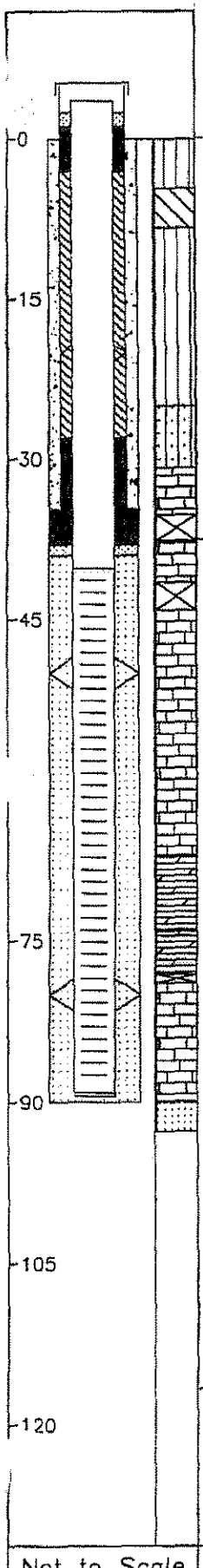
LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

Well No. PZ-202-SS

Boring No. X-Ref: PZ-202-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067320 ft. Easting: 517102 ft.

Elevation Ground Level 479.0 ft. NGVD

Top of PVC Casing 481.17 ft. NGVD

Drilling Summary:

Total Depth 90.0 ft.

Borehole Diameter 10 1/4 in. (0.0-33.5 ft.) 5 7/8 in. (33.5-90.0 ft.)

Casing Stickup Height 2.16 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/26/95	7:50	2/27/95	11:05
Schramm Rotary	3/11/95	10:30	3/12/95	8:00
Geophys.Logging:				
Casing:				
2" PVC	3/12/95	8:10	3/12/95	8:30
6" Steel	3/11/95	14:15	3/11/95	14:30
Filter Placement:	3/12/95	8:35	3/12/95	9:10
Cementing:				
Development				
Bentonite Grout	3/12/95	9:35	3/12/95	10:30
Bentonite Seal	3/12/95	9:20	3/12/95	9:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.16	-	40.20	C1	481.17	-	438.81
40.20	-	89.10	S1	438.81	-	389.91
89.10	-	89.43	C2	389.91	-	389.58
+ 1.00	-	34.00	C3	480.00	-	445.01
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 39.0-90.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 38.0-39.0ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-28.0 ft., Neat cement, 3.0-34.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 28.0-38.0 ft.

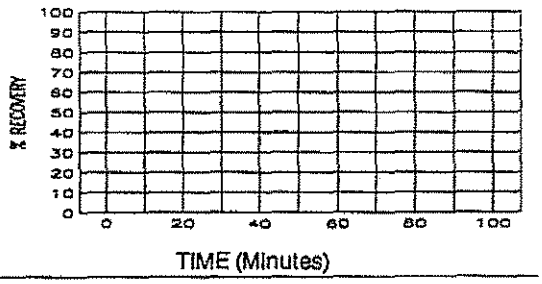
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ202SS

601574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115089	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-302-SS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK ROAD	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1834 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

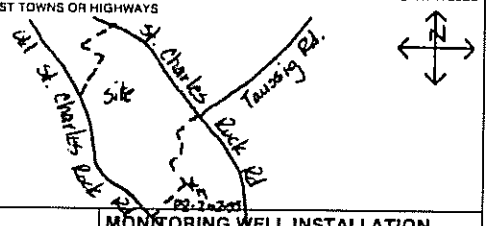
COUNTY ST. LOUIS
ELEVATION 474.0
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

LAT. 38 ° 45 ' 54 " LONG. 90 ° 26 ' 24 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 481.8

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING Type: STEEL Size: 8" x 6" x 5' Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 474.0 Ft	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column:	0-3	Silt
Depth to bottom of Protective Casing Seal:	3	
	3-22	Clay
	22-32	Silt
Depth to Base of Annular Seal:	38.0	
	32-67	Limestone
Depth to Base of Bentonite Seal:	38.0	
Depth to Base of Secondary Filter Pack:	39.0	
Depth to Top of the Screen:	40.2	
	67-78	Dolomite
Depth to Bottom of the Screen:	90.2	78-90.2 Limestone
Plug Back Total Depth		
Original Total Depth:	90.2	

PROTECTIVE CASING SEAL Type: Concrete / Cement Slurry
RISER PIPE Length: 43' Diameter: 2 Type of Material: SCHED PVC
BOREHOLE DIAMETER: 5 7/8 In.
ANNULAR SEAL Type: Bentonite Slurry / Cement Slurry / Non Slurry Bentonite
BENTONITE SEAL Type: Bentonite Slurry / Non Slurry Bentonite Length of Seal: 10' Ft.
SECONDARY FILTER PACK Type: Sand (Optional) / Manufactured Grain Size: SILICA Length: 1'
PRIMARY FILTER PACK Type: Sand / Manufactured Grain Size: 16-35 Length: 51.2'
WELL SCREEN Length: 50' Slot Size: 0.010" Type: SCHED PVC
SUMP DETAILS Length: 0.3 FT. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: CUTTINGS

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☐ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-12-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael J. Vogt

PERMIT NUMBER	DATE
OU1256 WM	4-11-95

SIGNATURE (DRILLING CONTRACTOR) Michael J. Vogt

PERMIT NUMBER	DATE
OU1256 WM	4-11-95

MO 780-1419 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-203-SS
			SHEET
	SAMPLING METHOD:		1 OF 3
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
		START	FINISH
	WATER LEVEL	TIME	TIME
	TIME	15:00	18:00
	DATE	DATE	DATE
NORTHING: 1066661.50 DATUM EASTING: 516607.70 ELEVATION 484.2	CASING DEPTH	5/25/95	5/25/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE -90 BEARING NA	
SAMPLE HAMMER 140 lb. - Falling 30 inches	

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1					(0.0-4.2 ft.) Soft, dark yellowish brown (10YR 4/2), fine sandy SILT, moist, (ML), (LOESS)		
2	1 2 2	1.3' / 2.0' (65%)				SP (1)	
3	2						
4	1	0.8' / 2.0' (40%)			(480.0) 4.2		
	2 3 3				(4.2-16.2 ft.) Firm, moderate yellowish brown (10YR 5/2) to light gray (N7), silty CLAY, moist, (CL), (ALLUVIUM)	SP (2)	
5							
6	1 3 3	2.0' / 2.0' (100%)				SP (3)	
7	5						
8	1 3 3	1.7' / 2.0' (85%)				SP (4)	
9	6						
10	2 4 3	2.0' / 2.0' (100%)			@ 10.4-16.0 ft., wet	SP (5)	
11	5						
12	0 1 2	1.5' / 2.0' (75%)				SP (6)	
13	3						
14	1 1 2	2.0' / 2.0' (100%)				SP (7)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY CHK'D BY W. HERST

DATE 6/20/95

JOB NO.: 943-2848

FILENAME: PZ203SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-203-SS
			SHEET
	SAMPLING METHOD:		2 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
			START / FINISH
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	WATER LEVEL		TIME 15:00 / TIME 18:00
	TIME		
	DATE		DATE 5/25/95 / DATE 5/25/95
NORTHING: 1066661.50 DATUM EASTING: 516607.70 ELEVATION 484.2	CASING DEPTH		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS		
ANGLE -90 BEARING NA			
SAMPLE HAMMER 140 lb. - Falling 30 inches			

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	0 0 3 4	1.2' / 2.0' (60%)			(4.2-16.2 ft.) Firm, moderate yellowish brown (10YR 5/2) to light gray (N7), silty CLAY, moist, (CL), (ALLUVIUM) (468.0) 16.2	SP 7	
17					(16.2-26.4 Ft.) Soft to Firm, medium yellowish brown (10YR 5/2) and light gray (N7), clayey SILT, trace Fine Sand, moist, (ML), (LOESS)	SP 8	
18	2 2 5 6	1.6' / 2.0' (80%)					
19						SP 9	
20	4 3 5 6	2.0' / 2.0' (100%)					
21						SP 10	
22	1 2 5 6	0.9' / 2.0' (45%)			@ 22.0-25.8 ft., color changes to medium yellowish brown (10YR 5/2)		
23						SP 11	
24	3 4 4 5	1.8' / 2.0' (90%)					
25						SP 12	
26	1 4 6 9	1.4' / 2.0' (70%)			@ 25.8-26.4 ft., color is medium gray (N5) (457.8) 26.4		
27					(26.4-41.2 Ft.) Loose to very dense, medium gray (N5), fine SAND, trace Silt, saturated, (SP), (ALLUVIUM)	SP 13	
28	3 4 5 7	1.4' / 2.0' (70%)					
29					@ 29.0-41.2 ft., occasional beds of SILT interbedded	SP 14	

LOGGED BY D. ALLOWAY CHK'D BY V. HERST

DATE 6/20/95

JOB NO.: 943-2848

FILENAME: PZ203SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:						BORING NO.	
	6.25 inch I.D. Hollow Stem Auger						PZ-203-SS	
							SHEET	
	SAMPLING METHOD:						3 OF 3	
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)						DRILLING	
							START	FINISH
	WATER LEVEL						TIME	TIME
	TIME						15:00	18:00
	DATE						DATE	DATE
NORTHING: 1066661.50 DATUM EASTING: 516607.70 ELEVATION 484.2	CASING DEPTH						5/25/95	5/25/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE -90 BEARING NA	
SAMPLE HAMMER 140 lb. - falling 30 inches	

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	5 6 7 12	1.5'/2.0' (75%)			@ 29.0-41.2 Ft., occasional beds of SILT interbedded	SP (15)	
32	4 5 12	1.7'/2.0' (85%)				SP (16)	
33	10						
34	1 4 5	1.6'/2.0' (80%)				SP (17)	
35	10						
36	4 7	0.8'/2.0' (40%)			@ 36.0-41.2 Ft., includes little medium sand	SP (18)	
37	11 13						
38	5 10	1.6'/2.0' (80%)				SP (19)	
39	25 50						
40	15 30	1.9'/1.9' (100%)				SP (20)	
41	30 50				(443.0) 41.2		
					(41.2-42.0 Ft.) Hard, medium gray (N5) and dark reddish brown (10R 3/4), mottled, SILT, (ML), (ALLUVIUM) (442.2) 42.0		
42					End of Soil Borehole Log at 42.0 Ft.		
43					See Record of Drillhole PZ-203-SS for rock descriptions		
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. ALLOWAY CHK'D BY W. HERST

DATE 6/20/95

JOB NO.: 943-2848

FILENAME: PZ203SS

RECORD OF DRILLHOLE PZ-203-SS

Sheet 1 of 5

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/26/95 & 5/31/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066681.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 516607.70
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-42.0 ft. See Soil Borehole Log PZ-203-SS 42.0-44.8 ft. No samples collected														
34															
36															
38															
40															
42															
44			439.40												
	44.8-53.4 ft. 44.80 Hard, medium light gray (N6) to dark reddish brown (10R 3/4), SILTY CLAY, moist, (CL), (ALLUVIAL)		44.80												5/26/95 @ 9:15 Began drilling
48				1	100										
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-203-SS

Sheet 2 of 5

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/26/95 & 5/31/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066661.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 516607.70
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	46.1-57.5 ft. Pale green (10G 6/2)														
				1	100										
50															
			433.40												
			50.80												50.8-52.0 ft. and 52.3-53.7 ft. Core loss due to Clay washing out End of Run 1 @ 10:15
52			431.40						Core Loss						
			430.80												
	53.4-73.6 ft. Moderately weathered, thickly bedded, yellowish gray (5Y 7/2), f-m grained, medium strong, BRECCIATED LIMESTONE, (ST. LOUIS FORMATION) Clay and poorly lithified Sandstone around pieces of Limestone		53.40												
54									J,I,R,CL						
									J,I,R						
									J,I,R						
56									J,I,R						
									J,P,SM						
				2	66%										
58									J,I,R						
									J,I,R						
									J,I,R,CL						
60									J,I,R,CL						
			423.40						J,C,SM (2)						5/26/95 @ 11:00 End of Run 2
			60.80												
									J,PL,SM						
62				3	97%										
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-203-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/26/95 & 5/31/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066661.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 515607.70
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R6 >1500, R5 1500, R4 500, R3 300, R2 150, R1 30)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	53.4-73.6 ft. Moderately weathered, thickly bedded, yellowish gray (5Y 7/2), f-m grained, medium strong, BRECCIATED LIMESTONE, (ST. LOUIS FORMATION) Clay and poorly lithified Sandstone around pieces of Limestone														
66									J,PL,SM						
				3	97%				J,PL,SM,CL						
68									J,PL,SM,CL (2)						
									B,PL,SM,CL						
70			413.40						J,I,R,CL						5/26/95 @ 12:00 End of Run 3
			70.80						J,PL,R,CL						
72									J,C,SM						
74	73.6-81.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2) to grayish orange pink (5YR 7/2), m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic			4	100%										
76	76.1-77.1 ft. Clay layer														
	77.6-77.9 ft. Clay layer		406.50												
78			77.70	5	100%										
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 8/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-203-SS

Sheet 4 of 5

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/26/95 & 5/31/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1086881.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 518807.70
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	73.6-81.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2) to grayish orange pink (5YR 7/2), m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic	402.70 / 81.50											
82	81.5-98.0 ft. Highly weathered, pale yellowish brown (10YR 6/2), f-c grained, very weak, LIMESTONE boulders in SILT matric (Collapse Zone)		5	100%									81.5-98.0 ft. Collapse Zone, RQD measurements not valid
84	84.0-85.5 ft. Limestone boulder	400.20 / 84.00											
86	85.5-87.2 ft. Weak, dark gray (N3), thinly laminated Siltstone	398.70 / 85.50											
	87.2-90.0 ft. Limestone boulder	397.00 / 87.20	6	100%									
88													5/26/95 @ 15:00 Stop drilling
90	90.0-90.5 ft. Weak, light olive gray (5Y 6/1), Siltstone	394.20 / 90.00											5/31/95 @ 8:30 Resume drilling after 4-day break, water level in open hole @ 34.1 ft. bgs
	90.5-92.4 ft. Limestone boulder	393.70 / 90.50											
92	92.4-95.0 ft. Very weak, medium dark gray (N4) to grayish black (N2), thinly laminated, Siltstone layer	392.50 / 91.70	7	82%				Core Loss					92.5-93.4 ft. Core loss in soft unit
94	95.0-96.0 ft. Limestone boulder	389.20 / 95.00											
			8	100%									
96		388.20 / 96.00											

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-203-SS

Sheet 5 of 5

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/26/95 & 5/31/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066661.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 516607.70
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
98	96.0-98.0 ft. Very weak, light olive gray (5Y 6/1), thinly laminated, Siltstone layer		388.20 / 96.00												
			386.20 / 98.00	6	100%										
	98.0-104.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		384.20 / 100.00						J,PL,SM						
100	100.3-100.7 ft. Chert zone								B,PL,SM,CL						
									J,I,VR,Calcite						
102									B,I,R						
									J,I,R						
104									J,I,R						
	104.2-110.0 ft. Slightly weathered, thinly bedded, olive gray (5Y 4/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)			9	98%				J,I,VR calcite crystals						
	104.4-105.0 ft. Highly weathered zone and weak														
106	105.0-106.8 ft. Intermittent vuggy zone (<3 mm.), zones <2 in. thick														
108															
															5/31/95 @ 11:00 Complete coring
110			374.20												
	End of Record of Drillhole at 110.0 ft.		110.00												
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

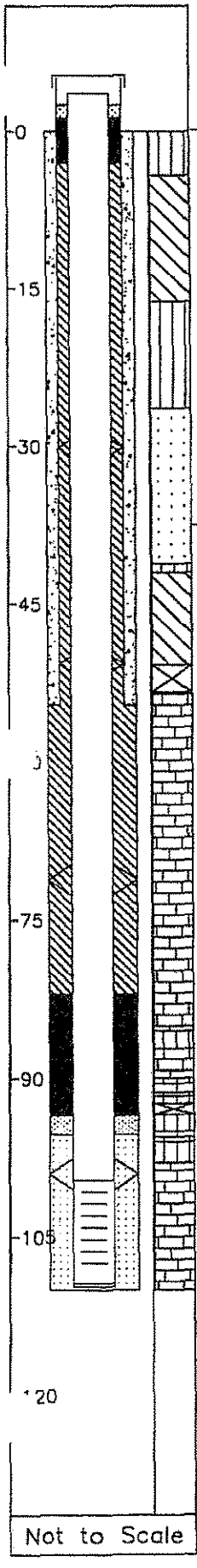
LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

Well No. PZ-203-SS

Boring No. X-Ref: PZ-203-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066662 ft. Easting: 516608 ft.

Elevation Ground Level 484.2 ft. NGVD

Top of PVC Casing 486.59 ft. NGVD

Drilling Summary:

Total Depth	110.0 ft.
Borehole Diameter	10 1/4 in. (0.0–56.0 ft.) 5 7/8 in. (56.0–110.0 ft.)
Casing Stickup Height	2.41 ft.
Driller	Layne-Western St. Louis, MO
Rig	CME 75, Schramm Portadrill T660H
Bit(s)	6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 9 7/8 in. Tricone Bit
Drilling Fluid	Auger–None, NX Core Water, Air and Mud Rotary
Protective Casing	8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/25/95	15:00	5/25/95	11:00
Schramm Rotary	6/3/95	7:20	6/3/95	8:30
Geophys.Logging:				
Casing:				
2" PVC	6/3/95	8:20	6/3/95	8:50
6" Steel	6/2/95	10:30	6/2/95	13:00
Filter Placement:	6/3/95	8:50	6/3/95	9:46
Cementing:				
Development				
Bentonite Grout	6/3/95	10:30	6/3/95	11:00
Bentonite Seal	6/3/95	9:40	6/3/95	10:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.41	-	99.60	C1	486.59	-	384.58
99.60	-	109.40	S1	384.58	-	374.78
109.40	-	109.70	C2	374.78	-	374.48
+ 0.50	-	56.10	C3	484.70	-	428.08
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3–see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16–35 mesh Silica Sand, 95.3–110.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 93.5–95.3 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0–82.0 ft., Neat cement, 3.0–56.1 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 82.0–93.5 ft.

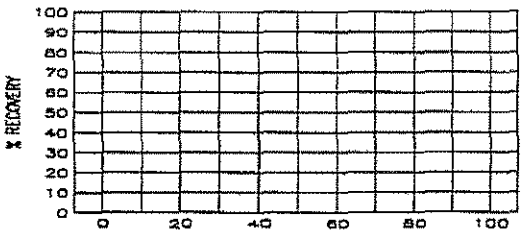
Concrete: 0.0–3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by E. Swanson

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ203SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122505	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: ~~XXXXXXXXX~~ PZ-203-55

SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: Mo | ZIP CODE: 63044

NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-341-3710

ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: Mo | ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

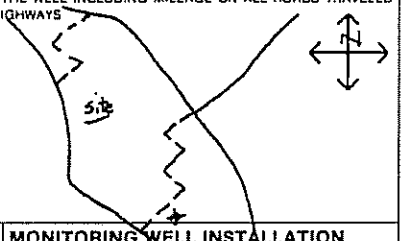
COUNTY: ST. LOUIS
ELEVATION: 484.2
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38° 45' 47" LONG. 90° 26' 30"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC

DRILLING CONTRACTOR'S NAME
LAYLIE WESTERN Co., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
486.6

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

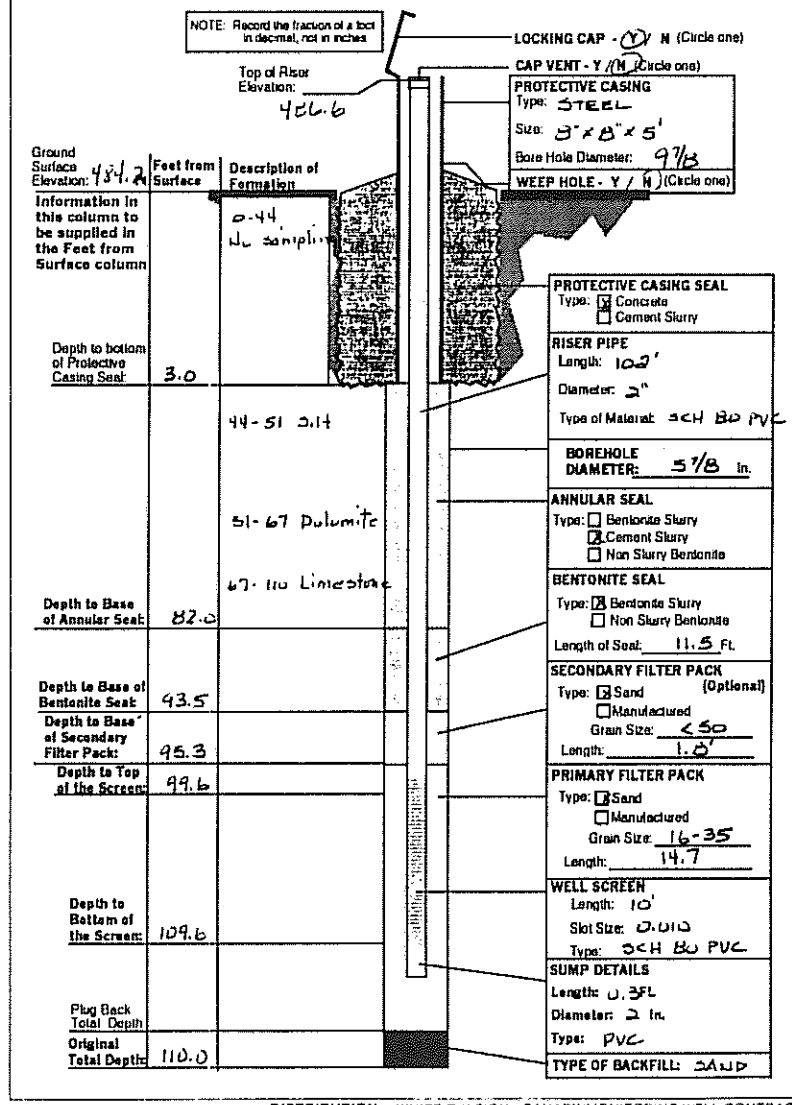
MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-23-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM1 | DATE 7-07-95
SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256 WM | DATE 7-07 95

NOTE: Record the fraction of a foot in decimal, not in inches



MO 780-1415 (2-94) DISTRIBUTION: WHITE DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-204-SS
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 1
NORTHING: 1066426.61 DATUM EASTING: 515533.49 ELEVATION 467.0		DRILLING START / FINISH
	WATER LEVEL	
	TIME	TIME 15:50 / 07:45
	DATE	DATE 3/7/95 / DATE 3/7/95
	CASING DEPTH	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Muddy, no vegetation.	
ANGLE BEARING		
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1					(0.0-6.0 ft.) CONCRETE, (FILL)		Auger from 0.0-6.5 feet with no sampling
2							
3							
4							
5							
6							
7	1 2 2	0.5' 1.5' (33%)			@ 6.5-7.9 ft., crushed CONCRETE, (FILL)	SP (1)	Begin split spoon sampling at 6.5 feet
					(459.1) 7.9		
8	2	1.1'			(7.9-9.3 ft.) Stiff, mottled moderate yellowish brown (10YR 5/4) and dark yellowish orange (10YR 6/6), CLAYEY SILT, iron stained, some roots, NR, damp, (CL-ML), (LOESS)		
9	4 6 5	2.0' (55%)				SP (2)	
10	3	1.5'			(9.3-10.5 ft.) Stiff, pale yellowish brown (10YR 6/2) and medium dark gray (N4), CLAYEY SILT, some fine sand, NR, damp, (CL-ML), (LOESS)		
11	4 5 5	2.0' (75%)			(10.5-14.6 ft.) Stiff, medium dark gray (N4), CLAYEY SILT, little fine sand, NR, damp, (CL-ML), (LOESS) @ 11.2-11.5 ft., silty CLAY	SP (3)	
12	1	0.8'					
13	6 8 9	2.0' (40%)				SP (4)	
					(453.0) 14.0		
14					End of Soil Borehole Log at 14.0 Ft. See PZ-204-SS Record of Drillhole for rock descriptions		Auger/split spoon refusal at 14.0 feet

LOGGED BY M. HIRT CHK'D BY W. HERST

DATE 3/7/95

JOB NO.: 943-2848

FILENAME: PZ204SS

RECORD OF DRILLHOLE PZ-204-SS

Sheet 1 of 8

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066426.81
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 10, R2 50, R3 150, R4 300, R5 600, R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
0	0.0-14.0 ft. See Soil Borehole Log PZ-204-SS 14.0-14.6 ft. No samples collected														
2															
4															
6															
8															
10															
12															
14			452.40												
	14.6-45.1 ft. 14.60 Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystal veins (<1 mm. thick), few fossils		452.40 14.60	1	89%										3/8/95 @ 8:15 Begin coring
16															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-SS

Sheet 2 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/6/95 - 3/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066426.61
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	14.6-45.1 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystal veins (< 1 mm. thick), few fossils								J,PL,SM,CL J,I,SM,CL J,I,SM J,I,SM,CL J,I,SM,CL J,I,SM J,ST,SM,CL J,I,SM,CL						
18				1	69%				J,I,SM J,I,SM J,PL,SM,CL J,I,SM						
			447.70 18.30						Core Loss						Core loss due to highly fractured rock; core End Run 1 @ 9:50
20									J,I,SM (2)						
									J,I,SM (2) J,I,SM,CL (3) J,U,SM,CL						
22				2	96%				J,I,SM,CL (3) J,U,SM,CL (2)						
	22.6-28.0 ft. Very fine grained								J,I,SM,CL (2) J,I,SM						
24			443.00 24.00						J,I,SM,CL (2)						3/8/95 @ 10:50 End Run 2
									J,I,R						Use new bit during Run 3; slightly larger diameter, therefore hole reamed slightly
26				3	98%				J,PL,SM J,I,SM,CL J,I,SM,CL, J,I,SM J,I,SM,Fe J,U,SM						
28	28.0-30.7 ft. Medium grained 28.1-28.5 ft. 0 iron stained vein (1 mm. thick)														
	29.3-29.8 ft. Slightly weathered, iron stained		437.70 29.30						J,PL,SM,Fe						3/8/95 @ 13:15 End Run 3
30				4	98%				J,I,R J,PL,SM (2) J,I,R J,I,R						
									J,U,SM J,I,R						
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-SS

Sheet 3 of 8

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066426.61
AZIMUTH: 0

COLLAR ELEV: 487.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW HW CW	STRENGTH INDEX: R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	14.6-45.1 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystal veins (<1 mm. thick), few fossils							90	J,I,R						
34								90	J,I,R (4)						
36				4	98%			90	J,I,SM,CL (4)						
38								90	J,I,SM,CL (5)						
38								90	J,I,SM,CL (2)						
			427.70 / 39.30					90	J,I,SM,CL						3/5895 @ 14:05 End Run 4
40								90	J,I,SM						
								90	J,I,SM,CL (6)						
								90	J,I,SM						
								90	J,I,SM,CL						
42	41.8-42.8 ft. Fine grained, calcareous dolomite														
	42.8-45.1 ft. Medium grained, dolomitic limestone							90	J,I,SM						
44				5	102 %										
			421.90 / 45.10					90	J,I,R (4)						
	45.1-49.3 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy (vugs ~1 mm. thick); some 10 degree calcite veins (<2 mm. thick)							0	B,U,R						
46															
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-SS

Sheet 4 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066426.61
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	48.8-49.3 ft. Fine grained, dolomitic limestone 417.70		417.70	5	102 %										3/8/95 @ 14:40 End Run 5
	49.3-64.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 49.30		48.30						J,I,SM (6)						
50	49.3-49.8 ft. Thinly laminated								J,I,SM (2)						
	49.8-50.9 ft. Chert zone								J,I,R,CL						
52									J,I,R,CL						
	52.8-54.5 ft. Intricate pattern of calcite veins														
54				6	98%				J,I,R,CL						
	54.8-55.9 ft. Moderately weathered								J,I,R,CL						
56															
	56.6-58.1 ft. Moderately weathered								J,PL,SM,CL						
	57.5-57.7 ft. 409.50 Claystone 57.70								J,I,R,CL						
									B,U,R,CL						
58	408.90								B,U,SM,CL						
	58.1-58.5 ft. 58.10 Claystone 408.50								B,I,R,CL						
	58.5-59.9 ft. 58.50 Siltstone, 45 degree crossbed								J,PL,SM,CL (2)						
									J,I,SM,CL						
			407.70												
			59.30						J,I,R						3/8/95 @ 15:35 End Run 6
									J,I,SM (2)						
	407.10								J,I,R						
60	60.0-60.4 ft. 59.90 Calcareous dolomite								J,I,R						
									J,PL,SM,CL						
									J,U,SM,CL						
									J,PL,R,CL						
	405.40														
	61.6-62.4 ft. 61.60 Calcareous dolomite, slightly weathered			7	100 %				J,PL,SM						
62	404.60														
	62.40								J,I,SM,CL (5)						
	63.0-64.3 ft. Microcrystalline														
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-SS

Sheet 5 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066426.61
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/t CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64			402.70												
			64.30						J,I,SM,CL (2)						
	64.3-79.9 ft. Moderately weathered, thinly bedded, pale to dark yellowish brown (10YR 6/2-10YR 4/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Very porous/vuggy (<1 mm.-5 mm.)								J,U,R J,I,SM,CL						
66				7	100 %										
68															
			397.70												3/8/95 @ 16:20 End Run 7
			69.30												
	69.6-70.3 ft. Slightly weathered														
70															
72															
74				8	100 %										
76															
78															
			387.70												
			79.30												3/8/95 @ 16:55 End Run 8
				9	98%										
	387.10								J,I,R						
80	79.90														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: O. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066426.61
AZIMUTH: 0

COLLAR ELEV: 487.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (RT 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	79.9-90.3 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystals, stylolites														
82				9	98%			0	J,PL,SM,CL						
								0	J,U,SM,CL						
								0	J,I,SM,CL						
84			382.70 84.30												3/8/95 @ 17:20 End Run 9
								0	J,I,R						
	85.7-89.6 ft. Microcrystalline							0	J,PL,SM						
86								0	J,I,SM (2)						
								0	J,I,SM						
				10	100%										
88								0	J,I,SM						
								0	J,I,SM,CL (2)						
								0	J,I,R,CL (2)						
								0	J,PL,SM						
90	378.70		378.70												3/8/95 @ 17:50 End Run 10
	End of Record of Drillhole at 90.3 ft. 90.30		90.30												
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

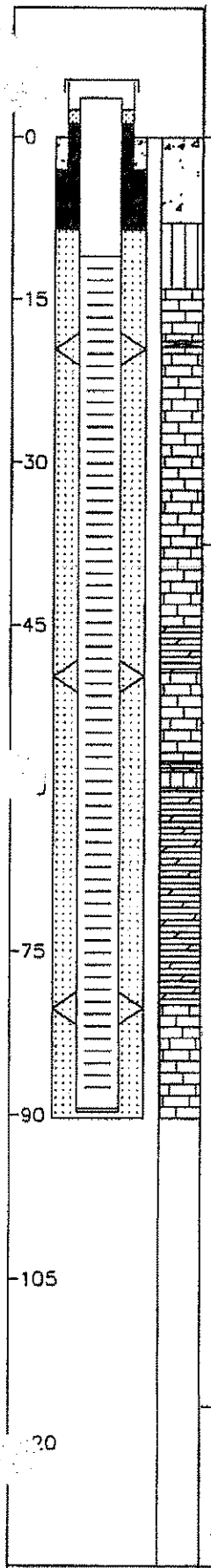
LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

Well No. PZ-204-SS

Boring No. X-Ref: PZ-204-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066427 ft. Easting: 515533 ft.

Elevation Ground Level 467.0 ft. NGVD

Top of PVC Casing 469.63 ft. NGVD

Drilling Summary:

Total Depth 90.3 ft.

Borehole Diameter 10 1/4 in. (0.0–14.0 ft.) 5 7/8 in. (14.0–90.3 ft.)

Casing Stickup Height 2.60 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger–None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/7/95	15:50	3/8/95	7:45
Schramm Rotary	3/10/95	12:15	3/10/95	14:15
Geophys. Logging:				
Casing:	3/10/95	14:15	3/10/95	14:35
Filter Placement:	3/10/95	14:35	3/10/95	15:05
Cementing:				
Development				
Bentonite Grout Bentonite Seal	3/10/95	15:05	3/10/95	15:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.60	–	10.95	C1	469.63	–	456.08
10.95	–	89.35	S1	456.08	–	377.68
89.35	–	89.68	C2	377.68	–	377.35

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16–35 mesh Silica Sand, 8.5–90.3 ft.

Filter Pack:

Grout Seal:

Bentonite Seal: Medium Bentonite Chips, 3.0–8.5 ft.

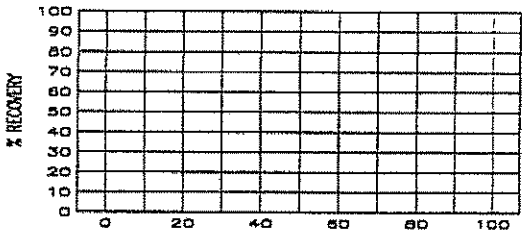
Concrete: 0.0–3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943–2848

Site LAIDLAW/OU2 RI–FS/MO

File Name PZ204SS

LL1374

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO 115087	DATE RECEIVED
ROUTE	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO
CHECKED BY	CROSS REFERENCE NO
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

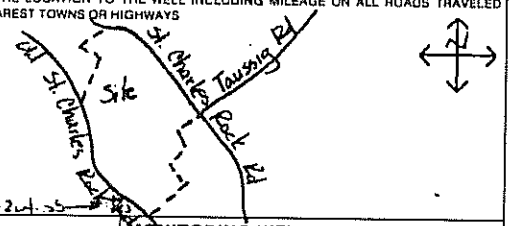
INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-204-SS
SITE ADDRESS: ST. CHARLES ROCK RD. CITY: BRIDGETON STATE: MO. ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC. TELEPHONE:
ADDRESS: 1338 N. BROADWAY CITY: ST. LOUIS STATE: MO. ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

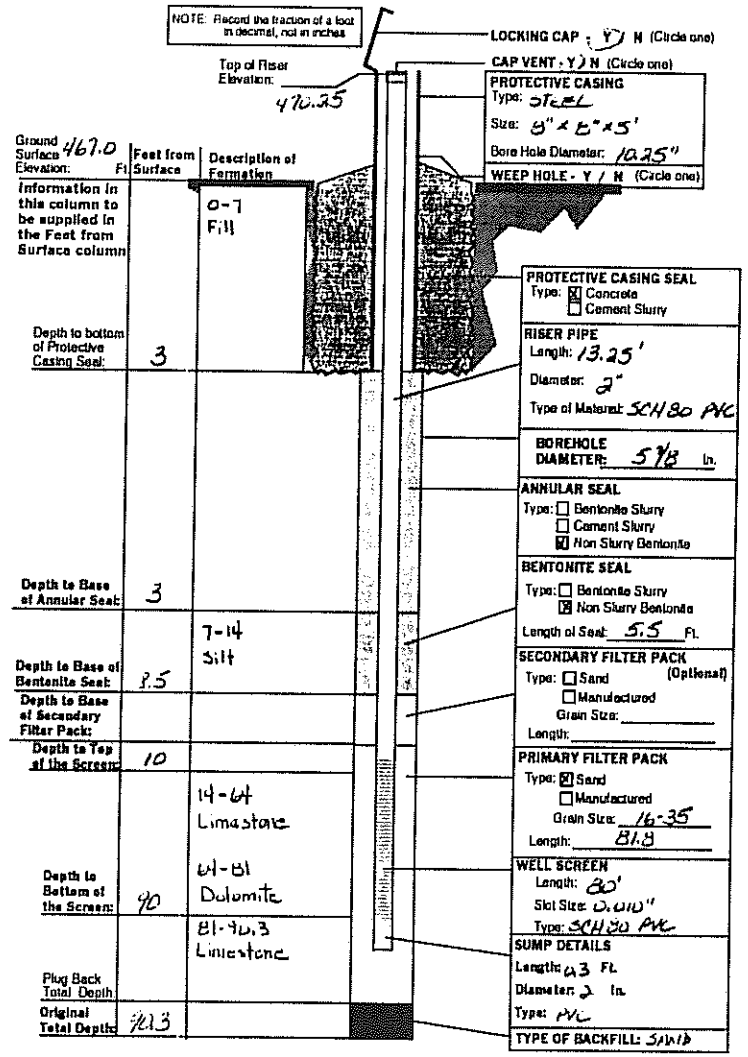
LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
ELEVATION: 467.0
AREA NO.:
SMALLEST ¼ LARGEST ¼
SEC. ____ TWN. 47 N.RNG. 5 (E) OR W
LAT. 38° 45' 45" LONG. 90° 36' 44"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches



MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS: ☐ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 4 TOTAL ☐ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS

SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 3-10-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM1 DATE: 4-11-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM1 DATE: 4-11-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

RECORD OF DRILLHOLE PZ-204A-SS

Sheet 1 of 1

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/21/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1066429.82
AZIMUTH: 0

COLLAR ELEV: 466.7
E: 515556.26
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R6 1500, R5 600, R4 300, R3 150, R2 30, R1	TEST ORIENTATION	NOTES: WATER LEVELS, INSTRUMENTATION
80	0.0-80.0 ft. See Soil Borehole Log and Record of Drillhole for PZ-204-SS		386.70 / 80.00												0.0-14.0 ft. Borehole advanced with 6 1/4 in. ID hollow stem augers
	80.0-90.0 ft. Fresh, medium to thickly bedded, light olive gray (5Y 6/1), finely crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic								J,PL,R,CL						14.0-80.0 ft. Borehole advanced with 5 7/8 in. dia. air rotary bit
82									J,PL,R,CL						6/21/95 @ 13:00 Began coring
	82.5-83.1 ft. Thinly laminated, fossiliferous								J,C,R,CL (3)						
	82.3-85.8 ft. Small vugs (1/4 in.) filled with glauconite														
84									J,C,VR-CL						
				1	96%				J,PL,R,CL						
	@ 85.4 ft. Grades to microcrystalline Limestone								J,C,SM,CL						
86									J,ST,R,CL						
									J,C,R,CL						
									J,C,R,CL (2)						
88															
			377.10 / 89.60						J,P,R						6/21/95 @ 15:45 Ended coring
	376.70								Core Loss						
90	End of Record of Drillhole at 90.0 ft. 90.00														
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: R. BOOTH
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

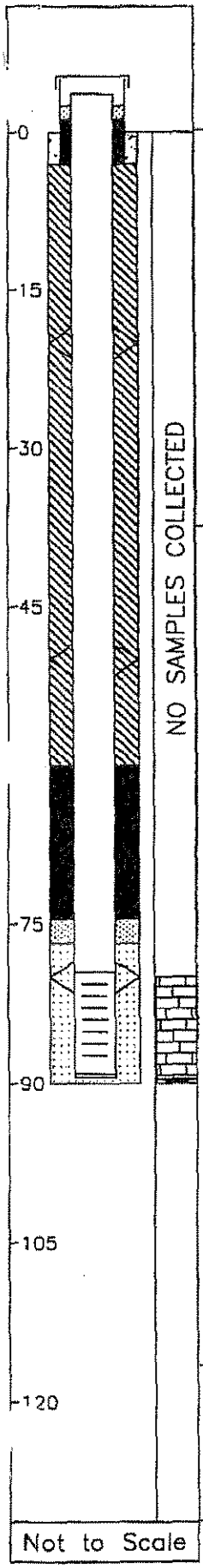
Well No. PZ-204A-SS

Boring No. X-Ref: PZ-204A-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1066430 ft.
Easting: 515556 ft.

Elevation Ground Level 466.7 ft. NGVD
Top of PVC Casing 468.16 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 90.0 ft.
Borehole Diameter 10 1/4 in. (0.0-14.0 ft.) 5 7/8 in. (14.0-90.0 ft.)
Casing Stickup Height 1.50 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	6/21/95	8:00	6/21/95	14:00
Geophys.Logging:				
Casing:	6/22/95	7:30	6/22/95	7:36
Filter Placement:	6/22/95	7:35	6/22/95	7:45
Cementing:				
Development				
Bentonite Grout	6/22/95	8:00	6/22/95	9:00
Bentonite Seal	6/22/95	7:45	6/22/95	8:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.50	-	79.50	C1	468.16	-	387.16
79.50	-	89.10	S1	387.16	-	377.56
89.10	-	89.43	C2	377.56	-	377.23
	-				-	
	-				-	
	-				-	

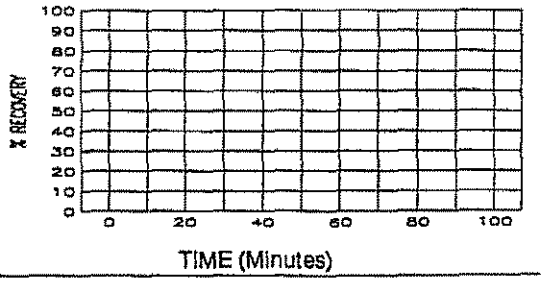
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 76.8-90.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 74.5-76.8 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-60.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 60.0-74.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ204ASS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 122518	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME		WELL NUMBER	
LANDAU BRIDGETON SANITARY LANDFILL		PZ-104A-SS	
SITE ADDRESS	CITY	STATE	ZIP CODE
51 CHARLES ROCK RD.	BRIDGETON	MO	63044
NAME		TELEPHONE	
LANDAU ASHDIE SYSTEMS, INC		314 291-3110	
ADDRESS	CITY	STATE	ZIP CODE
1939 N. BROADWAY	ST LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

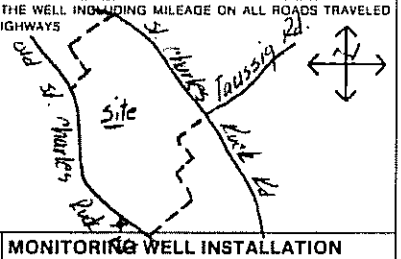
COUNTY ST. LOUIS
ELEVATION 466.66
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E OR W)

LAT. 38 · 45 · 44" LONG. 90 · 26 · 44"

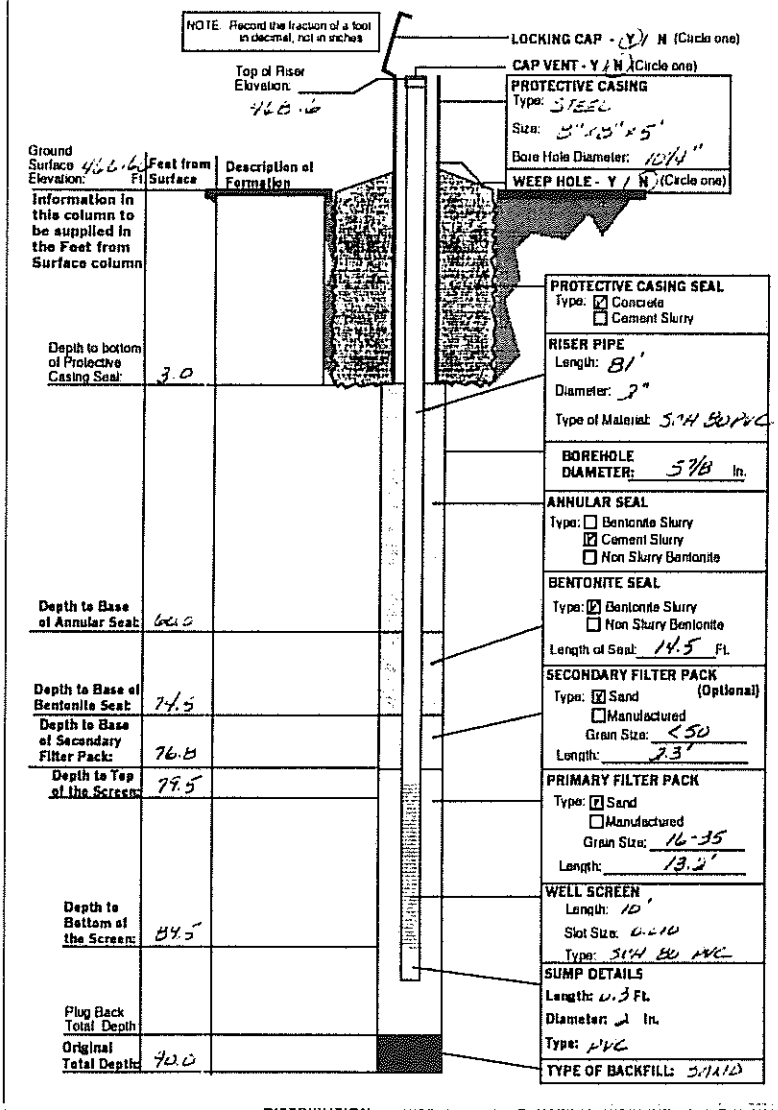
SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME

LAYNE WESTERN CO., INC



DRILLING CONTRACTOR'S NAME

LAYNE WESTERN CO., INC

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
468.16

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS

SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-22-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE
001256 WMI	7-07-95

SIGNATURE (DRILLING CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE
001256 WMI	7-07-95

DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK OWNER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	6.25 inch I.D. Hollow Stem Auger
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-205-AS
SHEET	1 OF 4
DRILLING	START: TIME 16:35, DATE 3/25/95 — FINISH: TIME 11:00, DATE 3/25/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DATUM	NORTHING: 1067463.60 EASTING: 515463.34
ELEVATION	459.3
DRILL RIG	CME 75 - TRUCK MOUNT
SURFACE CONDITIONS	
ANGLE	-90°
BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4, 7, 7, 10	1.5'/2.0' (75%)			(0.0-2.2 Ft.) Stiff, dark greenish gray (5GY 4/1) to olive gray (5Y 6/1), SILTY CLAY, trace Fine Sand, SR, damp, (CL), (FILL)	SP (1)	
(457.1) 2.2							
3	1, 2, 2, 4	0.5'/2.0' (25%)			(2.2-6.0 Ft.) Soft, black (N1), CLAYEY SILT, trace Fine Sand, WR, moist to wet, (CL-ML), (FILL)	SP (2)	
5	2, 2, 2, 3	1.5'/2.0' (75%)				SP (3)	Soil becomes wet @ 4.0 Ft.
(453.3) 6.0							
7	1, 4, 4, 3	0.1'/2.0' (5%)			(6.0-12.0 Ft.) Mixed wet waste and clayey silt	SP (4)	
9	6, 5, 6, 4	0.1'/2.0' (5%)			(8.0-10.0 Ft.) Mixed wet waste and clayey silt	SP (5)	
11	2, 2, 3, 3	0.6'/2.0' (30%)				SP (6)	
(447.3) 12.0							
13	2, 9, 3, 2	0.0'/2.0' (0%)	NO RECOVERY		(12.0-14.0 Ft.) No Recovery	SP (7)	From 12.0-28.0 Ft., no samples recovered, but drilling indicated mixed waste and silty clay layers
14	6, 8, 8, 7	0.0'/2.0' (0%)			(14.0-15.0 Ft.) No Recovery	SP (8)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY V. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ205AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067463.60
DATUM EASTING: 515463.34 ELEVATION 459.3

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-205-AS

SHEET 2 OF 4

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME					16:35	11:00
DATE					DATE	DATE
CASING DEPTH					3/25/95	3/25/95

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE -90° BEARING
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	5 5 5 4	0.0' / 2.0' (0%)	NO RECOVERY		(15.0-16.0 ft.) No Recovery	SP (8)	
					(16.0-18.0 ft.) No Recovery	SP (9)	
18	5 2 1 5	0.0' / 2.0' (0%)			(18.0-20.0 ft.) No Recovery	SP (10)	
20	1 2 3 3	0.0' / 2.0' (0%)			(20.0-22.0 ft.) No Recovery	SP (11)	
22	3 2 1 4	0.0' / 2.0' (0%)			(22.0-24.0 ft.) No Recovery	SP (12)	
24	3 3 23 50/1"	0.0' / 2.0' (0%)			(24.0-26.0 ft.) No Recovery	SP (13)	
26	8 6 8 10	0.0' / 2.0' (0%)			(26.0-28.0 ft.) No Recovery	SP (14)	
28	1 2 4 5	0.0' / 2.0' (0%)			(431.3) 28.0 (28.0-30.0 ft.) Loose, dark greenish gray (5GY 4/1), SANDY SILT, NR, wet, (ML)	SP (15)	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CUSIO

DATE 6/1/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ205AS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	6.25 inch I.D. Hollow Stem Auger	PZ-205-AS
		SHEET 3 OF 4
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING START TIME 16:35 / FINISH TIME 11:00
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	
	WATER LEVEL / TIME / DATE / CASING DEPTH	DATE 3/25/95 / DATE 3/25/95
NORTHING: 1067463.60 DATUM EASTING: 515463.34 ELEVATION 459.3		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE -90° BEARING		
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CASSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ205AS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31					(30.0-31.0 ft.) No samples collected		5/21/95, 10.0 in. ID steel casing installed through 10.25 in. ID augers to 29.0 ft. Casing sealed in borehole with neat cement grout to surface.
					(428.3) 31.0		
	6 5 5 8	1.2'/2.0' (60%)			(31.0-36.5 ft.) Stiff, medium dark gray (N4), SILTY CLAY, with thin fine sand layers (1' thick), moist, NR, (CL), (ALLUVIUM)	SP (16)	
32							
33	9 3 5 12	1.3'/2.0' (65%)				SP (17)	
34							
35	7 7 9 9	1.0'/2.0' (50%)				SP (18)	
36					(422.8) 36.5		
					(36.5-39.0 ft.) Dense, olive gray (5Y 4/1), SILTY fine SAND, wet, NR, (SM), (ALLUVIUM)		
37	7 14 21 17	1.1'/2.0' (55%)				SP (19)	
38							
39					(420.3) 39.0		
	4 3 3 4	1.4'/2.0' (70%)			(39.0-44.2 ft.) Firm, olive gray (5Y 4/1), SILTY CLAY, moist to wet, NR, (CL) from 40.2-40.4 ft., wet, fine, sandy clay layer	SP (20)	
40							
41	3 4 4 5	1.7'/2.0' (85%)			from 41.8-42.0 ft., wet, fine, sandy clay layer	SP (21)	
42							
43	2 7 11 18	1.3'/2.0' (65%)				SP (22)	
44					(415.1) 44.2		
					(44.2-49.0 ft.) Compact, olive gray (5Y 4/1), fine SAND, trace silt, wet, NR, (SM), (ALLUVIUM)		

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067463.60
DATUM EASTING: 515463.34 ELEVATION 459.3

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-205-AS

SHEET 4 OF 4

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME					16:35	11:00
DATE					DATE	DATE
CASING DEPTH					3/25/95	3/25/95

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE -90° BEARING
SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	6 8 12 16	1.6'/2.0' (80%)			(44.2-49.0 Ft.) Compact, olive gray (5Y 4/1), Fine SAND, trace silt, wet, NR, (SM), (ALLUVIUM)	SP (23)	
47	3 5 50/4"	1.1'/2.0' (55%)					
48						SP (24)	
49					(410.3) 49.0 End of Soil Borehole Log at 49.0 ft.		Top of weathered bedrock encountered @ 48.5 Ft.
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CISIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 243-2849

FILENAME: PZ205AS

Well No. PZ-205-AS

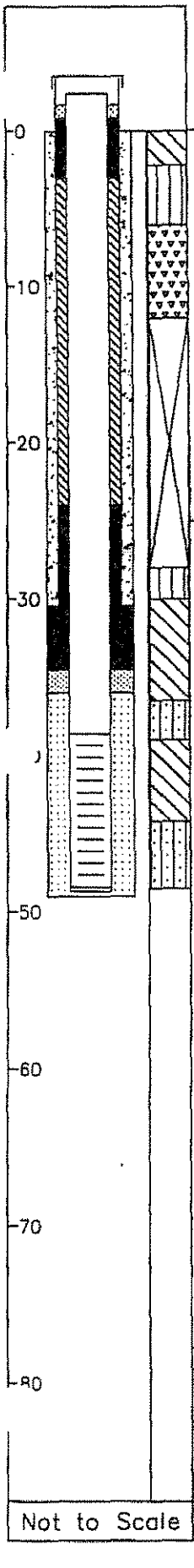
Boring No. X-Ref: PZ-205-AS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067464 ft. Easting: 515463 ft.

Elevation Ground Level 459.3 ft. NGVD

Top of PVC Casing 460.99 ft. NGVD



Drilling Summary:

Total Depth 49.0 ft.

Borehole Diameter 14 1/4 in. (0.0–29.0 ft.) 8 1/4 in. (29.0–49.0 ft.)

Casing Stickup Height 1.66 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. and 10 1/4 in. ID Hollow Stem Auger Bits

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/25/95	16:35	3/25/95	11:00
CME 75	4/21/95	14:10	4/21/95	15:30
CME 75	5/5/95	13:30	5/5/95	15:30
Geophys.Logging:				
Casing:				
2" PVC	5/5/95	16:00	5/5/95	16:05
10" Steel	4/21/95	15:29	4/21/95	16:30
Filter Placement:	5/5/95	16:05	5/5/95	16:45
Cementing:				
Development				
Bentonite Grout	5/5/95	17:00	5/5/95	17:30
Bentonite Seal	5/5/95	16:45	5/5/95	17:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.66	-	38.55	C1	460.99	-	420.78
38.55	-	48.35	S1	420.78	-	410.98
48.35	-	48.68	C2	410.98	-	410.65
+ 0.70	-	29.00	C3	460.00	-	430.33
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 36.0-49.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 34.5-36.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-24.0 ft., Neat cement, 3.0-29.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 24.0-34.5 ft.

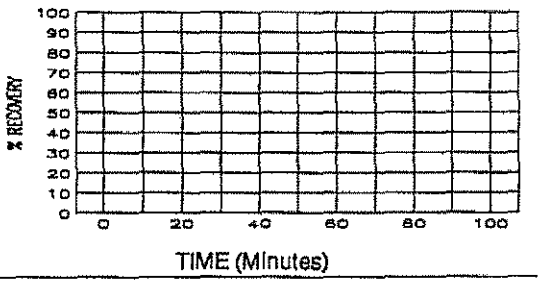
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Surface Casing C3: 10 in. ID / 10 7/8 in. OD Steel Casing

Not to Scale

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ205AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122496	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL — WELL NUMBER: P2-205AS

SITE ADDRESS: ST. CHARLES ROCK RD. — CITY: BRIDGETON — STATE: MO. — ZIP CODE: 63044

NAME: LAIDLAW WASTE SYSTEMS, INC. — TELEPHONE: 314-741-3710

ADDRESS: 1838 N. BROADWAY — CITY: ST. LOUIS — STATE: MO — ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

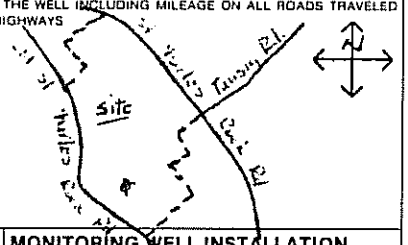
COUNTY: ST. LOUIS
ELEVATION: 454.3
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST

SEC. ____ TWN. 47 N.RNG. 5 (E OR W)

LAT. 38 ° 45 ' 55 " LONG. 90 ° 36 ' 45 "

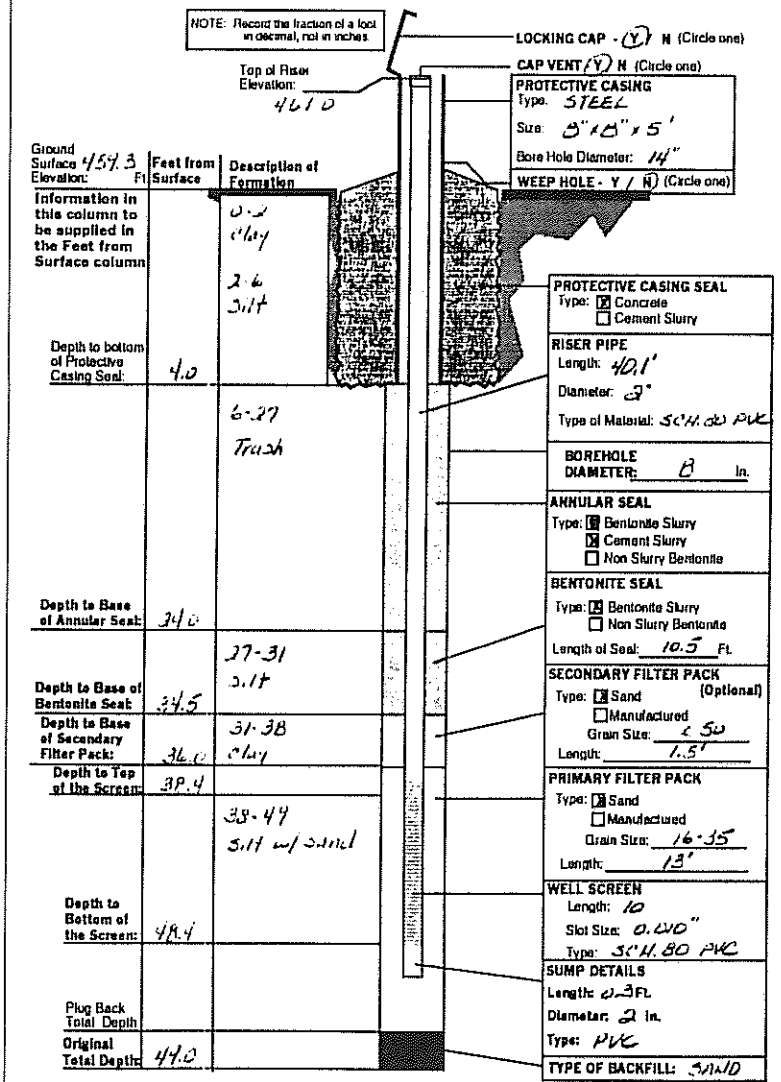
SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME

LAYNE WESTERN CO, INC.



DRILLING CONTRACTOR'S NAME

LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 461.0

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 2 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS

SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)

PERMIT NUMBER: OWI258 WWM — DATE: 6-02-95

SIGNATURE (DRILLING CONTRACTOR)

PERMIT NUMBER: OWI258 WWM-1 — DATE: 6-02-95

DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK/OWNER

RECORD OF DRILLHOLE PZ-205-SS

Sheet 1 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR / MW / HW / CW	STRENGTH INDEX: R6 / R5 / R4 / R3 / R2 / R1	POINT LOAD INDEX (psi): R1 30 / R2 150 / R3 300 / R4 600 / R5 1500 / R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-49.0 ft. See Soil Borehole Log PZ-205-AS 49.0-54.0 ft. No samples collected														0.0-49.0 ft. Borehole advanced with 10.25 in. ID hollow stem augers 49.0-54.0 ft. Borehole advanced with 9 7/8 in. bit using mud rotary then 6 in. steel casing grouted into annulas with neat cement Bedrock encountered @ 48.5 ft.
50															
52															
54	405.50 54.00 54.0-67.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		405.50 54.00												5/18/95 @ 8:15 Began coring
56				1	93%				J,PL,SM,Fe						
									J,PL,SM						
58									J,ST,SM						
									J,C,SM,Fe						
	400.50 59.00		400.10 59.40						B,PL,SM						5/18/95 @ 8:40 End of Run 1
60															
62				2	89%				J,PL,SM (2)						
	62.3-69.5 ft. Grain size is medium grained								J,PL,SM						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-SS

Sheet 2 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N. 1087483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	54.0-67.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,PL,R						
	65.0-75.9 ft. Scattered chert nodules								B,PL,SM (2)						
66	65.8-66.0 ft. Claystone layer								J,PL,SM,Fe						
				2	99%										
	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic														
68															5/18/95 @ 10:40 End of Run 2
			390.10						J,PL,R,Fe						
			69.40						J,PL,R						
	69.8-75.9 ft. Very fine to microcrystalline zones of thinly laminated layers of clay within the limestone, color is medium light gray (N6)								J,PL,R (2)						
70									J,I,R						
				3	100%										
72									J,PL,R						
									J,I,R						
			385.00						J,I,R (3)						5/18/95 @ 11:45 End of Run 3 Ended drilling for the day due to bad weather. 5/19/95 @ 7:40 Began drilling
74			74.50						J,PL,R						
									J,PL,R,Fe						
									J,PL,R						
76	76.6-77.4 ft. Argillaceous layer														
				4	100%				J,PL,R						
									J,I,R						
78	78.7-80.0 ft. Argillaceous zone, unfilled vugs (1-3 mm. in diameter)								J,PL,R						
									J,PL,R (2)						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-SS

Sheet 3 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE. (ST. LOUIS FORMATION) Stylolitic								J,PL,R (2)						
82	81.8-86.4 ft. Argillaceous zone, unfilled vugs, (1-3 mm. in diameter)			4	100%				J,PL,R						
84									J,PL,R						5/19/95 @ 9:15 End of Run 4
	84.5-86.4 ft. Color grades to light olive gray (5GY 6/1)		375.00 84.50						J,PL,R						
86									B,PL,SM						
									J,PL,SM						
									J,PL,SM						
									J,C,SM						
88									J,PL,R						
	88.6-93.8 ft. Argillaceous, vuggy, color is light olive gray (5GY 6/1)			5	100%										
90															
92									B,PL,SM						
94			365.00 94.50												5/19/95 @ 10:40 End of Run 5
	94.5-97.5 ft. Argillaceous, color is light olive gray (5GY 6/1)			6	100%				J,PL,SM						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-SS

Sheet 4 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1087483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R6 1500, R5 600, R4 300, R3 150, R2 30, R1)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
ROCK TYPE						80 60 40 20	2 4 6 8 10	0 30 60 90							
96	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic 97.5-99.5 ft. Thin clay laminae														
98				6	100 %				J,I,R,Fe J,PL,SM,CL						
	360.00		360.00						J,I,R						5/19/95 @ 11:30 Finished drilling
	End of Record of Drillhole at 99.5 ft. 99.50		99.50												
100															
102															
104															
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

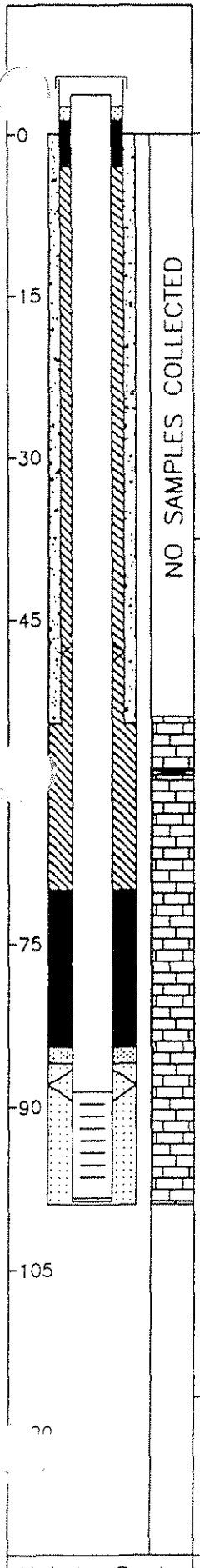
Well No. PZ-205-SS

Boring No. X-Ref: PZ-205-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067484 ft.
Easting: 515478 ft.

Elevation Ground Level 459.5 ft. NGVD
Top of PVC Casing 461.78 ft. NGVD



Drilling Summary:

Total Depth 99.0 ft.
Borehole Diameter 9 3/4 in. (0.0-54.0 ft.) 5 7/8 in. (54.0-99.0 ft.)
Casing Stickup Height 1.66 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core,
5 7/8 in. Button Bit and 9 3/4 in. Tricone Bit
Drilling Fluid Auger-None, NX Core Water,
Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/18/95	8:15	5/19/95	11:30
Schramm Rotary	5/21/95	13:30	5/21/95	14:30
Geophys.Logging:				
Casing:				
2" PVC	5/21/95	14:25	5/21/95	14:30
8" Steel	5/11/95	7:30	5/11/95	11:00
Filter Placement:	5/21/95	14:40	5/21/95	15:15
Cementing:				
Development				
Bentonite Grout	5/21/95	15:20	5/21/95	15:35
Bentonite Seal	5/21/95	15:15	5/21/95	15:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.66	-	88.57	C1	461.78	-	370.96
88.57	-	98.37	S1	370.96	-	361.16
98.37	-	98.70	C2	361.16	-	360.83
+ 1.00	-	54.00	C3	460.50	-	405.53
	-				-	
	-				-	

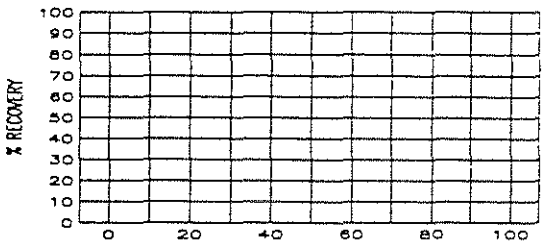
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 86.0-99.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 84.5-86.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-70.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 70.0-84.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Not to Scale

Supervised by W. Herst
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ205SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122506	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-20555

SITE ADDRESS	CITY	STATE	ZIP CODE
21. CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

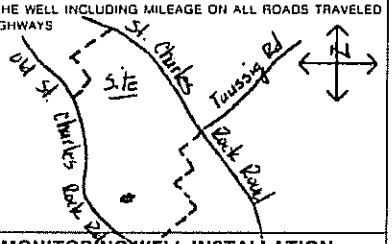
COUNTY ST. LOUIS
ELEVATION 454.5
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

LAT. 38 ° 45 ' 35 " LONG. 90 ° 36 ' 45 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.8

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☐ AUGER TYPE
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-21-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256 V1BM	6-20-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256 V1M	6-23-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 461.8

LOCKING CAP - (Y) N (Circle one)
CAP VENT - (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 454.5 ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
		50-85 Limestone
Depth to Base of Annular Seal:	60.0	
Depth to Base of Bentonite Seal:	71.0	
Depth to Base of Secondary Filter Pack:	72.5	
Depth to Top of the Screen:	74.7	
Depth to Bottom of the Screen:	84.7	
Plug Back Total Depth:		
Original Total Depth:	85.0	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 77'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 11 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: <50
Length: 1.5'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 13.5'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SAND

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-208-SS
			SHEET
	SAMPLING METHOD:		1 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
LAIDLAW\RI-FS\MD WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		START / FINISH
	WATER LEVEL		TIME / TIME
	TIME		14:30 / 8:50
	DATE		DATE / DATE
NORTHING: 1068030.83 DATUM EASTING: 515809.45 ELEVATION 458.4	CASING DEPTH		3/9/95 / 3/10/95

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Wet to muddy sand adjacent to access road; no vegetation.

ANGLE VERTICAL BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	23 29 20 22	0.8'/2.0' (40%)			(0.0-6.0 Ft.) Dense, medium light gray (N6), LIMESTONE GRAVEL and SAND, SR, dry, (GP), (FILL)	SP ①	
2	3 15 10 30	0.9'/2.0' (45%)				SP ②	
3							
4	33 25 16 18	0.1'/2.0' (5%)				SP ③	
5							
6	6 5 3 4	0.4'/2.0' (20%)			(452.4) 6.0 (6.0-15.6 Ft.) Firm, moderate yellowish brown (10YR 5/4), CLAYEY SILT, little fine sand, iron stained, laminated, NR, damp, (CL-ML), (LOESS)	SP ④	
7							
8	3 3 3 5	0.9'/2.0' (45%)				SP ⑤	
9							
10	2 2 3 4	1.1'/2.0' (55%)				SP ⑥	
11							
12	1 2 3 3	1.6'/2.0' (80%)			@ 12.7 Ft., becoming moist @ 13.2-13.3 Ft., medium dark gray (N4), SILTY CLAY	SP ⑦	
13							
14	2 3 5 3	0.8'/2.0' (40%)				SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY N. HIRT CHK'D BY W. HIRST

DATE 3/9/95

JOB NO.: 943-2848

FILENAME: PZ208SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	6.25 inch I.D. Hollow Stem Auger		PZ-206-SS
			SHEET
	SAMPLING METHOD:		2 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
LAIDLAW\RI-FS\MD WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		START / FINISH
	WATER LEVEL		TIME / TIME
	TIME		14:30 / 8:50
	DATE		DATE / DATE
NORTHING: 1068030.83 DATUM EASTING: 515809.45 ELEVATION 458.4	CASING DEPTH		3/9/95 / 3/10/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Wet to muddy sand adjacent to access road;
ANGLE VERTICAL BEARING	no vegetation.
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 2 5 7	1.2' / 2.0' (60%)			(6.0-15.6 Ft.) Firm, moderate yellowish brown (10YR 5/4), CLAYEY SILT, little fine sand, iron stained, laminated, NR, damp, (CL-ML), (LOESS) (442.8) 15.6	SP 8	
17					(15.6-17.6 Ft.) Firm, dark gray (N3), SILTY CLAY, damp, (CL), (LOESS)	SP 9	
					(440.8) 17.6		
18	1 3 3 4	2.0' / 2.0' (100%)			(17.6-18.0 Ft.) Stiff, olive gray (5Y 4/1), CLAY, little silt, NR, moist, (CL), (LOESS)		
19					(18.0-22.8 Ft.) Firm, olive gray (5Y 4/1), CLAYEY SILT, trace fine sand, NR, moist, (CL-ML), (LOESS)	SP 10	
20	hammer weight 2 4 4	1.7' / 2.0' (85%)					
21						SP 11	
22	2 2 2 3	1.5' / 2.0' (75%)			@ 22.0 Ft., becoming some fine sand		
23					(22.8-29.7 Ft.) Firm, light olive gray (5Y 5/2), CLAYEY SILT, iron stained, laminated, NR, moist, (CL-ML), (LOESS)	SP 12	
24	3 2 3 5	1.5' / 2.0' (75%)			@ 24.5-24.8 Ft., some sand, wet		
25					@ 25.2-25.4 Ft., some sand, wet	SP 13	
26	1 1 5 5	1.2' / 2.0' (60%)					
27					@ 27.2-29.7 Ft., wet @ 27.4-27.6 Ft., fine to medium sand layers	SP 14	
28	1 2 3 3	1.7' / 2.0' (85%)			@ 28.6-29.7 Ft., little sand		
29					(29.7-31.3 Ft.) Firm, medium dark gray (N4), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT DATE 3/9/95 CHK'D BY W. HERST

JOB NO.: 943-2808 FILENAME: PZ206SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW\RI-FS\MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068030.83
DATUM EASTING: 515809.45 ELEVATION 458.4

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					14:30	8:50
DATE					DATE	DATE
CASING DEPTH					3/9/95	3/10/95

BORING NO. PZ-206-SS

SHEET 3 OF 3

DRILLING

DRILL RIG CME 75 - TRUCK MOUNT

ANGLE VERTICAL BEARING

SAMPLE HAMMER

SURFACE CONDITIONS Wet to muddy sand adjacent to access road; no vegetation.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL		SAMPLER TYPE		REMARKS
31	1 4 12 16	1.8'/2.0' (90%)			(29.7-31.3 Ft.) Firm, medium dark gray (N4), CLAYEY SILT, NR, damp, (CL-ML), (LOESS) @ 31.1-31.3 Ft., wet	(427.1) 31.3	SP	16	
32	6 7 8	2.0'/2.0' (100%)			(31.3-36.9 Ft.) Compact to loose, moderate to dark yellowish brown (10YR 5/4-10YR 4/2), f-m SAND, trace silt, NR, wet, (SP), (ALLUVIAL)		SP	17	Split spoon wet
33									
34	0 2 4	2.0'/2.0' (100%)			@ 34.0 Ft., becoming medium sand		SP	18	Split spoon wet
35									
36	7 8 7	1.3'/2.0' (65%)			@ 35.9-36.9 Ft., SAND and CLAY				Add water to inside of augers to prevent sand blow
37	8					(421.5) 36.9	SP	19	
					(36.9-37.7 Ft.) Stiff, olive gray (5Y 4/1), CLAYEY f-m SAND, NR, MOIST, (SC), (ALLUVIAL)	(420.7) 37.7			
38	6 4 7	0.7'/2.0' (35%)			(37.7-41.1 Ft.) Stiff, olive gray (5Y 4/1), CLAYEY SILT, trace sand, laminated, NR, wet, (CL-ML), (LOESS)		SP	20	
39	11								
40	6 7 12 16	1.0'/2.0' (50%)							
41						(417.3) 41.1	SP	21	
					(41.1-43.0 Ft.) Compact, olive gray (5Y 4/1), fine SAND, trace silt, NR, wet, (SM), (ALLUVIAL)				
42	2 3 50/0"	0.7'/2.0' (35%)							
43						(415.4) 43.0	SP	22	Split spoon refusal at 43.0 feet; auger to 44.0 feet
					End of Soil Borehole Log at 43.0 Ft. See PZ-206-SS Record of Drillhole for rock descriptions				
44	50/1"	0.0'/1.0' (0%)					SP	23	Split spoon refusal at 44.0 feet

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT CHK'D BY W. HERST

DATE 3/9/95

JOB NO.: 943-2848

FILENAME: PZ206SS

RECORD OF DRILLHOLE PZ-206-SS

Sheet 1 of 8

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX: FR, SW, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): RT 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES, WATER LEVELS, INSTRUMENTATION
32	0.0-43.0 ft. See Soil Borehole Log PZ-206-SS														
34															
36															
38															
40															
42															
	415.40														
44	43.0-44.5 ft. 43.00 No samples collected														Advanced 4" diam. HW casing to 46.0 ft., begin coring on top of rubble at 44.5 ft.
	413.90		413.90												
46	44.5-51.7 ft. 44.50 Slightly weathered, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 44.5-46.1 ft. Some chlorite on broken surfaces		44.50	1	77%				J,I,SM,CL (2) J,I,SM						
48	47.7-49.4 ft. Moderately weathered, porous/ vuggy								J,U,SM,Fe J,I,SM,Fe						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-SS

Sheet 2 of 8

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	44.5-51.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		409.40	1	77%				Core Loss						Core loss due to fractured, weathered rock Core Run 1 at 11:55
			49.00						J,I,SM (6)						
50									J,PL,SM						
									J,I,R (2)						
	408.70								J,I,SM						
	51.7-52.7 ft. Completely weathered, thickly laminated, greenish gray (5GY 6/1), very fine grained, extremely weak, CLAYSTONE, (ST. LOUIS FORMATION) 51.70 406.10 52.30								J,I,SM,CL						
52									Core Loss						Core loss due to presence of weak claystone
	52.7-59.2 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)								J,I,R						
54	54.2-55.3 ft. Moderately weathered, very porous/vuggy, (<1-3 mm.)			2	96%										
									J,I,R						
56															
58			399.40												
	399.20		59.00												
	59.2-66.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 1-2 mm. calcite veins common, stylolitic, few zones showing up to 5 mm. vugs, little pyrite crystals, few Arenaceous Limestone beds throughout up to 10 mm.														End Core Run 2 at 14:10 4/5/95 @ 13:15 Begin coring Run 3
60									J,I,R						
				3	100 %				J,I,R						
62									J,I,R (2)						
									J,I,R						
64			394.40												4/5/95 @ 13:40 Begin coring Run 4
			64.00												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-SS

Sheet 3 of 8

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2846
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1060830.6
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (90 80 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, SW, MW, HW, CW)	STRENGTH INDEX (R5 R6, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (HT, R2 30, R3 150, R4 300, R5 600, R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64			394.40 64.00												4/5/95 @ 13:40 Begin coring Run 4
	64.5-67.3 ft. Small (up to 1 mm.), glauconite lenses, few pyrite veins <1 mm., but abundant crystals								J,I,CL (3) J,I,R						
									J,I,R						
66															
	66.5-68.5 ft. Fresh, thickly bedded, olive gray (5Y 4/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Abundant calcite crystals <1 mm.								J,I,R (2)						
68	66.6 ft. A large >20 mm. calcite crystals								J,I,R						
	68.5-70.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			4	100 %				J,I,CL						
									J,I,CL (2)						
70	Calcite crystals common, argillaceous partings observed 70.2-71.8 ft. Arenaceous Limestone with abundant calcity crystals														
	71.8-80.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Calcite crystals common, fossils present but not abundant, stylolitic, pyrite crystals and veins up to 1 mm. abundant								J,I,R						
72			384.40												
74			74.00						J,I,SM,CL						
									J,I,R						
									J,I,SM,CL						4/5/95 @ 14:25 Begin coring Run 5
									J,I,R (5)						
76															
				5	100 %				J,I,R (2)						
	77.3-77.8 ft. Argillaceous Limestone								J,I,SM,CL						
	77.8-78.1 ft. Chert nodules														
78									J,I,SM,CL (2)						
									J,I,R (2)						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/8/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	80.0-85.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained to microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Large calcite veins up to 12 mm., abundant pyrite crystals and veins up to 1 mm., argillaceous partings scattered throughout, stylolitic								J,I,R (2)						
82				5	150 %				J,I,SM,CL						
									J,I,SM,CL						
									J,I,R						
84			374.40 84.00												4/5/95 @ 15:24 Begin coring Run 6
86	85.0-87.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, calcite and pyrite veins present, trace of glauconite, few chert nodules								J,I,SM,CL (2)						
									J,I,R,CL						
88	87.5-89.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Calcite and pyrite crystals abundant, few calcite veins <1 mm.			6	100 %				J,I,R						
	89.5-93.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Calcite and pyrite crystals abundant, few calcite veins <1 mm.								J,I,R						
90									J,I,R,CL						
									J,I,R,CL						
92									J,I,CL (2)						
94	93.3-99.1 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, bioturbated, abundant calcite veins up to 1 mm., few pyrite crystals		364.40 94.00												4/5/95 @ 16:16 Begin coring Run 7
				7	100 %										
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 456.4
E: 515609.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infil, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	93.3-99.1 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, bioturbated, abundant calcite veins up to 1 mm., few pyrite crystals							90	J,I,R						
98															
100	99.1-102.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant argillaceous partings, calcite veins up to 10 mm., pyrite crystals scattered			7	100 %			90	J,I,R,CL						
								90	J,I,R						
102	102.5-105.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, calcite and pyrite crystals common, small <2 mm. vugs/porous, calcite veins <1 mm. scattered							90	J,I,R,CL						4/5/95 @ 17:00 Stop coring for the day
			354.40												
104			104.00												4/6/95 @ 8:13 Begin coring Run 8
	105.0-108.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, abundant calcite and pyrite veins up to 2 mm., fossiliferous, argillaceous partings common, few large crystals of calcite up to 8 mm.							90	J,I,R,CL (2)						
106				8	100 %			90	J,I,R						
								90	J,I,R						
								80	J,I,R,CL						
108	108.0-113.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic abundant calcite and pyrite veins, chert nodules common							90	J,I,R						4/6/95 @ 9:17 Begin coring Run 9
			349.40												
			109.00					90	J,I,SM,CL						
110	109.4-110.1 ft. Bed of bluish green, clayey material, foliated, intra-clasts of Limestone			9	97%			80	J,I,SM,CL						
								90	J,I,SM,CL (2)						
								90	J,I,R						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FT)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112															
	113.0-117.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Banded with fine to medium grained Limestone up to 8 mm. thick, calcite crystals and veins up to 1 mm. present, stylolites rare but present								J,I,SM,CL						
114									J,I,R,CL						
									J,I,R,CL						
				9	97%										
116															
	341.40														
	117.0-120.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, fossiliferous, pyrite and calcite veins common, oolitic, fossils are brachiopods and crinoids. Argillaceous partings from 119.0-119.7 ft.	117.00													117.0 ft. Inferred top of SALEM FORMATION encountered
118									J,I,R,CL						
			339.40												
			119.00												4/6/95 @ 10:23 Begin coring Run 10
									J,I,R,CL						
120															
	120.7-122.5 ft. Fresh, thickly bedded, olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Abundant argillaceous partings and calcite crystals, partings appear like spider form														
122				10	98%				J,I,R,CL						
	122.5-125.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (SALEM FORMATION) Beds of chert up to 60 mm., stylolitic, abundant argillaceous partings								J,I,R						
									J,I,R,CL						
124									J,I,R						
									J,I,R (2)						4/6/95 @ 11:05 Coring completed
	333.40		333.40												
	End of Record of Drillhole at 125.0 ft.	125.00	125.00												
126															
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

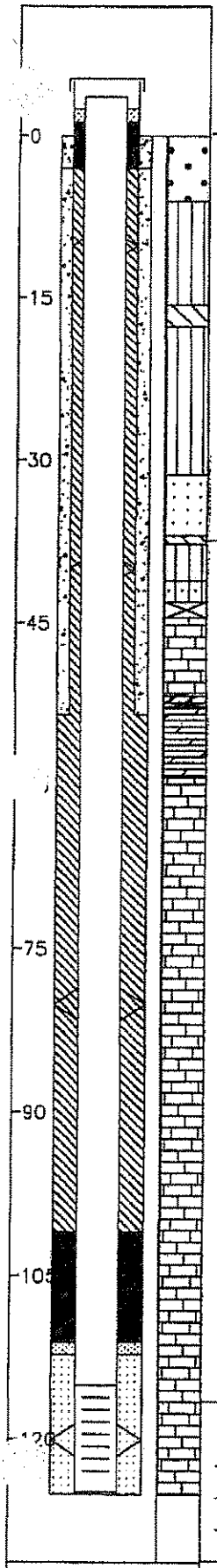
LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

Well No. PZ-206-SS

Boring No. X-Ref: PZ-206-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068031 ft. Easting: 515809 ft.

Elevation Ground Level 458.4 ft. NGVD

Top of PVC Casing 460.20 ft. NGVD

Drilling Summary:

Total Depth 125.5 ft.

Borehole Diameter 10 in. (0.0-52.0 ft.) 5 7/8 in. (52.0-125.5 ft.)

Casing Stickup Height 1.82 ft.

Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. and 10 1/4 in. ID Hollow Stem Auger Bits, NX Core, 5 7/8 in. and 10 in. Button Bits

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/9/95	14:30	3/10/95	11:05
Schramm Rotary	4/24/95	11:30	4/24/95	13:30
Geophys.Logging:				
Casing:				
2" PVC	4/24/95	13:45	4/24/95	14:02
6" Steel	3/27/95	9:30	3/23/95	10:15
Filter Placement:	4/24/95	14:00	4/24/95	14:15
Cementing:				
Development				
Bentonite Grout	4/24/95	14:20	4/24/95	15:30
Bentonite Seal	4/24/95	14:10	4/24/95	14:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.82	-	115.00	C1	460.20	-	343.38
115.00	-	124.80	S1	343.38	-	333.58
124.80	-	125.00	C2	333.58	-	333.38
+ 0.70	-	52.00	C3	459.10	-	406.38
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 112.2-125.5 ft.

Filter Pack: Less than 50 mesh Silica Sand, 111.1-112.2 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-101.0 ft., Neat cement, 3.0-52.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 101.0-111.1 ft.

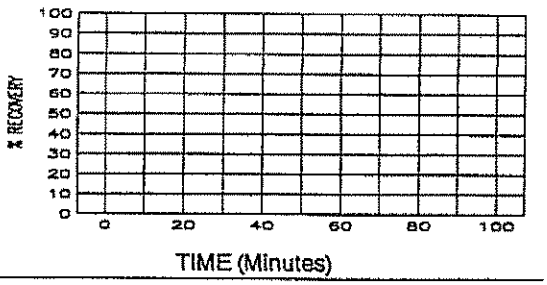
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by D. Alloway

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ206SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO 115096	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-206-55
SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO. ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC
TELEPHONE: 314-241-3710
ADDRESS: 1888 N. BROADWAY
CITY: ST. LOUIS
STATE: MO ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

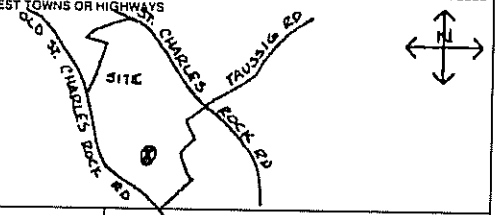
COUNTY: ST. LOUIS
ELEVATION: 458.4
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

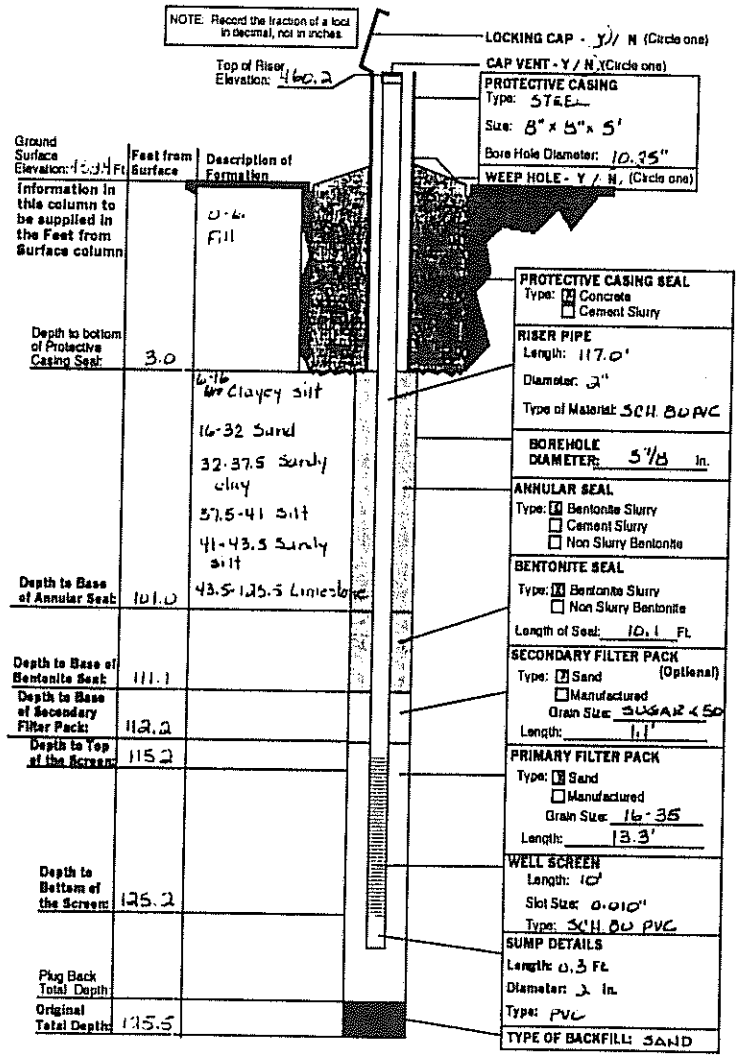
LAT. 38 ° 46 ' 00 " LONG. 90 ° 26 ' 40 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches



MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 460.20

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6¼ HSA [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 4 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-24-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Richard P. Vogt
PERMIT NUMBER: 001256WM1 DATE: 5-10-95
SIGNATURE (DRILLING CONTRACTOR): Richard P. Vogt
PERMIT NUMBER: 001256WM1 DATE: 5-10-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO DEPARTMENT OF NATURAL RESOURCES WITHIN 60 DAYS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1069644.67
DATUM EASTING: 516037.64 ELEVATION 461.9

DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

BORING NO. PZ-207-AS

SHEET 1 OF 3

DRILLING

START	FINISH
TIME 12:35	TIME 17:42
DATE 4/9/95	DATE 4/9/95

DRILL RIG CME 75 - TRUCK MOUNT

ANGLE VERTICAL BEARING NA

SAMPLE HAMMER 140 lbs.

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 50/6	0.0'/2.0' (0%)			(0.0-2.0 ft.) Concrete	SP (1)	
(459.9) 2.0							
2	11 10 7 6	1.1'/2.0' (55%)			(2.0-4.0 ft.) Very stiff, mottled, moderate yellowish brown (10YR 5/4) to dark greenish gray (5GY 4/1), SILT, NR, damp, (ML), (LOESS)	SP (2)	
(457.9) 4.0							
4	3 4 5 6	1.5'/2.0' (75%)			(4.0-5.8 ft.) Stiff, dark greenish gray (5GY 4/1), CLAYEY SILT, some fine Gravel, mottled, NR, damp, (CL-ML), (LOESS)	SP (3)	
(456.1) 5.8							
6	16 4 1 2	0.1'/2.0' (5%)			(5.8-12.0 ft.) Waste	SP (4)	
8	3 3 7 8	0.1'/2.0' (5%)				SP (5)	
10	5 2 4 23	0.3'/2.0' (15%)			below 9.5 ft., waste becomes wet	SP (6)	First water encountered @ 9.5 ft.
(449.9) 12.0							
12	4 14 18 3	0.7'/2.0' (35%)			(12.0-12.7 ft.) Hard, dark greenish gray (5GY 4/1), CLAY, trace fine Gravel, NR, wet, (CL), (FILL)	SP (7)	
(449.2) 12.7					(12.7-14.0 ft.) Waste		
14	4 6 1 4	0.0'/2.0' (0%)			(14.0-16.0 ft.) No Recovery	SP (8)	From 14.0-20.0 ft., no samples recovered, but drilling indicates waste

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 4/1/95

JOB NO.: 943-2848

FILENAME: PZ207AS

SOIL BOREHOLE LOG

LAIDLAW WASTE BYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-207-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START: TIME 12:35, DATE 4/9/95 — FINISH: TIME 17:42, DATE 4/9/95
DATUM NORTHING: 1069644.67 EASTING: 516037.64 ELEVATION 461.9		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE VERTICAL BEARING NA		
SAMPLE HAMMER 140 lbs.		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	3 1 5 7	0.0' 2.0' (0%)			(12.7-20.0 Ft.) Waste (16.0-18.0 Ft.) No Recovery	SP 8	
17						SP 9	
18	4 5 6 11	0.0' 2.0' (0%)			(18.0-20.0 Ft.) No Recovery	SP 10	
19							
20	6 5 5	1.0' 2.0' (50%)			(441.9) 20.0 (20.0-20.4 Ft.) Stiff, dark greenish gray (5GY 4/1), SILT, trace Fine Gravel, NR, wet, (ML), (FILL)	SP 11	
21	6				(441.5) 20.4 (20.4-20.6 Ft.) Loose, dark greenish gray (5GY 4/1), Fine SAND, NR, wet, (SW), (FILL)		
22	10 18 8 4	0.9' 2.0' (45%)			(441.3) 20.6 (20.6-22.0 Ft.) Waste (22.0-24.0 Ft.) No Recovery	SP 12	from 22.0-28.0 Ft., no samples recovered, but drilling indicates waste
23							
24	3 3 3 18	0.0' 2.0' (0%)			(24.0-26.0 Ft.) No Recovery	SP 13	
25							
26	30 31 14 5	0.0' 2.0' (0%)			(26.0-28.0 Ft.) No Recovery	SP 14	
27							
28	1 9 10 5	0.6' 2.0' (30%)			(433.9) 28.0 (28.0-32.0 Ft.) Firm to very stiff, greenish black (5G 4/1) to dusky blue-green (5BG 3/2), SILT, little Sand and Gravel, NR, wet, (ML), (FILL)	SP 15	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CISIO DATE 6/1/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ207AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
	4.25 inch I.D. Hollow Stem Auger					PZ-207-AS	
						SHEET	
	SAMPLING METHOD:					3 OF 3	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					12:35	17:42
	DATE					DATE	DATE
NORTHING: 1069644.67 DATUM EASTING: 516037.64 ELEVATION 461.9	CASING DEPTH					4/9/95	4/9/95

DRILL RIG CME 75 - TRUCK MOUNT — SURFACE CONDITIONS

ANGLE VERTICAL BEARING NA

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	4 1 4 4	0.1'/2.0' (5%)			(28.0-32.0 Ft.) Firm to very stiff, greenish black (5G 4/1) to dusky blue-green (5BG 3/2), SILT, little Sand and Gravel, NR, wet, (ML), (FILL)	SP (16)	
					(429.9) 32.0		
32	3 10 15 20	1.1'/2.0' (55%)			(32.0-40.0 Ft.) Very loose to compact, dark greenish gray (5GY 4/1), fine SAND, NR, wet, (SW), (ALLUVIUM)	SP (17)	
33							
34	10 8 18 15	1.3'/2.0' (65%)				SP (18)	
35							
36	0 0 0 0	2.0'/2.0' (100%)				SP (19)	
37							
38	1 4 5 7	0.5'/2.0' (25%)				SP (20)	
39							
					(421.9) 40.0		
40					End of Soil Borehole Log at 40.0 Ft.		
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

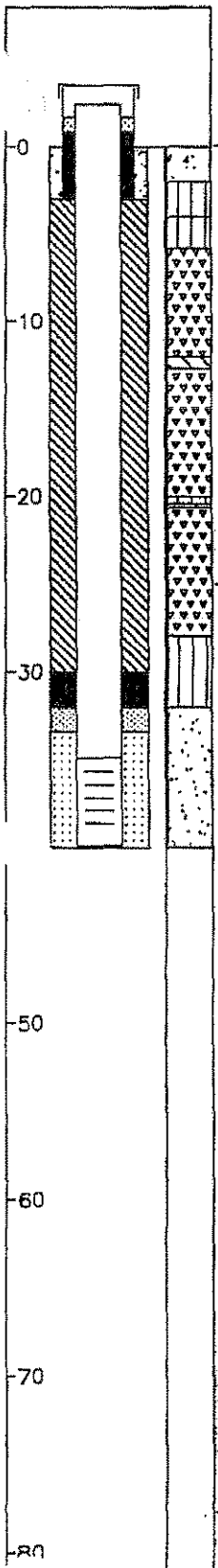
JOB NO.: 943-2848

FILENAME: PZ207AS

Well No. PZ-207-AS

Boring No. X-Ref: PZ-207-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1069645 ft. Easting: 516038 ft.

Elevation Ground Level 461.9 ft. NGVD

Top of PVC Casing 463.57 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.

Borehole Diameter 8 1/4 in.

Casing Stickup Height 1.69 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/9/95	12:35	4/9/95	17:45
Schramm Rotary				
Geophys.Logging:				
Casing:	4/10/95	9:45	4/10/95	10:00
Filter Placement:	4/10/95	10:00	4/10/95	10:17
Cementing:				
Development				
Bentonite Grout	4/10/95	10:35	4/10/95	11:10
Bentonite Seal	4/10/95	10:32	4/10/95	10:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.69	-	34.90	C1	463.57	-	428.98
34.90	-	39.70	S1	426.98	-	422.18
39.70	-	40.03	C2	422.18	-	421.85
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 33.4-40.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 32.0-33.4 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-20.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 20.0-32.0 ft.

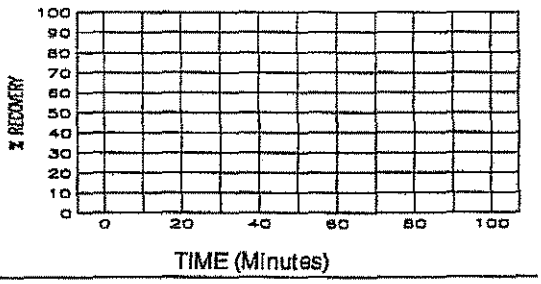
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by S. Cosio

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ207AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122486	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LANDFILL BRIDGETON SANITARY LANDFILL	PZ-207-AS

SITE ADDRESS	CITY	STATE	ZIP CODE
5300 CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LANDFILL MGMT SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1022 N BROADWAY	ST LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

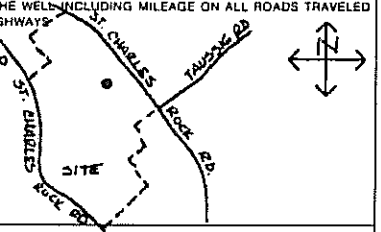
COUNTY ST. LOUIS
ELEVATION 460.7
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

LAT. 38 ° 46 ' 06 " LONG. 90 ° 26 ' 38 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
463.57

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 1 THRU
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-10-95

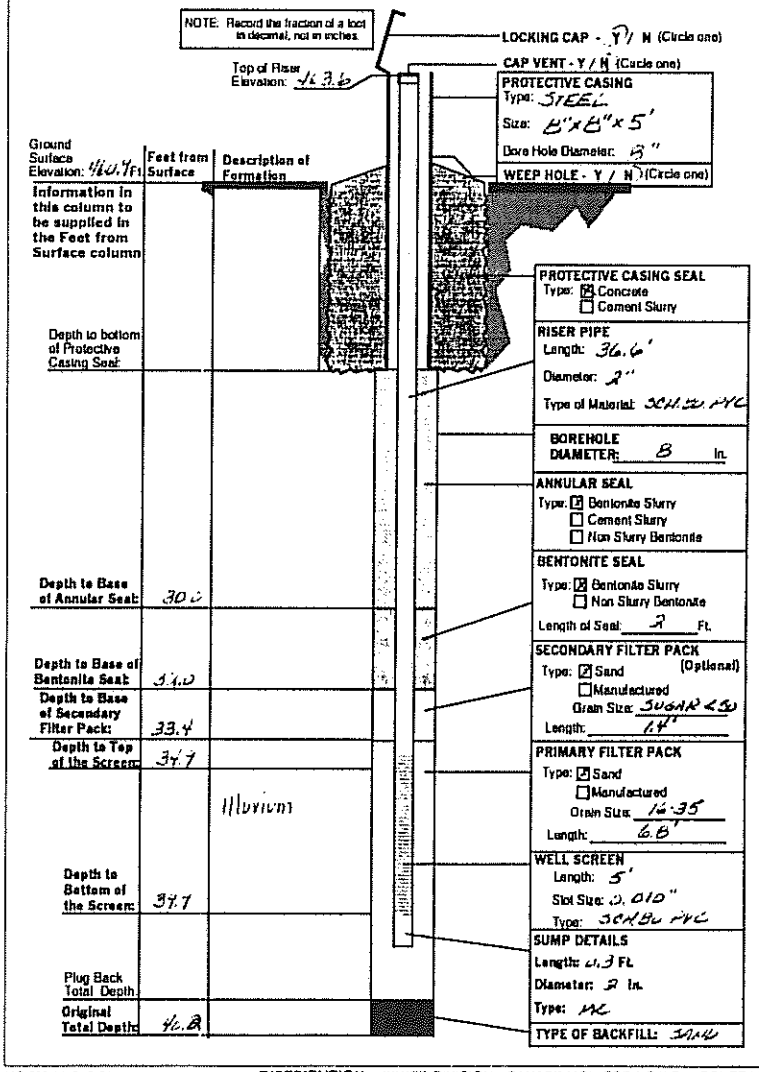
I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)

PERMIT NUMBER	DATE
001352 WMM	5-10-95

SIGNATURE (DRILLING CONTRACTOR)

PERMIT NUMBER	DATE
001358WMM	5-10-95



LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION: LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-208-SS
		SHEET 1 OF 2
	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
NORTHING: 1069219.14 DATUM EASTING: 517169.45 ELEVATION 472.5	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 8:15 / TIME 9:45 DATE 6/17/95 / DATE 6/17/95
DRILL RIG: CME 75 - TRUCK MOUNT	SURFACE CONDITIONS: Grass covered lawn	
ANGLE: BEARING:		
SAMPLE HAMMER:		

DRILLING CONTR: LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 3	1.1'/2.0' (55%)			(0.0-4.0 ft.) Firm, dark yellowish brown (10YR 4/2), SILT CLAY, trace organics consisting of fine roots, NR, damp, (CL), (TOPSOIL)	SP 1	
2	3 3 3	1.7'/2.0' (85%)			@ 2.0 ft., color changes to moderate yellowish brown (10YR 5/4)	SP 2	
3					(468.5) 4.0		
4	2 3 4	1.7'/2.0' (85%)			(4.0-7.5 ft.) Loose, moderate yellowish brown (10YR 5/4) to pale yellowish brown (10YR 6/2), CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP 3	
5	4						
6	3 4 5	0.9'/2.0' (45%)				SP 4	
7					(465.0) 7.5		
8	3 4 3	1.5'/2.0' (75%)			(7.5-15.0 ft.) Loose, pale yellowish brown (10YR 6/2), SILT, trace iron oxide staining, occasional thin, damp, fine sand seams (<1 1/2 in. thick), (ML), (LOESS)	SP 5	
9							
10	4 5 5	1.9'/2.0' (95%)				SP 6	
11							
12	1 8 10	0.5'/2.0' (25%)			From 12.0-14.0 ft., little fine sand throughout silt	SP 7	
13							
14	5 6 7 7	1.8'/2.0' (90%)				SP 8	

LOGGED BY: J. MILLER
DATE: 7/14/95
CHK'D BY: W. HERST

JOB NO.: 943-2848
FILENAME: PZ208SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1069219.14
DATUM EASTING: 517169.45 ELEVATION 472.5

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-208-SS

SHEET 2 OF 2

	DRILLING START	DRILLING FINISH
WATER LEVEL		
TIME	8:15	9:45
DATE	6/17/95	6/17/95
CASING DEPTH		

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE BEARING
SAMPLE HAMMER

SURFACE CONDITIONS Grass covered lawn

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	7 50	0.5' 1.0' (50%)			(15.0-17.0 Ft.) Compact, pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 6/2), fine SAND, trace Silt, trace iron oxide staining, NR, damp, (SP), (ALLUVIUM)	SP (8)	
					@ 16.0 Ft., fine sand becomes wet	SP (9)	
					(455.5) 17.0		
17					End of Soil Borehole Log at 17.0 Ft.		
					See PZ-208-SS Record of Drillhole For rock descriptions		
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER DATE 7/14/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ208SS

RECORD OF DRILLHOLE PZ-208-SS

Sheet 1 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 8/17/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517189.45
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	ROD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-17.0 ft. See Soil Borehole Log PZ-202-SS 17.0-17.4 ft. No samples collected		455.10												
	17.4-24.3 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1), fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossils		17.40												6/17/95 @ 10:15 Begain Run 1
18				1	100 %			0	J,I,R (4)						
								30	J,PL,SM						
			453.30												6/17/95 @ 10:30 End Run 1
			19.20					0	B,I,R (2)						
20								0	J,PL,SM,CL						
								0	J,PL,SM						
								0	J,PL,SM (3)						
								0	J,I,SM						
								30	J,I,SM,Fe						
22								0	J,I,R (3)						
								0	J,I,R						
								0	J,I,SM (4)						
								0	J,I,R (2)						
								0	J,I,SM,CL						
								0	J,I,R (2)						
24	24.3-59.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossiliferous zones			2	100 %			0	J,I,R,CL						
								0	J,I,R,CL (4)						
								0	J,I,R						
								0	J,I,R						
								0	J,I,R,CL (4)						
26								0	J,I,R,CL						
								0	J,I,R						
								0	J,I,SM,CL (2)						
								0	J,I,R (3)						
								0	J,I,R,CL (2)						
28								0	J,I,R,CL (2)						
								0	J,I,R						
			443.30												6/17/95 @ 11:00 End Run 2
	Below 29.2 ft. no fossils present		29.20					0	J,I,R,CL						
								0	J,P,SM,CL						
								0	J,I,R						
30								0	J,I,R						
								0	J,I,R,CL						
				3	100 %			0	J,I,R						
								0	J,I,R,CL (2)						
								0	J,I,SM,CL (4)						
								0	J,I,R,CL						
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/17/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517168.45
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, HW, MW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 10, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	24.3-59.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossiliferous zones Below 33.0 ft. Limestone becomes microcrystalline with intermittent zones that are very fine to fine crystalline							0	J,I,SM,CL						
								0	J,I,R						
								0	J,I,R,CL						
								0	J,I,R,CL						
34								0	J,I,R,CL (2)						
								0	J,I,R						
								0	J,I,R,CL						
								0	J,I,R,CL						
								0	J,I,R,CL						
								0	J,I,R						
				3	100 %			0	J,PL,SM,CL (3)						
36								0	J,I,R,CL (6)						
								0	J,U,SM,CL						
								0	J,I,SM,CL (5)						
38								0	J,PL,SM,CL (3)						
			433.30												6/17/95 @ 11:40
			39.20					0	J,I,R						End Run 3
								0	J,I,SM						
								0	J,C,SM						
40								0	J,I,R,Fe						
	40.7-41.5 ft. Moderately weathered zone							0	J,I,R,Fe						
								0	J,PL,SM,CL						
								0	J,PL,SM,CL						
42	42.4-46.7 ft. Intermittent dark gray (N3) chert nodules (1/2 to 2 in. dia.)														
				4	100 %			0	J,PL,R,Fe						
44								0	J,I,SM,Fe						
								0	J,PL,SM						
46								0	J,PL,SM						
	Below 46.5 ft. stylolites common							0	J,PL,SM (2)						
								0	J,I,R,CL						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-SS

Sheet 3 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/17/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1089219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: Dip wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R6 30, R5 150, R4 300, R3 600, R2 1500, R1)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	24.3-59.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossiliferous zones			4	100 %				J,I,R,CL						
			423.30												6/17/95 @ 12:40 End Run 4
			49.20						J,I,SM						
50									B,PL,SM						
									B,PL,SM						
									J,I,R,CL						
52															
54				5	100 %										
									J,PL,SM,CL						
56															
									B,PL,SM						
									J,C,SM,CL						
58															
			413.30												
			59.20												
60	59.8-65.9 ft. Moderately weathered, thickly bedded, dark yellowish orange (10YR 6/6), fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Heavy iron oxide staining								B,PL,SM,Fe						
				6	100 %										
62															
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-SS

Sheet 4 of 8

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/17/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	59.8-65.9 ft. Moderately weathered, thickly bedded, dark yellowish orange (10YR 6/6), fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Heavy iron oxide staining								B,I,R,Fe						
	65.4-65.7 ft. Very porous zone, open vugs, (<1 mm.), highly weathered								B,I,SM						
66	65.9-71.4 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic			6	100 %										
68									J,I,SM						
	@ 68.8 ft. Very stiff, greenish gray (5G 6/1), glauconite clay seam (~1/2 in.)		403.50 69.00												
70									J,I,R,CL J,U,SM,CL J,PL,SM,CL						
	71.4-74.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, BIOTURBATED LIMESTONE, (ST. LOUIS FORMATION) Glauconite clay seams surrounding Limestone pieces, Limestone														
72															
74				7	100 %				B,I,R,CL J,I,SM						
	74.8-76.8 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,I,R,CL J,PL,SM,CL						
76									J,I,R,CL						
	76.8-78.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								B,I,R,CL						
78									J,I,SM,CL (2) J,PL,SM,CL						
	78.5-84.5 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		393.50 79.00						B,PL,SM						6/17/95 @ 15:45 End Run 7
				8	100 %										
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-SS

Sheet 5 of 6

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/17/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1089219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.5-84.5 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
	81.5-83.0 ft. Low porosity zone, open vugs (<1 mm. dia.)														
82									B,PL,SM,CL						
	82.5-83.2 ft. Moderately weathered zone								J,PL,SM,CL						
									J,I,R,CL						
84															
				8	100 %										
	84.8-85.8 ft. Fresh, medium bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)														
86	85.8-92.8 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), very finely grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
	86.0-88.0 ft. Low porosity zone, intermittent zones with open vugs (<1 mm. - 2 m. dia.) with iron oxide staining														
88	@ 88.0 ft. Firm, clay seam (~1/2 in.)								B,I,SM,CL						6/17/95 @ 16:50 End Run 8
			383.50 / 88.00												
90															
92									B,PL,SM,CL						
				9	100 %										
	92.8-99.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)														
94	Slightly argillaceous, stylolitic														
	94.1-94.8 ft. Argillaceous Limestone layer														
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 843-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/17/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066218.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

Depth Scale (Feet)	DESCRIPTION	Graphic Log	Elev / Depth (Ft)	Run No.	Core Recovery	RQD	Fractures per Foot	Discontinuity Data: Dip wrt Core Axis	Discontinuity Data: Type and Surface Description	Graphic Log	Weathering Index	Strength Index	Point Load Index (psi)	Test Orientation	Notes: Water Levels, Instrumentation
96	92.8-99.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Slightly argillaceous, stylolitic														
98	98.0-99.0 ft. Limestone becomes coarsely crystalline			9	100 %				B,PL,SM,CL						
			373.50												6/17/95 @ 17:40 Coring completed
	End of Record of Drillhole at 99.0 ft.		99.00												
100															
102															
104															
106															
108															
110															
112															

Weathering Index: SW FR, MW, HW, CW
Strength Index: R5, R4, R3, R2, R1
Point Load Index (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6
Test Orientation: R6

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

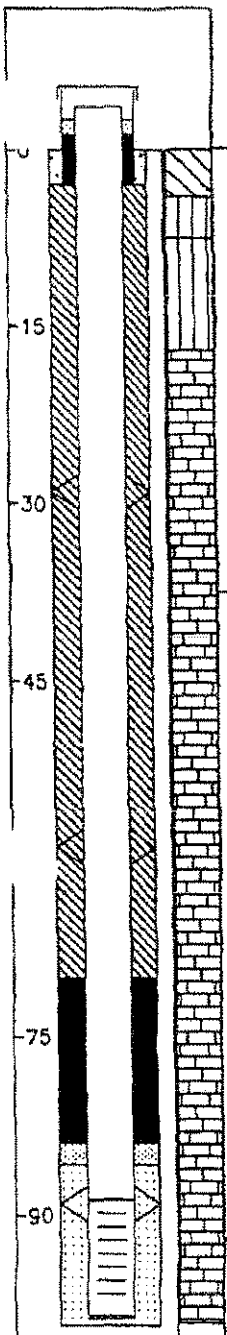
LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

Well No. PZ-208-SS

Boring No. X-Ref: PZ-208-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1069219 ft. Easting: 517169 ft.

Elevation Ground Level 472.5 ft. NGVD

Top of PVC Casing 474.25 ft. NGVD

Drilling Summary:

Total Depth 99.2 ft.

Borehole Diameter 10 1/4 in. (0.0-17.0 ft.) 5 7/8 in. (17.0-99.2 ft.)

Casing Stickup Height 1.72 ft.

Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	6/17/95	8:15	6/17/95	17:35
Schramm Rotary	6/18/95	8:50	6/18/95	10:00
Geophys.Logging:				
Casing:	6/18/95	10:10	6/18/95	10:20
Filter Placement:	6/18/95	10:30	6/18/95	10:55
Cementing:				
Development				
Bentonite Grout	6/18/95	11:15	6/18/95	14:00
Bentonite Seal	6/18/95	11:05	6/18/95	11:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.72	-	88.70	C1	474.25	-	383.83
88.70	-	98.50	S1	383.83	-	374.03
98.50	-	98.83	C2	374.03	-	373.70
	-				-	
	-				-	
	-				-	

Casing: C1 2 ft. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 ft. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 85.65-99.2 ft.

Filter Pack: Less than 50 mesh Silica Sand, 83.90-85.65 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-70.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 70.0-83.90 ft.

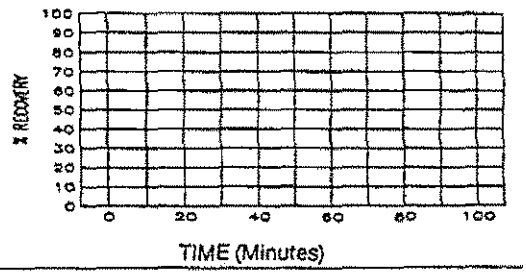
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ208SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122514	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LANDFILL BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-208-SS

SITE ADDRESS: ST. CHARLES ROCK RD | CITY: BRIDGETON | STATE: MO | ZIP CODE: 63044

NAME: LANDFILL WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710

ADDRESS: 135 N. BROADWAY | CITY: ST. LOUIS | STATE: MO | ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

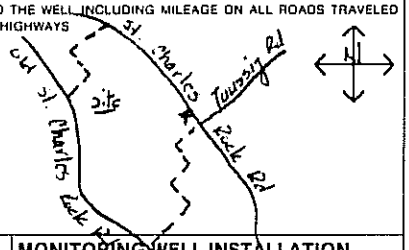
COUNTY: St. Louis
ELEVATION: 472.23
AREA NO.:

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG 5 (E) OR W

LAT. 38° 46' 12" LONG. 90° 26' 22"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 474.25

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6¼ HSA [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 3 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS

SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 6-18-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

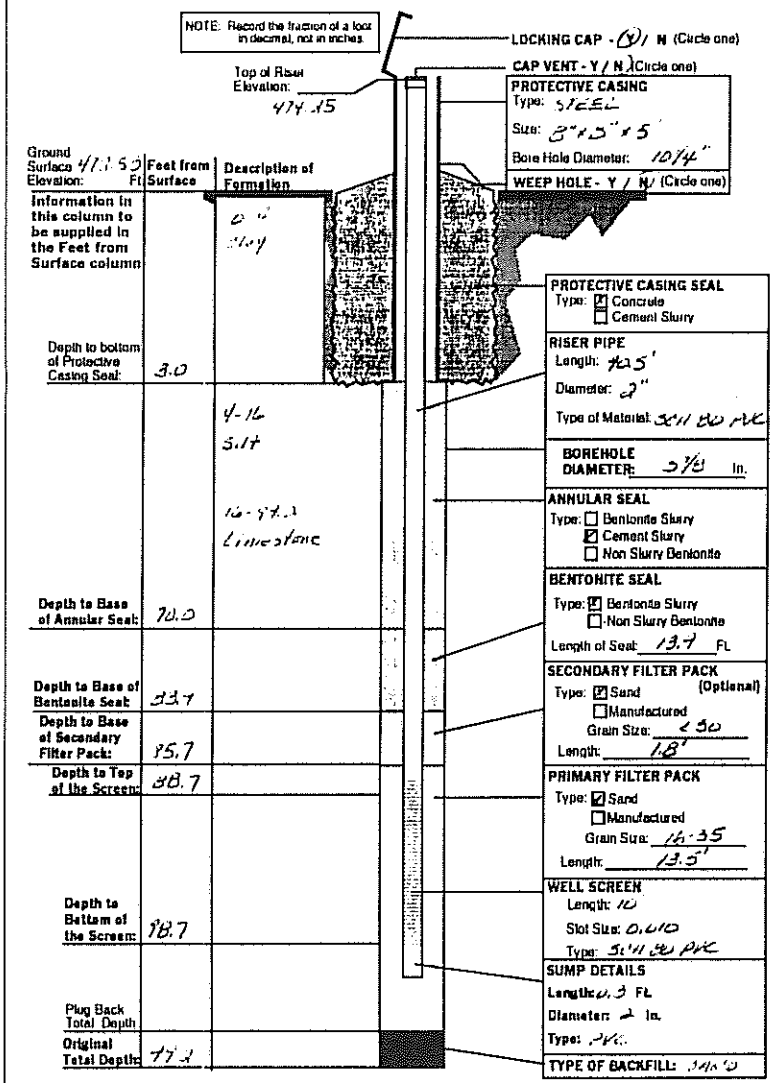
SIGNATURE (MONITORING WELL CONTRACTOR): Michael J. Vogt

PERMIT NUMBER	DATE
001256 MW1	7-07-95

SIGNATURE (DRILLING CONTRACTOR): Michael J. Vogt

PERMIT NUMBER	DATE
001256 MW1	7-07-95

NOTE: Record the fraction of a foot in decimal, not in inches.



HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SS

Rock Log

Local Site Coordinates: 1067071.07 N, 517108.12 E Ground Surface Elevation: 487.38

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
0.0	**0.0 to 135.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	Blind-drilled from 0 - 135 ft; no samples collected. 0 - 60 ft drilled via air rotary. O_2 (%), methane (%LEL), and VOCs (ppm) monitored at borehole. 20.9% O_2, 0% LEL, 0 ppm.
5.0										59.1	
10.0										58.7	20.9% O_2, 0% LEL, 0 ppm.
15.0										58.7	
20.0										58.7	20.9% O_2, 0% LEL, 0 ppm.
25.0										58.5	
30.0										58.5	20.9% O_2, 0% LEL, 0 ppm.
35.0										58.5	
40.0										58.2	20.9% O_2, 0% LEL, 0 ppm.
45.0										58.0	Competent bedrock encountered.
50.0										57.9	

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helper: Rob Underwood

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SS

Rock Log

Local Site Coordinates: 1067071.07 N, 517108.12 E Ground Surface Elevation: 487.38

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
50.0	**0.0 to 135.0 ft.** - Blind drilled. No sample collected.									57.9	Set temporary 12-in. D casing 5 ft into bedrock. Continued drilling through casing. 20.9% O_2, 0% LEL, 0 ppm.
55.0										57.6	
60.0										57.4	Switched to sonic drilling. 20.9% O_2, 0% LEL, 0 ppm..
65.0										57.4	
70.0										57.4	
75.0										57.1	
80.0										57.1	20.9% O_2, 0% LEL, 0 ppm.
85.0										57.1	
90.0										56.9	
95.0										56.9	
100.0										56.7	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SS

Rock Log

Local Site Coordinates: 1067071.07 N, 517108.12 E Ground Surface Elevation: 487.38

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
100.0	**0.0 to 135.0 ft.** - Blind drilled. No sample collected.									56.7	20.9% O_2, 0% LEL, 0 ppm.
105.0										56.5	
110.0										56.5	
115.0										56.2	
120.0										56.2	20.9% O_2, 0% LEL, 0 ppm.
125.0										56.2	
130.0										56.0	
135.0										56.0	

Change in scale see sheet 4 of 5

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SS

Rock Log

Local Site Coordinates: 1067071.07 N, 517108.12 E Ground Surface Elevation: 487.38

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
135.0											
	135.0 to 136.0 ft. - LIMESTONE, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1) with pale yellowish brown (10YR 6/2), very light gray, (N9) and medium dark gray (N4) mottling; light bluish gray (5B 7/1) banding. Microcrystalline; massive; competent. Requires multiple hammer blows to fracture, but easily scratched with knife. Reactive with with 10% HCl solution.		1 of 2	4.8/5.0	4.8/4.8	0		FR	R4	56.0	20.9% O_2, 0% LEL, 0 ppm.
136.0											
	136.0 to 137.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1), light olive gray (5Y 6/1), light gray (N7), and medium gray (N5).					0		FR	R4	56.0	
137.0											
	137.0 to 138.0 ft. - LIMESTONE, as above, but laminated beginning at 137.6 ft. Large number of mechanical breaks from 137.7 - 138.8 ft.					0		FR	R3 to R4	56.0	
138.0											
	138.0 to 139.0 ft. - LIMESTONE, as above, but massive beginning at 138.8 ft.					0		FR	R3 to R4	56.9	
139.0											
	139.0 to 140.0 ft. - LIMESTONE, as above, with greenish-gray (5G 8/1) mottling.					0		FR	R4	56.9	
140.0										55.7	20.9% O_2, 0% LEL, 0 ppm.
	140.0 to 141.0 ft. - LIMESTONE, light olive gray (5Y 6/1) and greenish gray (5GY 6/1) with yellowish gray (5Y 8/1) and olive gray (5Y 4/1) mottling. With faint grayish orange (10YR 7/4) staining. Microcrystalline; massive; competent. Requires multiple hammer blows to fracture, but easily scratched with knife. Reactive with with 10% HCl solution.		2 of 2	9.9/10.0	9.9/9.9	0		FR to SW	R4		
141.0											
	141.0 to 142.0 ft. - LIMESTONE, as above, but laminated from 141.7 - 142 ft.					0		FR to SW	R4		
142.0											
	142.0 to 143.0 ft. - LIMESTONE, as above, but microcrystalline to fine-grained. Large number of mechanical breaks from 142.4 - 142.6 ft.					0		FR to SW	R3		
143.0											
	143.0 to 144.0 ft. - LIMESTONE, as above, but dark gray (N3), light olive gray (5Y 6/1), and greenish gray (5GY 6/1)					0		FR to SW	R4		
144.0											
	144.0 to 145.0 ft. - LIMESTONE, as above, but medium gray (N5) and light olive gray (5Y 6/1). No staining.					0		FR	R4		
145.0										56.0	

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SS

Rock Log

Local Site Coordinates: 1067071.07 N, 517108.12 E Ground Surface Elevation: 487.38

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

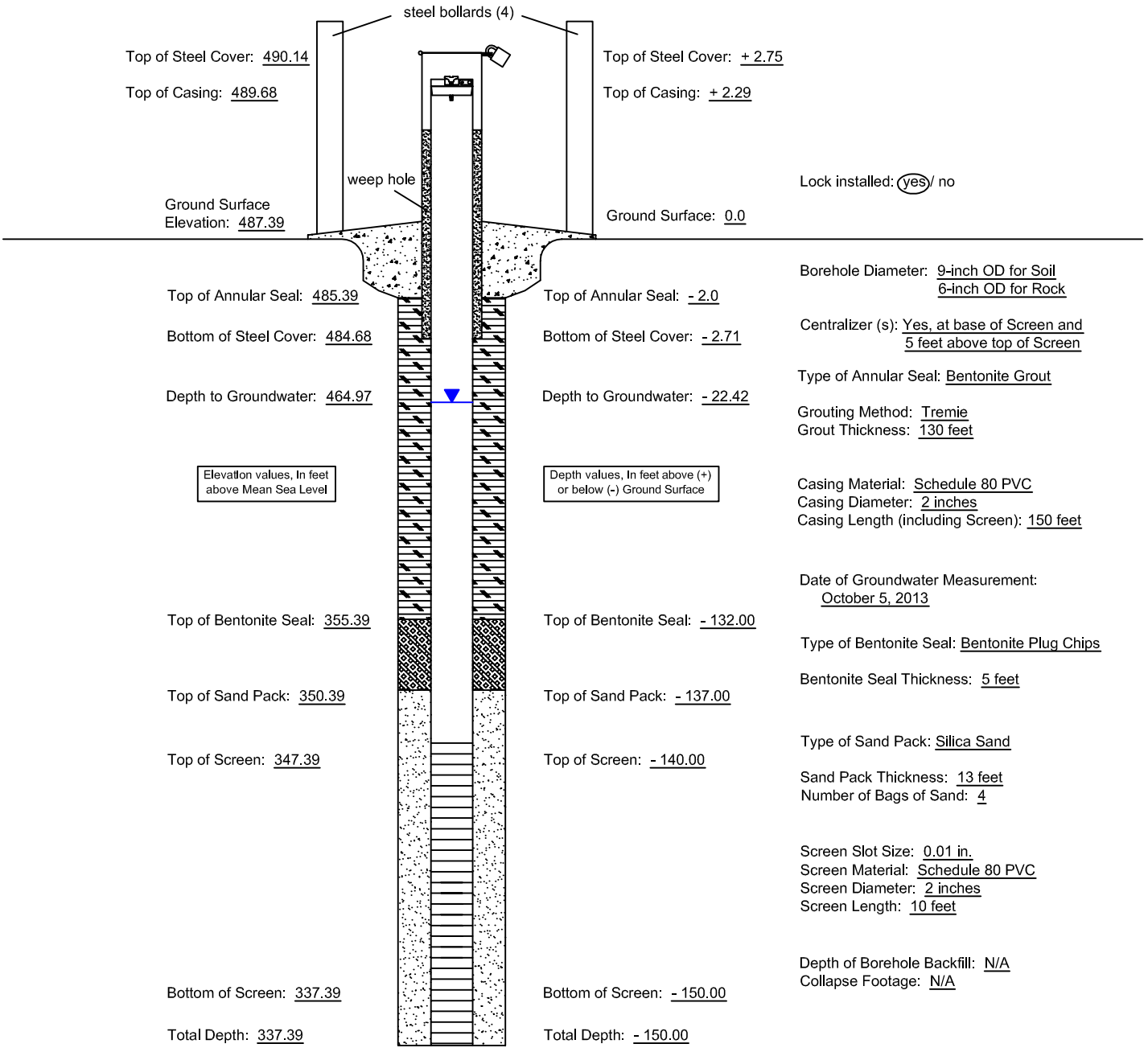
Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
145.0										56.0	
	145.0 to 146.0 ft. - LIMESTONE, as above.					0		FR	R4		
146.0											
	146.0 to 147.0 ft. - LIMESTONE, as above, but microcrystalline.					0		FR	R4		
147.0											
	147.0 to 148.0 ft. - LIMESTONE, as above.					0		FR	R4		
148.0											
	148.0 to 149.0 ft. - LIMESTONE, as above.					0		FR	R4		
149.0											
	149.0 to 150.0 ft. - LIMESTONE, as above.					0		FR	R4		≤20.3% O_2, ≤6.3% LEL, ≤9.8 ppm. Readings fluctuating rapidly.
150.0										56.0	
											Boring Depth: 150 ft. bgs.
151.0											
152.0											
153.0											
154.0											
155.0											

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

Well Coordinates:
N 1067071.541
E 517108.567

Drilling Contractor: Frontz Drilling
Lead Driller: Rob Hamilton
Drilling Dates: October 5, 2013



Top of Steel Cover: 490.14
Top of Casing: 489.68
Ground Surface Elevation: 487.39

Top of Steel Cover: + 2.75
Top of Casing: + 2.29
Ground Surface: 0.0

Lock installed: (yes) / no

Top of Annular Seal: 485.39
Bottom of Steel Cover: 484.68
Depth to Groundwater: 464.97

Top of Annular Seal: - 2.0
Bottom of Steel Cover: - 2.71
Depth to Groundwater: - 22.42

Elevation values, In feet above Mean Sea Level

Depth values, In feet above (+) or below (-) Ground Surface

Top of Bentonite Seal: 355.39
Top of Sand Pack: 350.39
Top of Screen: 347.39

Top of Bentonite Seal: - 132.00
Top of Sand Pack: - 137.00
Top of Screen: - 140.00

Bottom of Screen: 337.39
Total Depth: 337.39

Bottom of Screen: - 150.00
Total Depth: - 150.00

(Not to Scale)

Borehole Diameter: 9-inch OD for Soil
6-inch OD for Rock

Centralizer (s): Yes, at base of Screen and 5 feet above top of Screen

Type of Annular Seal: Bentonite Grout

Grouting Method: Tremie
Grout Thickness: 130 feet

Casing Material: Schedule 80 PVC
Casing Diameter: 2 inches
Casing Length (including Screen): 150 feet

Date of Groundwater Measurement:
October 5, 2013

Type of Bentonite Seal: Bentonite Plug Chips

Bentonite Seal Thickness: 5 feet

Type of Sand Pack: Silica Sand

Sand Pack Thickness: 13 feet
Number of Bags of Sand: 4

Screen Slot Size: 0.01 in.
Screen Material: Schedule 80 PVC
Screen Diameter: 2 inches
Screen Length: 10 feet

Depth of Borehole Backfill: N/A
Collapse Footage: N/A

4631 North St. Peters Parkway
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

Bridgeton Landfill
Bridgeton, Missouri

PZ-209-SS
As-Built Diagram

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM
MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REFERENCE NO	
C R NO	CHECK NO
STATE WELL NUMBER	REVENUE NO
ENTERED Ph1 Ph2 Ph3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR
NOTE: THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME: Republic Services
CONTACT NAME: Bryan Sehie
VARIANCE GRANTED BY DNR NUMBER:
OWNER ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Bridgeton Sanitary Landfill
WELL NUMBER: PZ-209-55
COUNTY: Saint Louis
SITE ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATIC WATER LEVEL: 29.75

SURFACE COMPLETION
TYPE: ☑ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH AND DIAMETER OF SURFACE COMPLETION: LENGTH 2.5 FT. DIAMETER 5 IN.
DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: DIAMETER 5 IN. LENGTH 2.5 FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE ☐ OTHER

LOCATION OF WELL (D/M/S FORMAT ONLY)
LAT. 38 · 45 · 51.1 "
LONG. 90 · 26 · 24.4 "

SMALLEST ¼ LARGEST ¼ ¼
SECTION ____ TOWNSHIP 47 NORTH
RANGE 5 ☑ EAST ☐ WEST

MONITORING FOR: (CHECK ALL THAT APPLY)
☑ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☐ METALS ☑ VOC
☑ SVOCS ☐ PESTICIDES/HERBICIDES

PROPOSED USE OF WELL
☐ GAS MIGRATION WELL ☑ OBSERVATION
☐ EXTRACTION WELL ☐ OPEN HOLE
☐ PIEZOMETERS ☐ INJECTION WELL
☐ DIRECT PUSH

☑ LOCKING CAP
☑ WEEP HOLE

ELEVATION 489.27 FT.

ANNULAR SEAL
LENGTH 130 FT.
☑ SLURRY ☐ CHIPS
☐ PELLETS ☐ GRANULAR
☐ CEMENT/SLURRY
IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG 250 GAL.

SECONDARY FILTER PACK
LENGTH 0 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK 137 FT.

LENGTH OF PRIMARY FILTER PACK 13 FT.

SURFACE COMPLETION
☑ STEEL ☐ ALUMINUM ☐ PLASTIC

RISER
RISER PIPE DIAMETER 2 IN.
RISER PIPE LENGTH 142 FT.
DIAMETER OF DRILL HOLE 6 IN.
WEIGHT OR SDR# Sch 80
MATERIAL: ☐ STEEL ☑ THERMOPLASTIC (PVC) ☐ OTHER

BENTONITE SEAL
LENGTH 5 Foot
☑ CHIPS ☐ PELLETS ☐ GRANULAR ☐ SLURRY
☑ SATURATED ZONE ☐ HYDRATED

SCREEN
SCREEN DIAMETER 2 IN.
SCREEN LENGTH 10 FT.
DIAMETER OF DRILL HOLE 6 IN.
DEPTH TO TOP 140 FT.
SCREEN MATERIAL: ☐ STEEL ☑ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH TO	DEPTH FROM	FORMATION DESCRIPTION
0'	45'	Silty Clay
45'	150'	Limestone

TOTAL DEPTH: 150 Foot

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE & SIZE OF ALL CASING, HOLE DIAMETER & GROUT USED.

SIGNATURE (PRIMARY CONTRACTOR): [signature]
PERMIT NUMBER: 003839 M
DATE WELL DRILLING WAS COMPELTED: 10-5-13

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. ☐ PUMP INSTALLED

SIGNATURE (WELL DRILLER): [signature]
PERMIT NUMBER: 003456-M
SIGNATURE (OF APPRENTICE):
APPRENTICE PERMIT NUMBER:

MO 780-1415 (07-11)
DISTRIBUTION: WHITE/DIVISION CANARY/CONTACTOR PINK/OWNER
RETURN WHITE COPY WITH APPROPRIATE FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SD

Rock Log

Local Site Coordinates: 1067075.74 N, 517103.75 E Ground Surface Elevation: 487.24

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 2-4, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
0.0	**0.0 to 235.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	Blind-drilled from 0 - 235 ft; no samples collected. 0 - 80 ft drilled via air rotary. O_2 (%), methane (%LEL), and VOCs (ppm) monitored at borehole. 20.6% O_2, 0% LEL, 0 ppm.
5.0										59.9	
10.0										59.6	20.6% O_2, 0% LEL, 0 ppm.
15.0										59.6	
20.0										59.6	20.6% O_2, 0% LEL, 0 ppm.
25.0										59.4	
30.0										59.4	20.6% O_2, 0% LEL, 0 ppm.
35.0										59.1	
40.0										59.1	20.6% O_2, 0% LEL, 0 ppm.
45.0										59.1	Competent bedrock encountered.
50.0										59.1	

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt & Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SD

Rock Log

Local Site Coordinates: 1067075.74 N, 517103.75 E Ground Surface Elevation: 487.24

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 2-4, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
50.0	**0.0 to 235.0 ft.** - Blind drilled. No sample collected.									59.1	Set temporary 8-in. D casing 5 ft into bedrock. Continued drilling through casing.
55.0										58.7	
60.0										58.7	20.9% O_2, 0% LEL, 0 ppm.
65.0										58.7	
70.0										58.7	20.9% O_2, 0% LEL, 0 ppm.
75.0										58.5	
80.0										58.5	Very difficult drilling from 80 to 100 feet, driller switched to Sonic rest of way. 20.9% O_2, 0% LEL, 0 ppm.
85.0										58.5	
90.0										58.5	
95.0										58.5	
100.0										58.5	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt & Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SD

Rock Log

Local Site Coordinates: 1067075.74 N, 517103.75 E Ground Surface Elevation: 487.24

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 2-4, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
100.0	**0.0 to 235.0 ft.** - Blind drilled. No sample collected.									58.5	20.9% O_2, 0% LEL, 0 ppm.
105.0										58.5	
110.0										58.5	
115.0										58.5	
120.0										58.5	20.9% O_2, 0% LEL, 0 ppm..
125.0										58.5	
130.0										58.2	
135.0										58.2	
140.0										58.0	20.9% O_2, 0% LEL, 0 ppm.
145.0										58.0	
150.0										58.0	

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SD

Rock Log

Local Site Coordinates: 1067075.74 N, 517103.75 E Ground Surface Elevation: 487.24

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 2-4, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
150.0	**0.0 to 235.0 ft.** - Blind drilled. No sample collected.									58.0	
155.0										57.9	
160.0										57.9	20.9% O_2, 0% LEL, 0 ppm.
165.0										57.6	
170.0										57.6	
175.0										57.6	
180.0										57.6	20.9% O_2, 0% LEL, 0 ppm.
185.0										57.4	
190.0										57.4	
195.0										57.4	
200.0										57.4	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt & Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SD

Rock Log

Local Site Coordinates: 1067075.74 N, 517103.75 E Ground Surface Elevation: 487.24

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 2-4, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
200.0	**0.0 to 235.0 ft.** - Blind drilled. No sample collected.									57.4	20.9% O_2, 0% LEL, 0 ppm.
205.0										57.4	
210.0										57.1	
215.0										56.9	
220.0										56.9	20.9% O_2, 0% LEL, 0 ppm.
225.0										56.7	
230.0										56.2	
235.0										56.2	20.9% O_2, 0% LEL, 0 ppm.

Change in scale see sheet 6 of 7

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SD

Rock Log

Local Site Coordinates: 1067075.74 N, 517103.75 E Ground Surface Elevation: 487.24

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 2-4, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
235.0										56.2	20.9% O_2, 0% LEL, 0 ppm.
	235.0 to 236.0 ft. - LIMESTONE, medium gray (N6). Medium-grained; massive; competent; fresh.		1 of 2	5.0/5.0	4.5/5.0	0		FR	R5		
236.0						0		FR	R5		
237.0						0		FR	R5		
238.0						1	85°, PL	FR	R5		
	238.0 to 239.0 ft. - LIMESTONE, as above, 238.3 to 238.4 ft but more fossilized. 238.4 to 240.0 ft, gray (N5). Medium-grained; thinly to intensely bedded; competent, fresh.										
239.0						0		FR	R5		
240.0										55.7	20.9% O_2, 0% LEL, 0 ppm.
	240.0 to 241.0 ft. - LIMESTONE, as above.		2 of 2	10.0/10.0	7.2/10.0	0		FR	R5		
241.0						0		FR	R5		
242.0						0		FR	R5		
243.0						0		FR	R5		
244.0						0		FR	R5		
245.0										55.6	

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-209-SD

Rock Log

Local Site Coordinates: 1067075.74 N, 517103.75 E Ground Surface Elevation: 487.24

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 2-4, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

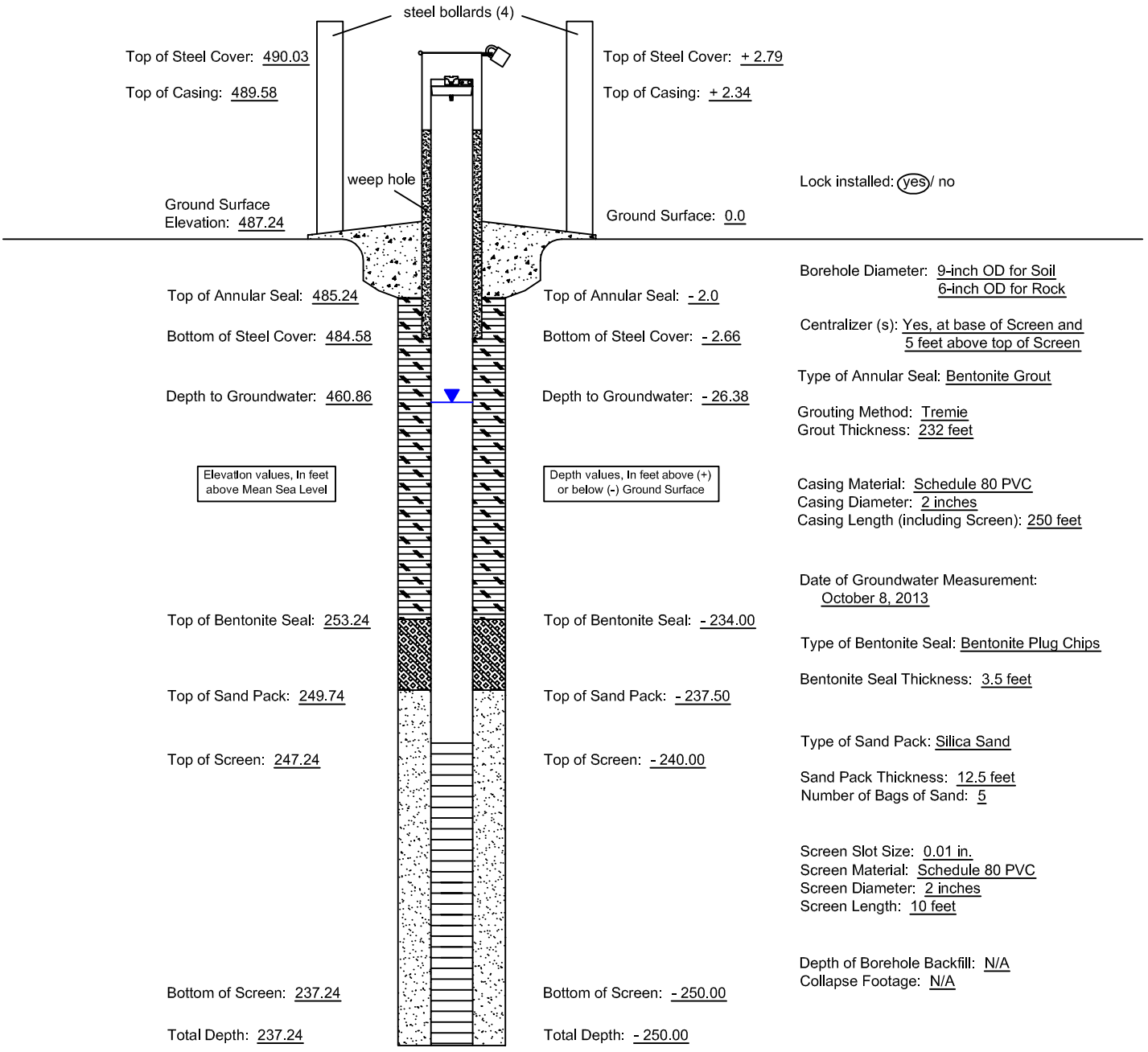
Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
245.0										55.6	
246.0						0		FR	R5		
247.0						1	45°, PL	FR	R5		
248.0						0		FR	R5		
249.0	**248.0 to 249.0 ft.** - LIMESTONE, as above, but thinly bedded.					0		FR	R5		
250.0						0		FR	R5	55.4	20.9% O_2, 0% LEL, 0 ppm.
251.0											**Boring Depth: 250 ft. bgs.**
252.0											
253.0											
254.0											
255.0											

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett, Herst & Associates, Inc.

LIMESTONE

Well Coordinates:
N 1067075.739
E 517104.415

Drilling Contractor: Frontz Drilling
Lead Driller: Rob Hamilton
Drilling Dates: October 4, 2013



Elevation values, In feet above Mean Sea Level

Depth values, In feet above (+) or below (-) Ground Surface

(Not to Scale)

Lock installed: (yes) / no

Borehole Diameter: 9-inch OD for Soil
6-inch OD for Rock

Centralizer (s): Yes, at base of Screen and 5 feet above top of Screen

Type of Annular Seal: Bentonite Grout

Grouting Method: Tremie
Grout Thickness: 232 feet

Casing Material: Schedule 80 PVC
Casing Diameter: 2 inches
Casing Length (including Screen): 250 feet

Date of Groundwater Measurement: October 8, 2013

Type of Bentonite Seal: Bentonite Plug Chips

Bentonite Seal Thickness: 3.5 feet

Type of Sand Pack: Silica Sand

Sand Pack Thickness: 12.5 feet
Number of Bags of Sand: 5

Screen Slot Size: 0.01 in.
Screen Material: Schedule 80 PVC
Screen Diameter: 2 inches
Screen Length: 10 feet

Depth of Borehole Backfill: N/A
Collapse Footage: N/A

4631 North St. Peters Parkway
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

Bridgeton Landfill
Bridgeton, Missouri

PZ-209-SD
As-Built Diagram

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM
MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REFERENCE NO	
C.R. NO	CHECK NO
STATE WELL NUMBER	REVENUE NO.
ENTERED Ph1 Ph2 Ph3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR
NOTE: THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME: Repulic Seruices
CONTACT NAME: Bryan Sehie
VARIANCE GRANTED BY DNR NUMBER:
OWNER ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Bridgeton Sanitary Landfill
WELL NUMBER: PZ-209-SD
COUNTY: Saint Louis
SITE ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATIC WATER LEVEL: 27.09

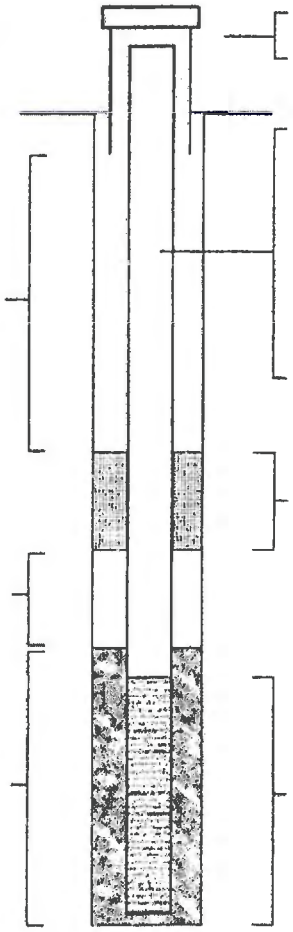
SURFACE COMPLETION
TYPE: ☑ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH AND DIAMETER OF SURFACE COMPLETION: LENGTH 2.5 FT. DIAMETER 5 IN.
DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: DIAMETER 5 IN. LENGTH 2.5 FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE ☐ OTHER

LOCATION OF WELL (D/M/S FORMAT ONLY)
LAT. 38 · 45 · 51.2 "
LONG. 90 · 26 · 24.4 "

SMALLEST ¼ LARGEST ¼ ¼
SECTION ____ TOWNSHIP 47 NORTH
RANGE 5 ☑ EAST ☐ WEST

MONITORING FOR: (CHECK ALL THAT APPLY)
☑ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☑ METALS ☑ VOC
☑ SVOCS ☑ PESTICIDES/HERBICIDES

PROPOSED USE OF WELL
☐ GAS MIGRATION WELL ☑ OBSERVATION
☐ EXTRACTION WELL ☐ OPEN HOLE
☐ PIEZOMETERS ☐ INJECTION WELL
☐ DIRECT PUSH



☑ LOCKING CAP
☑ WEEP HOLE
ELEVATION 487.27 FT.

ANNULAR SEAL
LENGTH 234 FT.
☑ SLURRY ☐ CHIPS
☐ PELLETS ☐ GRANULAR
☐ CEMENT/SLURRY
IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG 440 GAL.

SECONDARY FILTER PACK
LENGTH 6 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK 238 FT.

LENGTH OF PRIMARY FILTER PACK 12 FT.

SURFACE COMPLETION
☑ STEEL ☐ ALUMINUM ☐ PLASTIC

RISER
RISER PIPE DIAMETER 2 IN.
RISER PIPE LENGTH 242 FT.
DIAMETER OF DRILL HOLE 6 IN.
WEIGHT OR SDR# Sch 80

MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

BENTONITE SEAL
LENGTH 2 Foot
☑ CHIPS ☐ PELLETS ☐ GRANULAR
☐ SLURRY
☑ SATURATED ZONE ☐ HYDRATED

SCREEN
SCREEN DIAMETER 2 IN.
SCREEN LENGTH 10 FT.
DIAMETER OF DRILL HOLE 6 IN.
DEPTH TO TOP 240 FT.

SCREEN MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

DEPTH TO	DEPTH FROM	FORMATION DESCRIPTION
0'	45'	Silty Clay
45'	250'	Limestone

TOTAL DEPTH: 250 Foot

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE & SIZE OF ALL CASING, HOLE DIAMETER & GROUT USED.

SIGNATURE (PRIMARY CONTACTOR):
PERMIT NUMBER: 003839 M
DATE WELL DRILLING WAS COMPELTED: 10-4-13

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. ☐ PUMP INSTALLED

SIGNATURE (WELL DRILLER):
PERMIT NUMBER: 003456-M
SIGNATURE (OF APPRENTICE):
APPRENTICE PERMIT NUMBER:

MO 780-1413 (07-11)
DISTRIBUTION: WHITE/DIVISION CANARY/CONTACTOR PINK/OWNER
RETURN WHITE COPY WITH APPROPRIATE FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SS

Rock Log

Local Site Coordinates: 1066828.73 N, 516777.04 E Ground Surface Elevation: 484.52

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 16, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
0.0	**0.0 to 133.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	Blind-drilled from 0 - 133 ft; no samples collected. 0 - 50 ft drilled via air rotary. O_2 (%), methane (%LEL), and VOCs (ppm) monitored at borehole. 20.9% O_2, 0% LEL, 0 ppm.
5.0										58.2	
10.0										57.9	20.9% O_2, 0% LEL, 0 ppm. Very wet.
15.0										57.9	
20.0										57.9	20.9% O_2, 0% LEL, 0 ppm.
25.0										57.6	
30.0										57.6	20.9% O_2, 0% LEL, 0 ppm.
35.0										57.6	
40.0										57.6	20.9% O_2, 0% LEL, 0 ppm.
45.0										57.6	Competent bedrock encountered.
50.0										57.6	

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SS

Rock Log

Local Site Coordinates: 1066828.73 N, 516777.04 E Ground Surface Elevation: 484.52

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 16, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
50.0	**0.0 to 133.0 ft.** - Blind drilled. No sample collected.									57.6	Set temporary 8-in. D casing 5 ft into bedrock. Switched to sonic drilling. Continued drilling through casing. 20.9% O_2, 0% LEL, 0 ppm.
55.0										57.6	
60.0										57.6	20.9% O_2, 0% LEL, 0 ppm..
65.0										57.6	
70.0										57.6	
75.0										57.6	
80.0										57.6	20.9% O_2, 0% LEL, 0 ppm.
85.0										57.6	
90.0										57.6	
95.0										57.6	
100.0										57.9	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SS

Rock Log

Local Site Coordinates: 1066828.73 N, 516777.04 E Ground Surface Elevation: 484.52

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 16, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
100.0	**0.0 to 133.0 ft.** - Blind drilled. No sample collected.									57.9	20.9% O_2, 0% LEL, 0 ppm.
105.0										57.9	
110.0										57.6	
115.0										57.4	
120.0										57.4	20.9% O_2, 0% LEL, 0 ppm.
125.0										57.4	
130.0										57.1	
133.0											

Change in scale see sheet 4 of 5

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SS

Rock Log

Local Site Coordinates: 1066828.73 N, 516777.04 E Ground Surface Elevation: 484.52

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 16, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
133.0											
134.0	**133.0 to 134.0 ft.** - LIMESTONE, light olive gray (5Y 6/1) to olive gray (5Y 4/1). With very light gray (N9) and yellowish gray (5Y 8/1) mottling and spotting. Microcrystalline to fine-grained; massive to laminated; competent. Requires one to multiple hammer blows to fracture, but easily scratched with knife. Reactive with with 10% HCl solution.		1 of 2	5.0/5.0	4.3/5.0	0	[134.2] 90°, B, PL, R [134.3] 85°, B, PL, R [134.75] 90°, B, I, R [134.8] 85°, B, PL, R [134.85] 90°, B, PL, R	FR	R3 to R4	56.9	
135.0	**134.0 to 135.0 ft.** - LIMESTONE, as above, but with medium bluish gray (5B 5/1) spotting. Slightly weathered from 134.1 to 134.9 ft; surface discoloration on fractures, weaker along bedding planes, can easily be broken by hand in spots. Surface discoloration of dark yellowish brown (10YR 4/2), moderate yellowish brown (10YR 5/4) on fractures. Partial healing/filling of cavities at 134.2 ft. Medium bluish gray (5B 5/1) mineralization at 134.8 ft.					5		SW	R3 to R4		
136.0	**135.0 to 136.0 ft.** - LIMESTONE, as above, but yellowish gray (5Y 8/1) to light olive gray (5Y 6/1). With greenish gray (5G 6/1) mottling. Microcrystalline beginning at 135.6 ft. Flint-or chert-like. Very uniform in color. Dark greenish gray (5GY 4/1) dendritic mineralization at 135.9 ft.					0		FR	R3-R4		
137.0	**136.0 to 137.0 ft.** - LIMESTONE, as above. Moderately healed bedding plane joint at 136.6 ft.					0		FR	R3-R4		
138.0	**137.0 to 138.0 ft.** - LIMESTONE, as above. Medium dark-gray (N4) dendritic mineralization at 137.1-137.2 ft. Multiple moderatly healed bedding plane joints at 137.7 ft. Slightly weathered from 137.9-140 ft; surface discoloration on fractures. Surface discoloration of dark yellowish brown (10YR 4/2), brownish gray (5YR 4/1), medium bluish gray (5B 5/1) on fractures.					2	[137.9] 60°, B, PL, R [137.95] 80°, B, PL, R	FR to SW	R3-R4		
139.0	**138.0 to 139.0 ft.** - LIMESTONE, yellowish gray (5Y 8/1) and light gray (5Y 6/1). With very light gray (N8) and dark gray (N3) mottling. With dark yellowish brown (10YR 4/2) from 138-138.2 ft. Microcrystalline; massive to laminated; competent. Requires one to multiple hammer blows to fracture, but easily scratched with knife. Reactive with with 10% HCl solution.		2 of 2	9.7/10.0	9.1/9.7	0	[139.15] 90°, B, PL, R	FR	R3-R4		
140.0	**139.0 to 140.0 ft.** - LIMESTONE, as above, but microcrystalline to fine-grained. Slightly weathered from 139.1-139.7 ft; surface discoloration on fractures, weaker along bedding planes, can be broken by hand in spots. Surface discoloration of pale yellowish brown (10YR 6/2), brownish gray (5YR 4/1), and olive gray (5Y 4/1) on fractures. Vitreous, medium bluish gray (5B 5/1) mineralization at approx. 139.5 ft. Multiple mechanical breaks mixed with bedding plane joints, Core has little cross-sectional integrity; gravel-like. Difficult to discern individual joints.					2+	[139.65] 90°, B, PL, S Other fractures evident, but difficult to discern.	FR to SW	R3-R4	56.9	
141.0						0		FR	R4		
142.0	**140.0 to 141.0 ft.** - LIMESTONE, as above, but with little mottling. Microcrystalline, massive. **141.0 to 142.0 ft.** - LIMESTONE, as above.					0		FR	R4		
143.0	**142.0 to 143.0 ft.** - LIMESTONE, as above, 0.2 ft band of medium light gray (N6) at 142.5 ft. Laminated from 142.5 to 143 ft. With very light gray (N8) and medium dark gray (N4) mottling. Multiple mechanical breaks.					0		FR	R4 to R3		

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SS

Rock Log

Local Site Coordinates: 1066828.73 N, 516777.04 E Ground Surface Elevation: 484.52

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 16, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

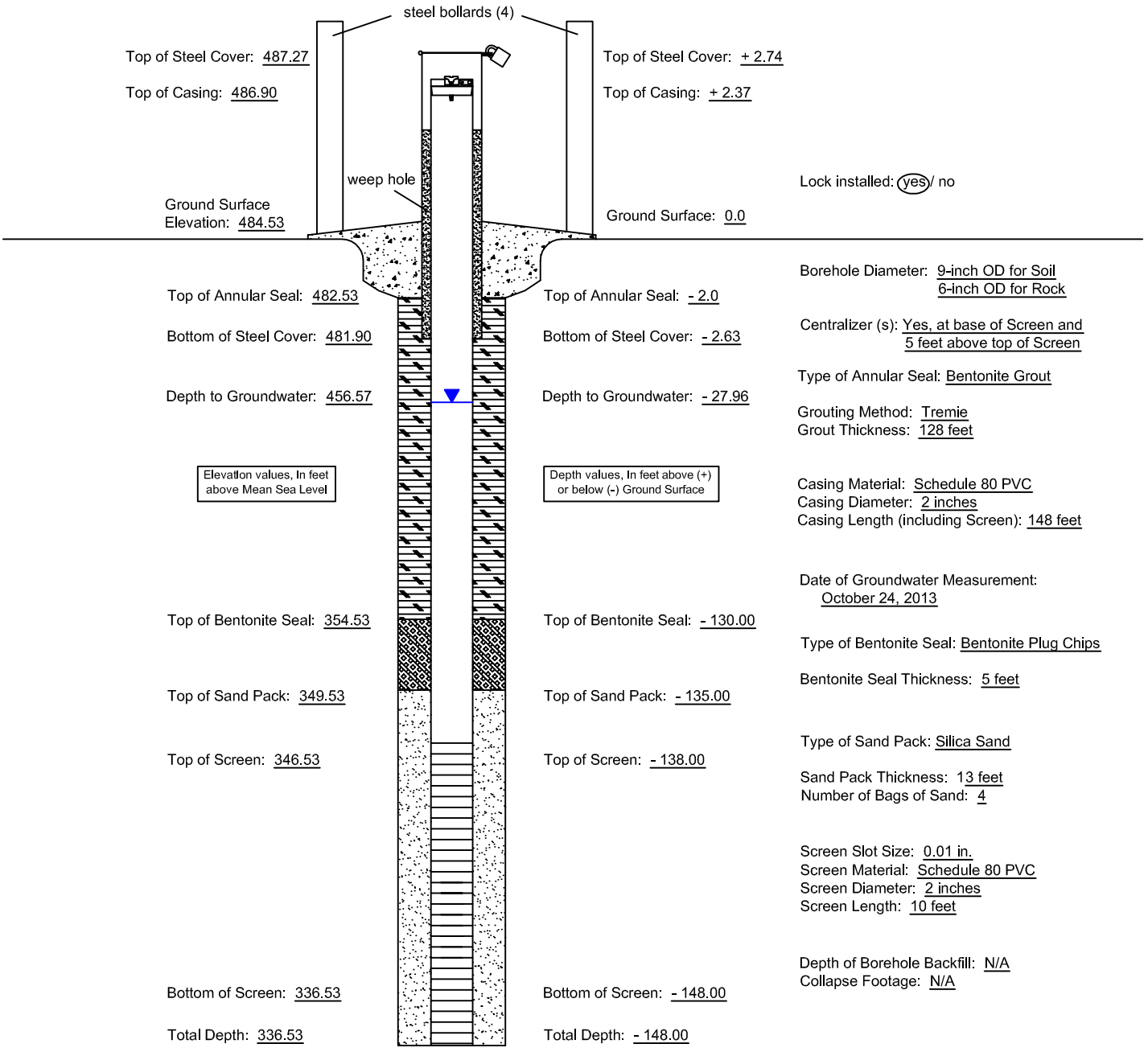
Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
143.0											
	143.0 to 144.0 ft. - LIMESTONE, as above, but massive to laminated. Multiple mechanical breaks from 143.2 - 143.7 ft. Surface discoloration on bottom face of fracture at 143.7 ft. Medium dark gray (N4) and olive gray (5Y 4/1). (No discoloration on top face; possible mechanical destruction.)					1	[143.7] 85°, B, PL, S	FR to SW	R3 to R4		
144.0											
	144.0 to 145.0 ft. - LIMESTONE, as above, but massive; microcrystalline to fine-grained.					0		FR	R4		
145.0										56.7	
	145.0 to 146.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/I), light olive gray (5Y 6/1), and olive gray (5Y 4/1). With greenish gray (5G 6/1) mottling at 145.5 ft. Massive to laminated. Can be broken by hand from 145.7 to 145.9 ft. Likely mechanical destruction and weakening. (No weathering evident.)					0		FR	R4 to R3		
146.0											
	146.0 to 147.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/I) and light olive gray (5Y 6/1), massive, microcrystalline beginning 1t 146.4 ft. Slightly weathered at 146.1 ft: surface discoloration on fracture, weaker along bedding planes, can be broken by hand in spots. Vitreous, planar mineralization roughly parallel to core axis (90 to 80°) from 146.7 - 146.8 ft.					1	[146.1] 90°, B, PL, VR	FR to SW	R4 to R3		
147.0											
	147.0 to 148.0 ft. - LIMESTONE, as above.					0		FR	R4		
148.0										56.7	**Boring Depth: 148 ft. bgs.**
149.0											
150.0											
151.0											
152.0											
153.0											

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

Well Coordinates:
N 1066828.381
E 516777.407

Drilling Contractor: Frontz Drilling
Lead Driller: Rob Hamilton
Drilling Dates: October 16-17, 2013



Top of Steel Cover: 487.27
Top of Casing: 486.90
Ground Surface Elevation: 484.53

Top of Steel Cover: + 2.74
Top of Casing: + 2.37
Ground Surface: 0.0

Lock installed: (yes) / no

Top of Annular Seal: 482.53
Bottom of Steel Cover: 481.90
Depth to Groundwater: 456.57

Top of Annular Seal: - 2.0
Bottom of Steel Cover: - 2.63
Depth to Groundwater: - 27.96

Elevation values, In feet above Mean Sea Level

Depth values, In feet above (+) or below (-) Ground Surface

Top of Bentonite Seal: 354.53
Top of Sand Pack: 349.53
Top of Screen: 346.53

Top of Bentonite Seal: - 130.00
Top of Sand Pack: - 135.00
Top of Screen: - 138.00

Bottom of Screen: 336.53
Total Depth: 336.53

Bottom of Screen: - 148.00
Total Depth: - 148.00

(Not to Scale)

Borehole Diameter: 9-inch OD for Soil
6-inch OD for Rock

Centralizer (s): Yes, at base of Screen and 5 feet above top of Screen

Type of Annular Seal: Bentonite Grout

Grouting Method: Tremie
Grout Thickness: 128 feet

Casing Material: Schedule 80 PVC
Casing Diameter: 2 inches
Casing Length (including Screen): 148 feet

Date of Groundwater Measurement: October 24, 2013

Type of Bentonite Seal: Bentonite Plug Chips

Bentonite Seal Thickness: 5 feet

Type of Sand Pack: Silica Sand

Sand Pack Thickness: 13 feet
Number of Bags of Sand: 4

Screen Slot Size: 0.01 in.
Screen Material: Schedule 80 PVC
Screen Diameter: 2 inches
Screen Length: 10 feet

Depth of Borehole Backfill: N/A
Collapse Footage: N/A

4631 North St. Peters Parkway
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

Bridgeton Landfill
Bridgeton, Missouri

PZ-210-SS
As-Built Diagram

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM
MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REFERENCE NO	
C.R. NO	CHECK NO
STATE WELL NUMBER	REVENUE NO
ENTERED Ph1 Ph2 Ph3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR
NOTE: THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME: Republic Services
CONTACT NAME: Bryan Schie
VARIANCE GRANTED BY DNR NUMBER:
OWNER ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Bridgeton Sanitary Landfill
WELL NUMBER: PZ-210-SS
COUNTY: Saint Louis
SITE ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATIC WATER LEVEL: 30.33

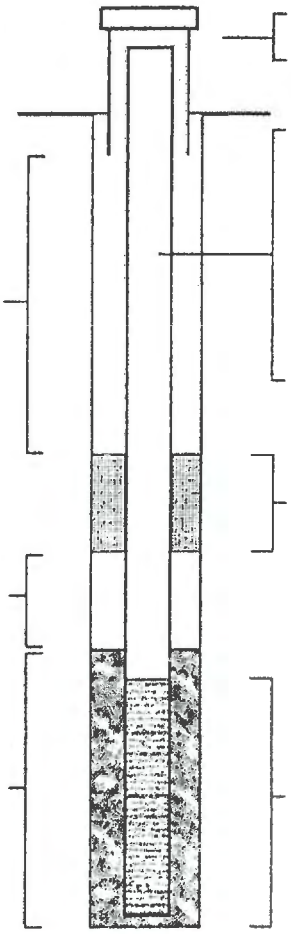
SURFACE COMPLETION
TYPE: ☑ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH AND DIAMETER OF SURFACE COMPLETION: LENGTH 2.5 FT. DIAMETER 5 IN.
DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: DIAMETER 5 IN. LENGTH 2.5 FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE ☐ OTHER

LOCATION OF WELL (D/M/S FORMAT ONLY)
LAT. 38 . 45 . 49.4"
LONG. 90 . 26 . 25.8"

SMALLEST ¼ LARGEST ¼ ¼
SECTION ____ TOWNSHIP 47 NORTH
RANGE 5 ☑ EAST ☐ WEST

MONITORING FOR: (CHECK ALL THAT APPLY)
☑ RADIONUCLIDES [redacted]
☐ EXPLOSIVES ☑ METALS ☑ VOC
☑ SVOCS ☑ PESTICIDES/HERBICIDES

PROPOSED USE OF WELL
☐ GAS MIGRATION WELL ☑ OBSERVATION
☐ EXTRACTION WELL ☐ OPEN HOLE
☐ PIEZOMETERS ☐ INJECTION WELL
☐ DIRECT PUSH



☑ LOCKING CAP
☑ WEEP HOLE
ELEVATION 481.29 FT.

ANNULAR SEAL
LENGTH 128 FT.
☑ SLURRY ☐ CHIPS ☐ PELLETS ☐ GRANULAR ☐ CEMENT/SLURRY
IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG 340 GAL.

SECONDARY FILTER PACK
LENGTH 0 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK 135 FT.

LENGTH OF PRIMARY FILTER PACK 13 FT.

SURFACE COMPLETION
☑ STEEL ☐ ALUMINUM ☐ PLASTIC

RISER
RISER PIPE DIAMETER 2 IN.
RISER PIPE LENGTH 140 FT.
DIAMETER OF DRILL HOLE 6 IN.
WEIGHT OR SDR# Sch80

MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC) ☐ OTHER

BENTONITE SEAL
LENGTH 5 Foot
☑ CHIPS ☐ PELLETS ☐ GRANULAR ☐ SLURRY
☑ SATURATED ZONE ☐ HYDRATED

SCREEN
SCREEN DIAMETER 2 IN.
SCREEN LENGTH 10 FT.
DIAMETER OF DRILL HOLE 6 IN.
DEPTH TO TOP 138 FT.
SCREEN MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC) ☐ OTHER

DEPTH TO	DEPTH FROM	FORMATION DESCRIPTION
0'	45'	Silty Clay
45'	148'	Limestone
TOTAL DEPTH:		148 Foot

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE & SIZE OF ALL CASING, HOLE DIAMETER & GROUT USED.

SIGNATURE (PRIMARY CONTACTOR) | PERMIT NUMBER 003839M | DATE WELL DRILLING WAS COMPELTED 10-16-13

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. ☐ PUMP INSTALLED

SIGNATURE (WELL DRILLER) | PERMIT NUMBER 003456-M | SIGNATURE (OF APPRENTICE) | APPRENTICE PERMIT NUMBER

MO 780-1415 (07-11)
DISTRIBUTION: WHITE/DIVISION CANARY/CONTACTOR PINK/OWNER
RETURN WHITE COPY WITH APPROPRIATE FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SD

Rock Log

Local Site Coordinates: 1066824.04 N, 516772.85 E Ground Surface Elevation: 484.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
0.0	**0.0 to 233.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	Blind-drilled from 0 - 233 ft; no samples collected. 0 - 50 ft drilled via air rotary. O_2 (%), methane (%LEL), and VOCs (ppm) monitored at borehole. 20.6% O_2, 0% LEL, 0 ppm.
5.0										58.2	
10.0										58.2	20.6% O_2, 0% LEL, 0 ppm.
15.0										58.2	
20.0										58.0	20.6% O_2, 0% LEL, 0 ppm.
25.0										58.0	
30.0										58.0	20.9% O_2, 0% LEL, 0 ppm.
35.0										58.0	
40.0										58.0	20.9% O_2, 0% LEL, 0 ppm.
45.0										58.0	Competent bedrock encountered.
50.0										58.0	

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SD

Rock Log

Local Site Coordinates: 1066824.04 N, 516772.85 E Ground Surface Elevation: 484.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
50.0	**0.0 to 233.0 ft.** - Blind drilled. No sample collected.									58.0	Set temporary 8-in. D casing 5 ft into bedrock. Switched to sonic drilling. Continued drilling through casing.
55.0										58.0	20.9% O_2, 0% LEL, 0 ppm.
60.0										58.0	20.9% O_2, 0% LEL, 0 ppm..
65.0										58.0	
70.0										58.0	
75.0										58.0	
80.0										58.0	20.9% O_2, 0% LEL, 0 ppm.
85.0										58.0	
90.0										58.0	
95.0										58.0	
100.0										58.0	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SD

Rock Log

Local Site Coordinates: 1066824.04 N, 516772.85 E Ground Surface Elevation: 484.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
100.0	**0.0 to 233.0 ft.** - Blind drilled. No sample collected.									58.0	20.9% O_2, 0% LEL, 0 ppm.
105.0										58.0	
110.0										58.0	
115.0										58.0	
120.0										58.0	
125.0										58.0	
130.0										58.0	
135.0										58.0	
140.0										58.0	20.9% O_2, 0% LEL, 0 ppm.
145.0										58.0	
150.0										57.9	

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SD

Rock Log

Local Site Coordinates: 1066824.04 N, 516772.85 E Ground Surface Elevation: 484.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
150.0	**0.0 to 233.0 ft.** - Blind drilled. No sample collected.									57.9	
155.0										57.9	
160.0										57.9	20.9% O_2, 0% LEL, 0 ppm.
165.0										57.9	
170.0										57.6	
175.0										57.6	
180.0										57.6	20.9% O_2, 0% LEL, 0 ppm.
185.0										57.6	
190.0										57.6	
195.0										57.6	
200.0										57.6	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SD

Rock Log

Local Site Coordinates: 1066824.04 N, 516772.85 E Ground Surface Elevation: 484.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
200.0	**0.0 to 233.0 ft.** - Blind drilled. No sample collected.									57.6	20.9% O_2, 0% LEL, 0 ppm.
205.0										57.6	
210.0										57.6	
215.0										57.6	
220.0										57.4	20.9% O_2, 0% LEL, 0 ppm.
225.0										57.4	
230.0										57.4	
233.0											20.9% O_2, 0% LEL, 0 ppm.

Change in scale see sheet 6 of 7

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SD

Rock Log

Local Site Coordinates: 1066824.04 N, 516772.85 E Ground Surface Elevation: 484.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
233.0											
	233.0 to 234.0 ft. - LIMESTONE, light olive gray (5Y 6/1) and olive gray (5Y 4/1) with medium dark gray (N4) and yellowish gray (5Y 8/1) mottling. Microcrystalline to fine grained; massive to laminated; competent. Requires multiple hammer blows to fracture, but easily scratched with knife. Reactive with 10% HCl solution. Slightly weathered from 233.4 to 233.7 ft; moderate surface discoloration on fractures, weaker along bedding planes, can easily be broken by hand in spots. Moderate surface discoloration of dark yellowish brown (10YR 4/2) and olive gray (5Y 4/1) on fractures.		1 of 2	4.9/5.0	4.6/4.9	3	[233.4] 90°, B, PL, S [233.65] 85°, B, PL, R [233.7] 85°, B, PL, S	FR to SW	R4		20.9% O_2, 0% LEL, 0 ppm.
234.0						0		FR	R4		
235.0	**234.0 to 235.0 ft.** - LIMESTONE, as above, but light olive gray (5Y 6/1). With pale yellowish brown (10YR 6/2), light gray (N7), and olive gray (5Y 4/1) mottling. Massive. Mineralization at 234.0 ft.					0		FR	R4	57.1	
	235.0 to 236.0 ft. - LIMESTONE, as above, but pale yellowish brown (10YR 6/2), light olive gray (5Y 4/1). Light gray (N7) mineralization within cavities at 235.5 ft.										
236.0						1	[236.1] 85°, B, PL, R	FR to SW	R4		
	236.0 to 237.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1) to light olive gray (5Y 6/1). With light gray (N7) mottling. Slightly weathered at 236.1 ft; surface discoloration on bottom face of fracture, weaker along bedding planes, easily flakes away when scratched with fingernail. Surface discoloration of pale yellowish brown (10YR 6/2) and olive gray (5Y 4/1) on fracture. Massive with lamination around fracture at 236.1 ft.										
237.0						0		FR	R4		
	237.0 to 238.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1) to light olive gray (5Y 6/1). Color is uniform; little mottling, spotting, or banding.										
238.0											20.9% O_2, 0% LEL, 0 ppm.
	238.0 to 239.0 ft. - LIMESTONE, yellowish gray (5Y 8/1), light olive gray (5Y 6/1) and olive gray (5Y 4/1). With moderate yellowish brown (10YR 5/4) and light gray (N8) mottling. Microcrystalline to fine-grained; massive; competent. Requires one or multiple hammer blows to fracture, but easily scratched with knife. Reactive with 10% HCl solution. Laminated from 238.9 ft; weaker (R1 to R2) along bedding planes, easily flakes away when scratched with fingernail.		2 of 2	10.0/10.0	10.0/10.0	0		FR	R4 to R3		
239.0						1	[239.85] 80°, B, PL, S	FR to SW	R3		
	239.0 to 240.0 ft. - LIMESTONE, as above, but with pale yellowish brown (10YR 6/2) and light gray (N8) mottling. Massive to laminated. Slightly weathered at 239.85 ft; surface discoloration on fracture, weaker along bedding planes, can easily be broken by hand in spots. Surface discoloration of brownish gray (5YR 4/1) to olive gray (5Y 4/1) on fracture.										
240.0						0		FR to SW	R3	56.9	
	240.0 to 241.0 ft. - LIMESTONE, as above, but with light gray (N8) mottling. Slightly weathered from 240.2 to 240.3 ft; weaker along bedding planes, can easily be broken by hand in spots. Moderate surface discoloration of olive gray (5Y 4/1) along planes when broken by hand.										
241.0						0		FR to SW	R3		
	241.0 to 242.0 ft. - LIMESTONE, as above. Slightly weathered at 241.35 ft; weaker along bedding planes, olive gray (5Y 4/1) discoloration on mechanical break surfaces.										
242.0						0		FR to SW	R3		
	242.0 to 243.0 ft. - LIMESTONE, as above, but fine to medium-grained. Slightly weathered at 242-242.1 ft and 242.3 ft; weaker along bedding planes, olive gray (5Y 4/1) discoloration on mechanical break surfaces.										
243.0											

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-210-SD

Rock Log

Local Site Coordinates: 1066824.04 N, 516772.85 E Ground Surface Elevation: 484.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 15, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
243.0											
	243.0 to 244.0 ft. - LIMESTONE, as above, but light olive gray (5Y 6/1). With pale yellowish brown (10YR 6/2), olive gray (5Y 4/1) mottling and white (N9), yellowish gray (5Y 8/1), medium bluish gray (5B 5/1) speckling.					0		FR	R3 to R4		
244.0											
	244.0 to 245.0 ft. - LIMESTONE, as above, but also with medium dark gray (N4) mottling.					0		FR	R3 to R4		
245.0										56.9	
	245.0 to 246.0 ft. - LIMESTONE, as above.					0		FR	R3 to R4		
246.0											
	246.0 to 247.0 ft. - LIMESTONE, as above.					0		FR	R3 to R4		
247.0											
	247.0 to 248.0 ft. - LIMESTONE, as above.					0		FR	R3 to R4		
248.0											20.9% O_2, 0% LEL, 0 ppm.
											Boring Depth: 248 ft. bgs.
151.0											
152.0											
153.0											
154.0											
155.0											

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

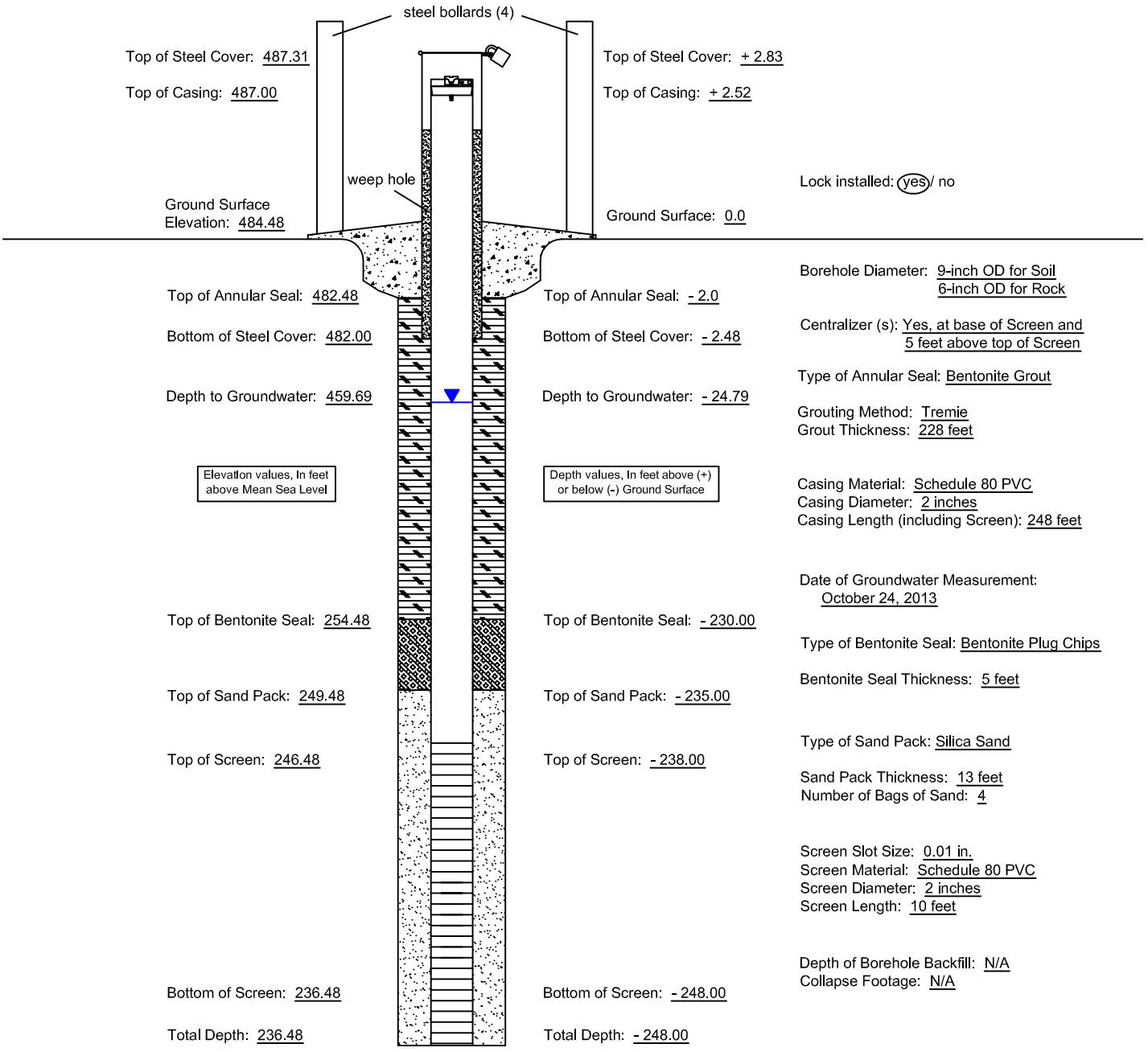
Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

Well Coordinates:
N 1066824.035
E 516773.117

Drilling Contractor: Frontz Drilling
Lead Driller: Rob Hamilton
Drilling Dates: October 15-16, 2013



Top of Steel Cover: 487.31
Top of Casing: 487.00
Ground Surface Elevation: 484.48

Top of Steel Cover: + 2.83
Top of Casing: + 2.52
Ground Surface: 0.0

Lock installed: (yes) / no

Top of Annular Seal: 482.48
Bottom of Steel Cover: 482.00
Depth to Groundwater: 459.69

Top of Annular Seal: - 2.0
Bottom of Steel Cover: - 2.48
Depth to Groundwater: - 24.79

Elevation values, In feet above Mean Sea Level

Depth values, In feet above (+) or below (-) Ground Surface

Top of Bentonite Seal: 254.48
Top of Sand Pack: 249.48
Top of Screen: 246.48

Top of Bentonite Seal: - 230.00
Top of Sand Pack: - 235.00
Top of Screen: - 238.00

Bottom of Screen: 236.48
Total Depth: 236.48

Bottom of Screen: - 248.00
Total Depth: - 248.00

(Not to Scale)

Borehole Diameter: 9-inch OD for Soil
6-inch OD for Rock

Centralizer (s): Yes, at base of Screen and 5 feet above top of Screen

Type of Annular Seal: Bentonite Grout

Grouting Method: Tremie
Grout Thickness: 228 feet

Casing Material: Schedule 80 PVC
Casing Diameter: 2 inches
Casing Length (including Screen): 248 feet

Date of Groundwater Measurement:
October 24, 2013

Type of Bentonite Seal: Bentonite Plug Chips

Bentonite Seal Thickness: 5 feet

Type of Sand Pack: Silica Sand

Sand Pack Thickness: 13 feet
Number of Bags of Sand: 4

Screen Slot Size: 0.01 in.
Screen Material: Schedule 80 PVC
Screen Diameter: 2 inches
Screen Length: 10 feet

Depth of Borehole Backfill: N/A
Collapse Footage: N/A

4631 North St. Peters Parkway
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

Bridgeton Landfill
Bridgeton, Missouri

PZ-210-SD
As-Built Diagram

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM
MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REFERENCE NO	
C R NO	CHECK NO
STATE WELL NUMBER	REVENUE NO
ENTERED Ph1 Ph2 Ph3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR
NOTE: THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME: Republic services
CONTACT NAME: Bryan Sehie
VARIANCE GRANTED BY DNR NUMBER:
OWNER ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Bridgeton Sanitary Landfill
WELL NUMBER: PZ-210-SD
COUNTY: Saint Louis
SITE ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATIC WATER LEVEL: 27.31

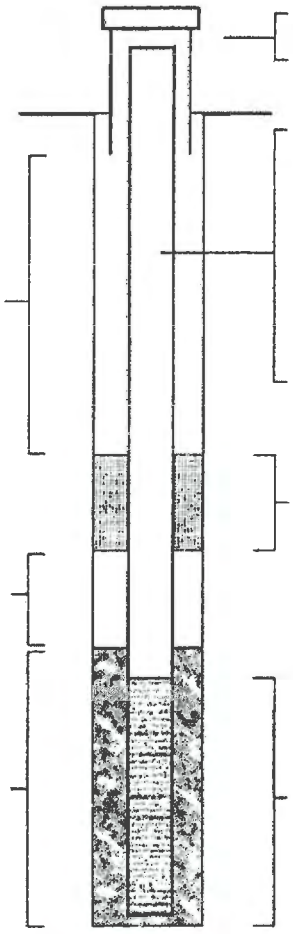
SURFACE COMPLETION
TYPE: ☑ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH AND DIAMETER OF SURFACE COMPLETION: LENGTH 2.5 FT. DIAMETER 5 IN.
DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: DIAMETER 5 IN. LENGTH 2.5 FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE ☐ OTHER

LOCATION OF WELL (D/M/S FORMAT ONLY)
LAT. 38 · 45 · 49.4 "
LONG. 90 · 26 · 21.8 "

SMALLEST ¼ LARGEST ¼ ¼
SECTION ____ TOWNSHIP 47 NORTH
RANGE 5 ☑ EAST ☐ WEST

MONITORING FOR: (CHECK ALL THAT APPLY)
☑ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☑ METALS ☑ VOC
☑ SVOCS ☑ PESTICIDES/HERBICIDES

PROPOSED USE OF WELL
☐ GAS MIGRATION WELL ☑ OBSERVATION
☐ EXTRACTION WELL ☐ OPEN HOLE
☐ PIEZOMETERS ☐ INJECTION WELL
☐ DIRECT PUSH



☑ LOCKING CAP
☑ WEEP HOLE
ELEVATION 481.29 FT.

ANNULAR SEAL
LENGTH 228 FT.
☑ SLURRY ☐ CHIPS
☐ PELLETS ☐ GRANULAR
☐ CEMENT/SLURRY
IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG 360 GAL

SECONDARY FILTER PACK
LENGTH 0 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK 235 FT.

LENGTH OF PRIMARY FILTER PACK 13 FT.

SURFACE COMPLETION
☑ STEEL ☐ ALUMINUM ☐ PLASTIC

RISER
RISER PIPE DIAMETER 2 IN.
RISER PIPE LENGTH 240 FT.
DIAMETER OF DRILL HOLE 6 IN.
WEIGHT OR SDR# Sch80

MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

BENTONITE SEAL
LENGTH 5 Foot
☑ CHIPS ☐ PELLETS ☐ GRANULAR
☐ SLURRY
☑ SATURATED ZONE ☐ HYDRATED

SCREEN
SCREEN DIAMETER 2 IN.
SCREEN LENGTH 10 FT.
DIAMETER OF DRILL HOLE 6 IN.
DEPTH TO TOP 238 FT.

SCREEN MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

DEPTH TO	DEPTH FROM	FORMATION DESCRIPTION
0'	45'	Silty Clay
45'	248'	Limestone
TOTAL DEPTH:		248 Foot

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE & SIZE OF ALL CASING, HOLE DIAMETER & GROUT USED.

SIGNATURE (PRIMARY CONTACTOR)
PERMIT NUMBER 003839M
DATE WELL DRILLING WAS COMPELTED 10-16-13

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. ☐ PUMP INSTALLED

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	SIGNATURE (OF APPRENTICE)	APPRENTICE PERMIT NUMBER
	003456-M		

MO 780-1415 (07-11)
DISTRIBUTION: WHITE/DIVISION CANARY/CONTACTOR PINK/OWNER
RETURN WHITE COPY WITH APPROPRIATE FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SS

Rock Log

Local Site Coordinates: 1067061.27 N, 517021.26 E Ground Surface Elevation: 485.05

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 7, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
0.0	**0.0 to 132.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	Blind-drilled from 0 - 132 ft; no samples collected. 0 - 50 ft drilled via air rotary. O_2 (%), methane (%LEL), and VOCs (ppm) monitored at borehole.
5.0										57.4	
10.0										57.4	20.9% O_2, 0% LEL, 0 ppm.
15.0										57.4	
20.0										57.4	20.9% O_2, 0% LEL, 0.8 ppm (peak).
25.0										57.4	
30.0										57.1	20.9% O_2, 0% LEL, 0 ppm.
35.0										57.1	
40.0										57.1	20.9% O_2, 0% LEL, 0 ppm.
45.0										57.1	
50.0										57.1	

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SS

Rock Log

Local Site Coordinates: 1067061.27 N, 517021.26 E Ground Surface Elevation: 485.05

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 7, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
50.0	**0.0 to 132.0 ft.** - Blind drilled. No sample collected.									57.1	Set temporary 8-in. D casing 5 ft into bedrock. Switched to sonic drilling. Continued drilling through casing. 20.9% O_2, 0% LEL, 0 ppm.
55.0										57.1	
60.0										57.1	20.9% O_2, 0% LEL, 0 ppm..
65.0										57.1	
70.0										57.1	
75.0										57.1	
80.0										57.1	20.9% O_2, 0% LEL, 0 ppm.
85.0										57.1	
90.0										57.1	
95.0										56.9	
100.0										56.9	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SS

Rock Log

Local Site Coordinates: 1067061.27 N, 517021.26 E Ground Surface Elevation: 485.05

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 7, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
100.0	**0.0 to 132.0 ft.** - Blind drilled. No sample collected.									56.9	20.9% O_2, 0% LEL, 0 ppm.
105.0											
110.0										56.9	
115.0										56.9	
120.0										56.9	20.9% O_2, 0% LEL, 0 ppm.
125.0										56.7	
130.0										56.7	
132.0											20.9% O_2, 0% LEL, 0 ppm.

Change in scale see sheet 4 of 5

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SS

Rock Log

Local Site Coordinates: 1067061.27 N, 517021.26 E Ground Surface Elevation: 485.05

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 7, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
132.0											
	132.0 to 133.0 ft. - LIMESTONE, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1). With pale yellowish brown (10YR 6/2), dark yellowish brown (10YR 4/2), dark gray (N3), brownish gray (5YR 4/1), olive gray (5Y 4/1) mottling. Microcrystalline; massive to laminated; competent. Requires multiple hammer blows to fracture, but easily scratched with knife. Reactive with with 10% HCl solution.		1 of 2	4.9/5.0	4.9/4.9	0		FR	R4		20.9% O_2, 0% LEL, 0 ppm.
133.0											
	133.0 to 134.0 ft. - LIMESTONE, as above, but pale yellowish brown (10YR 6/2), yellowish gray (5Y 8/1), and light olive gray (5Y 6/1). Slightly weathered at 133.8 ft: surface discoloration on fracture, weaker along bedding planes, can easily be broken by hand in spots (R1 to R2). Surface discoloration of olive gray (5Y 4/1) and dark greenish gray (5GY 4/1) on fracture. Light gray(N7) to yellowish gray (5Y 8/1) filling of cavities near fracture; some mineralization.					1	[133.8] 70°, J or B, I, R	FR to SW	R3		
134.0											
	134.0 to 135.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1) to light olive gray (5Y 6/1). With some blotches of greenish gray (5G 6/1). Little mottling or spotting; more uniform in color than above. Massive.					0		FR	R4		
135.0										56.7	
	135.0 to 136.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1), light olive gray (5Y 6/1), and greenish gray (5G 6/1).					0		FR	R3 to R4		
136.0											
	136.0 to 137.0 ft. - LIMESTONE, as above, but with white (N9) spotting. Massive, with some lamination and very thin bedding from 136.6 - 136.8 ft. Moderately healed irregular bedding joints from 136.6 - 136.7 ft. Very light gray (N8), light olive gray (5Y 6/1), and olive gray (5Y 4/1) near joints.					0		FR	R4		
137.0											20.9% O_2, 0% LEL, 0 ppm.
	137.0 to 138.0 ft. - LIMESTONE, light olive gray (5Y 6/1). With pale yellowish brown (10YR 6/2), dark yelloish brown (10YR 4/2), white (N9), medium gray (N5), medium bluish gray (5B 5/1) mottling and spotting. Microcrystalline; massive; competent. Requires one hammer blow to fracture, but easily scratched with knife. Reactive with with 10% HCl solution. Some lamination at 137.8 ft.		2 of 2	9.1/10.0	9.1/9.1	0		FR	R3		
138.0											
	138.0 to 139.0 ft. - LIMESTONE, as above, but pale yellowish brown (10YR 6/2) and light olive gray (5Y 6/1). With dark yellowish brown (10YR 4/2), white (N9), olive gray (5Y 4/1) mottling. Microcrystalline to fine-grained. Slightly weathered from 138.4 - 138.9 ft: some lamination, weaker along bedding planes, can be broken by hand with difficulty (R2). With olive gray (5Y 4/1) in weathered interval.					0		FR to SW	R3		
139.0											
	139.0 to 140.0 ft. - LIMESTONE, as above, but light olive gray (5Y 6/1). With white (N9), light gray (N7), and olive gray (5Y 4/1) mottling and spots. Microcrystalline to fine-grained; massive to laminated. Possible moderate healing of bedding joints from 139.3 - 139.4 ft.					0		FR	R4		
140.0										56.7	
	140.0 to 141.0 ft. - LIMESTONE, as above, but very light gray (N8), yellowish gray (5Y 8/1), and light olive gray (5Y 6/1). With mottling of olive gray (5Y 4/1) and greenish gray (5G 6/1). Moderately healed irregular bedding joint at 140.3 ft.					0		FR	R4		
141.0											
	141.0 to 142.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1) to light olive gray (5Y 6/1). Little mottling; more uniform in color than above. Microcrystalline; massive.					0		FR	R4		
142.0											

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SS

Rock Log

Local Site Coordinates: 1067061.27 N, 517021.26 E Ground Surface Elevation: 485.05

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 7, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
142.0											
	142.0 to 143.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1). Fine (< 1 mm) veins, pale green (10G 6/2) and medium bluish gray (5B 5/1).					0		FR	R4		
143.0											
	143.0 to 144.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1). Uniform in color.					0		FR	R4		
144.0											
	144.0 to 145.0 ft. - LIMESTONE, as above.					0		FR	R3		
145.0										56.7	
	145.0 to 146.0 ft. - LIMESTONE, as above, but yellowish gray (5Y 8/1) to light olive gray (5Y 6/1). With olive gray (5Y 4/1), pale yellowish brown (10YR 6/2), white (N9), and medium bluish gray (5B 5/1) spots.					0		FR	R3		
146.0											
	146.0 to 147.0 ft. - LIMESTONE, as above, but with some lamination from 146 - 146.1 ft.					0		FR	R3 to R4		
147.0										56.7	20.9% O_2, 0% LEL, 0 ppm.
											Boring Depth: 147 ft. bgs.
151.0											
152.0											
153.0											
154.0											
155.0											

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

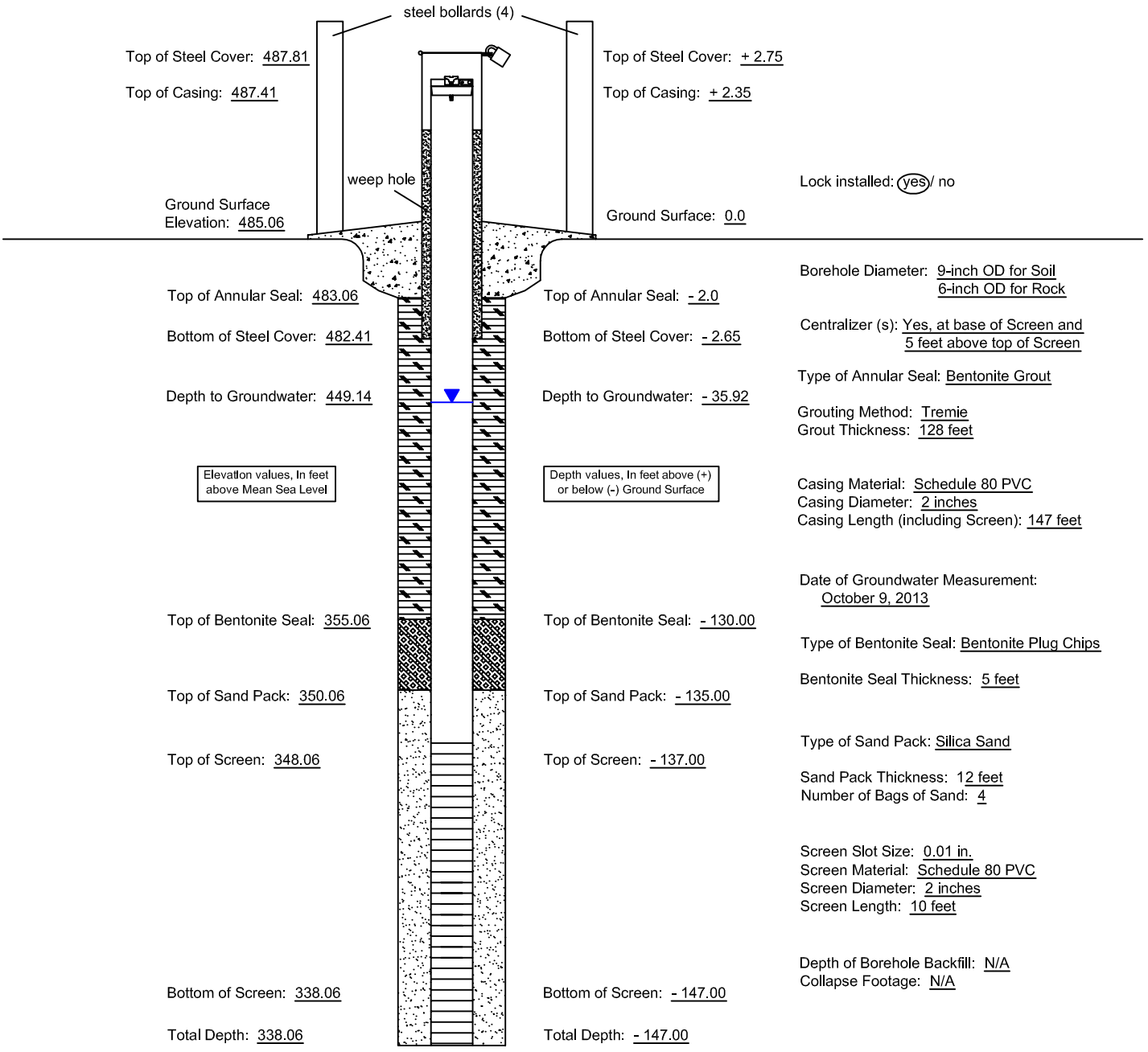
Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt, Herst & Associates, Inc.

LIMESTONE

Well Coordinates:
N 1067060.785
E 517021.151

Drilling Contractor: Frontz Drilling
Lead Driller: Rob Hamilton
Drilling Dates: October 7-8, 2013



Top of Steel Cover: 487.81
Top of Casing: 487.41
Ground Surface Elevation: 485.06

Top of Steel Cover: + 2.75
Top of Casing: + 2.35
Ground Surface: 0.0

Lock installed: (yes) / no

Top of Annular Seal: 483.06
Bottom of Steel Cover: 482.41
Depth to Groundwater: 449.14

Top of Annular Seal: - 2.0
Bottom of Steel Cover: - 2.65
Depth to Groundwater: - 35.92

Elevation values, In feet above Mean Sea Level

Depth values, In feet above (+) or below (-) Ground Surface

Top of Bentonite Seal: 355.06
Top of Sand Pack: 350.06
Top of Screen: 348.06

Top of Bentonite Seal: - 130.00
Top of Sand Pack: - 135.00
Top of Screen: - 137.00

Bottom of Screen: 338.06
Total Depth: 338.06

Bottom of Screen: - 147.00
Total Depth: - 147.00

(Not to Scale)

Borehole Diameter: 9-inch OD for Soil
6-inch OD for Rock

Centralizer (s): Yes, at base of Screen and 5 feet above top of Screen

Type of Annular Seal: Bentonite Grout

Grouting Method: Tremie
Grout Thickness: 128 feet

Casing Material: Schedule 80 PVC
Casing Diameter: 2 inches
Casing Length (including Screen): 147 feet

Date of Groundwater Measurement:
October 9, 2013

Type of Bentonite Seal: Bentonite Plug Chips

Bentonite Seal Thickness: 5 feet

Type of Sand Pack: Silica Sand

Sand Pack Thickness: 12 feet
Number of Bags of Sand: 4

Screen Slot Size: 0.01 in.
Screen Material: Schedule 80 PVC
Screen Diameter: 2 inches
Screen Length: 10 feet

Depth of Borehole Backfill: N/A
Collapse Footage: N/A

4631 North St. Peters Parkway
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

Bridgeton Landfill
Bridgeton, Missouri

PZ-211-SS
As-Built Diagram

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM
MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REFERENCE NO	
C.R. NO	CHECK NO
STATE WELL NUMBER	REVENUE NO
ENTERED Ph1 Ph2 Ph3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR
NOTE THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME: Republic Services
CONTACT NAME: Bryan Sehie
VARIANCE GRANTED BY DNR NUMBER:
OWNER ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Bridgeton Sanitary Landfill
WELL NUMBER: PZ-211-55
COUNTY: Saint Louis
SITE ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATIC WATER LEVEL: 23.95

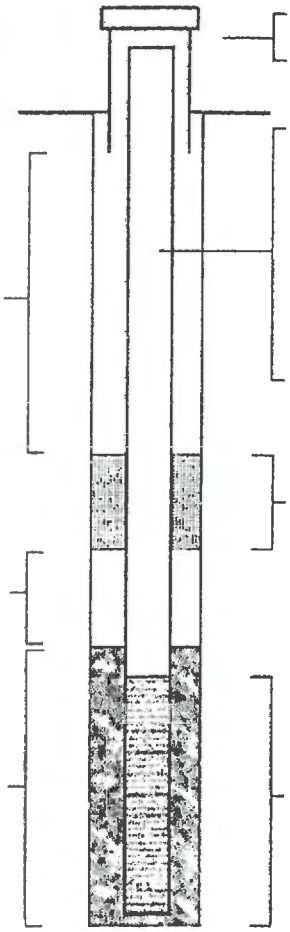
SURFACE COMPLETION
TYPE: ☑ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH AND DIAMETER OF SURFACE COMPLETION: LENGTH 2.5 FT. DIAMETER 5 IN.
DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: DIAMETER 5 IN. LENGTH 2.5 FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE ☐ OTHER

LOCATION OF WELL (D/M/S FORMAT ONLY)
LAT. 38 . 45 . 47.8 "
LONG. 90 . 26 . 34.6 .

SMALLEST ¼ LARGEST ¼
SECTION ____ TOWNSHIP 47 NORTH
RANGE 5 ☑ EAST ☐ WEST

MONITORING FOR: (CHECK ALL THAT APPLY)
☑ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☑ METALS ☑ VOC
☑ SVOCS ☑ PESTICIDES/HERBICIDES

PROPOSED USE OF WELL
☐ GAS MIGRATION WELL ☑ OBSERVATION
☐ EXTRACTION WELL ☐ OPEN HOLE
☐ PIEZOMETERS ☐ INJECTION WELL
☐ DIRECT PUSH



☑ LOCKING CAP
☑ WEEP HOLE
ELEVATION 485.21 FT.

ANNULAR SEAL
LENGTH 128 FT.
☑ SLURRY ☐ CHIPS
☐ PELLETS ☐ GRANULAR
☐ CEMENT/SLURRY
IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG 360 GAL.

SECONDARY FILTER PACK
LENGTH 0 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK 135 FT.

LENGTH OF PRIMARY FILTER PACK 12 FT.

SURFACE COMPLETION
☑ STEEL ☐ ALUMINUM ☐ PLASTIC

RISER
RISER PIPE DIAMETER 2 IN.
RISER PIPE LENGTH 139 FT.
DIAMETER OF DRILL HOLE 6 IN.
WEIGHT OR SDR# Sch80

MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

BENTONITE SEAL
LENGTH 5 Foot
☑ CHIPS ☐ PELLETS ☐ GRANULAR
☐ SLURRY
☑ SATURATED ZONE ☐ HYDRATED

SCREEN
SCREEN DIAMETER 2 IN.
SCREEN LENGTH 10 FT.
DIAMETER OF DRILL HOLE 6 IN.
DEPTH TO TOP 137 FT.

SCREEN MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

DEPTH TO	DEPTH FROM	FORMATION DESCRIPTION
0'	45'	Silty Clay
45'	147'	Limestone
TOTAL DEPTH:		147 Foot

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE & SIZE OF ALL CASING, HOLE DIAMETER & GROUT USED.

SIGNATURE (PRIMARY CONTACTOR)
PERMIT NUMBER 003839-M
DATE WELL DRILLING WAS COMPELTED 10-8-13

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. ☐ PUMP INSTALLED

SIGNATURE (WELL DRILLER)	PERMIT NUMBER	SIGNATURE (OF APPRENTICE)	APPRENTICE PERMIT NUMBER
	003456-M		

MO 780-1415 (07-11)
DISTRIBUTION: WHITE/DIVISION CANARY/CONTACTOR PINK/OWNER
RETURN WHITE COPY WITH APPROPRIATE FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SD

Rock Log

Local Site Coordinates: 1067056.90 N, 517015.98 E Ground Surface Elevation: 484.82

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 6, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
0.0	**0.0 to 232.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	Blind-drilled from 0 - 232 ft; no samples collected. 0 - 50 ft drilled via air rotary. O_2 (%), methane (%LEL), and VOCs (ppm) monitored at borehole.
5.0										57.9	
10.0										57.6	20.4% O_2, 40% LEL, 18.1 ppm.
15.0										57.6	
20.0										57.6	20.9% O_2, 0% LEL, 0 ppm.
25.0										57.6	
30.0										57.6	
35.0										57.6	
40.0										57.6	
45.0										57.4	Competent bedrock encountered.
50.0										57.4	

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SD

Rock Log

Local Site Coordinates: 1067056.90 N, 517015.98 E Ground Surface Elevation: 484.82

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 6, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
50.0	**0.0 to 232.0 ft.** - Blind drilled. No sample collected.									57.4	Set temporary 8-in. D casing 5 ft into bedrock. Continued drilling through casing.
55.0										57.4	
60.0										57.4	
65.0										57.4	
70.0										57.4	
75.0										57.4	
80.0										57.4	20.9% O_2, 0% LEL, 0 ppm.
85.0										57.4	
90.0										57.4	
95.0										57.4	
100.0										57.4	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SD

Rock Log

Local Site Coordinates: 1067056.90 N, 517015.98 E Ground Surface Elevation: 484.82

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 6, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
100.0	**0.0 to 232.0 ft.** - Blind drilled. No sample collected.									57.4	20.9% O_2, 0% LEL, 0 ppm.
105.0										57.4	
110.0										57.4	
115.0										57.4	
120.0										57.4	20.9% O_2, 0% LEL, 0 ppm..
125.0										57.4	
130.0										57.4	
135.0										57.4	
140.0										57.4	20.9% O_2, 0% LEL, 0 ppm.
145.0										57.4	
150.0										57.4	

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SD

Rock Log

Local Site Coordinates: 1067056.90 N, 517015.98 E Ground Surface Elevation: 484.82

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 6, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
150.0	**0.0 to 232.0 ft.** - Blind drilled. No sample collected.									57.4	
155.0										57.1	
160.0										57.1	20.9% O_2, 0% LEL, 0 ppm.
165.0										57.1	
170.0										56.9	
175.0										56.7	
180.0										56.5	20.9% O_2, 0% LEL, 0 ppm.
185.0										56.5	
190.0										56.2	
195.0										56.2	
200.0										56.2	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SD

Rock Log

Local Site Coordinates: 1067056.90 N, 517015.98 E Ground Surface Elevation: 484.82

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 6, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
200.0	**0.0 to 232.0 ft.** - Blind drilled. No sample collected.									56.2	20.9% O_2, 0% LEL, 0 ppm.
205.0										56.2	
210.0										56.2	
215.0										56.2	
220.0										56.2	20.9% O_2, 0% LEL, 0 ppm.
225.0										56.2	
230.0										56.0	
232.0											20.9% O_2, 0% LEL, 0 ppm. Weathered fracture.

Change in scale see sheet 6 of 7

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SD

Rock Log

Local Site Coordinates: 1067056.90 N, 517015.98 E Ground Surface Elevation: 484.82

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 6, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
232.0											
	232.0 to 233.0 ft. - LIMESTONE, medium gray (N6). Medium-grained; massive; competent; fresh.		1 of 2	4.8 / 5.0	3.2 / 5.0	1	85°, PL	FR	R5		20.9% O_2, 0% LEL, 0 ppm. Weathered fracture.
233.0											
						0		FR	R5		
234.0											
						2	90°, PL; 90°, PL	FR	R5		Weathered fracture with very dark gray deposits; slightly weathered fracture with small amounts of dark gray deposits.
235.0										55.6	
						0		FR	R5		
236.0											
						0		FR	R5		
237.0											
	240.0 to 241.0 ft. - LIMESTONE, as above.		2 of 2	9.6 / 10.0	6.8 / 10.0	5	90°, PL (all 5)	FR	R5		
238.0											
						4	90°, PL (all 4)	FR	R5		
239.0											
						3	80°, PL (all 3)	FR	R5		
240.0										55.4	
						2	90°, PL; 90°, PL	FR	R5		
241.0											
						1	90°, PL	FR	R5		
242.0											

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helpers: Rob Underwood, Ben Williams
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-211-SD

Rock Log

Local Site Coordinates: 1067056.90 N, 517015.98 E Ground Surface Elevation: 484.82

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 6, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
242.0											
243.0						2	90°, PL; 90°, PL	FR	R5		
244.0						1	90°, PL	FR	R5		
245.0	**244.0 to 245.0 ft.** - LIMESTONE, medium gray (N6) with light brownish gray (5YR 6/1). Medium-grained; massive; competent; fresh.					0		FR	R5	55.6	
246.0	**245.0 to 246.0 ft.** - LIMESTONE, 245.2 to 246 ft. light brownish gray (5YR 6/1) with mixture of dark gray (N4). Medium to coarse-grained; massive; competent; fresh.					2	90°, PL; 90°, PL	FR	R5		
247.0	**246.0 to 247.0 ft.** - LIMESTONE, dark gray (N4). Coarse-grained; massive; competent; fresh.					3	80°, PL; 90°, PL; 75°, PL	FR	R5	55.6	20.9% O_2, 0% LEL, 0 ppm.
248.0											**Boring Depth: 247 ft. bgs.**
249.0											
250.0											
251.0											
252.0											

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helpers: Rob Underwood, Ben Williams

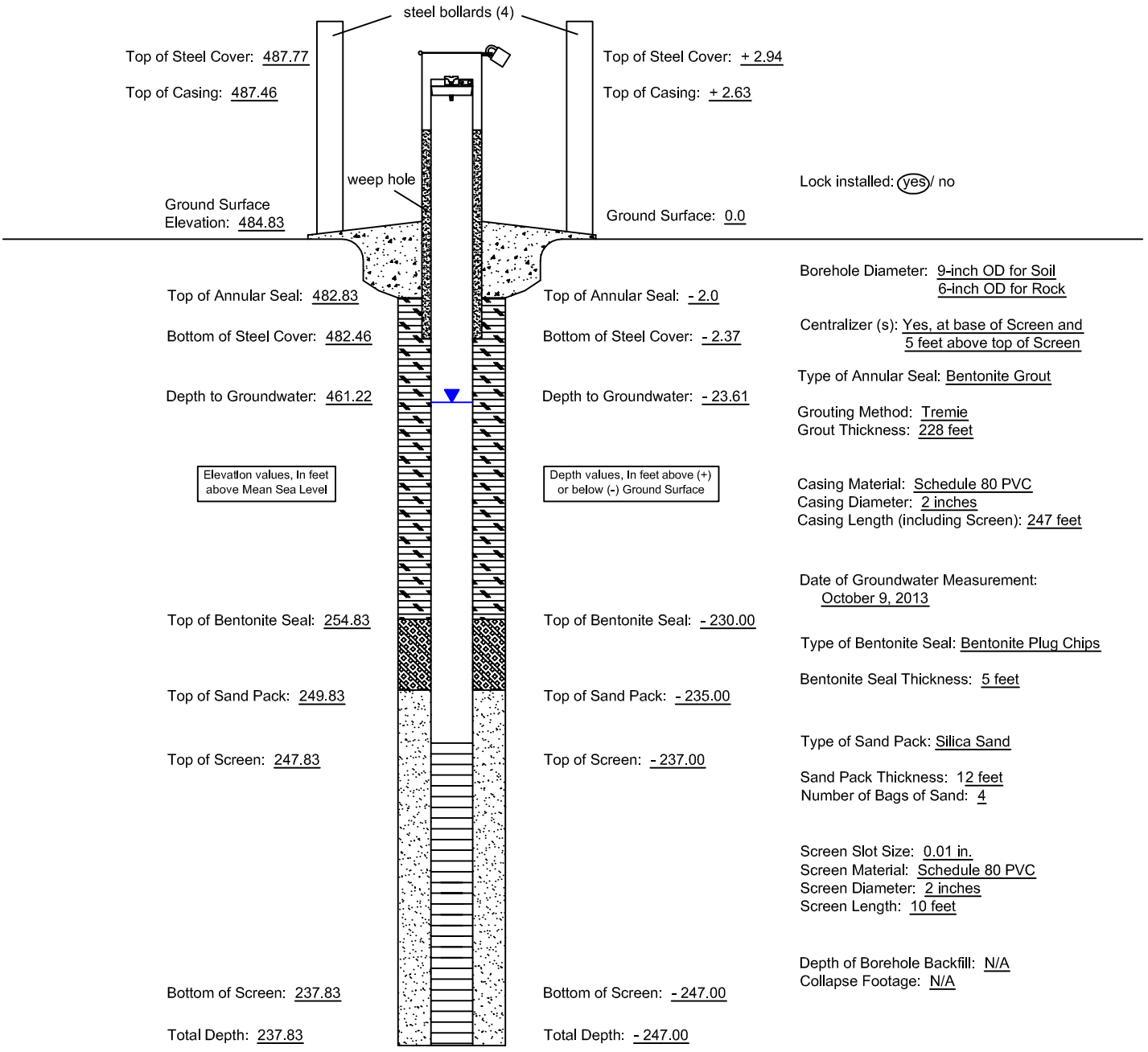
Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

Well Coordinates:
N 1067056.698
E 517016.608

Drilling Contractor: Frontz Drilling
Lead Driller: Rob Hamilton
Drilling Dates: October 6-7, 2013



Top of Steel Cover: 487.77
Top of Casing: 487.46
Ground Surface Elevation: 484.83

Top of Steel Cover: + 2.94
Top of Casing: + 2.63
Ground Surface: 0.0

Lock installed: (yes) / no

Top of Annular Seal: 482.83
Bottom of Steel Cover: 482.46
Depth to Groundwater: 461.22

Top of Annular Seal: - 2.0
Bottom of Steel Cover: - 2.37
Depth to Groundwater: - 23.61

Elevation values, In feet above Mean Sea Level

Depth values, In feet above (+) or below (-) Ground Surface

Borehole Diameter: 9-inch OD for Soil
6-inch OD for Rock

Centralizer (s): Yes, at base of Screen and 5 feet above top of Screen

Type of Annular Seal: Bentonite Grout

Grouting Method: Tremie
Grout Thickness: 228 feet

Casing Material: Schedule 80 PVC
Casing Diameter: 2 inches
Casing Length (including Screen): 247 feet

Date of Groundwater Measurement: October 9, 2013

Top of Bentonite Seal: 254.83
Top of Sand Pack: 249.83
Top of Screen: 247.83

Top of Bentonite Seal: - 230.00
Top of Sand Pack: - 235.00
Top of Screen: - 237.00

Type of Bentonite Seal: Bentonite Plug Chips

Bentonite Seal Thickness: 5 feet

Type of Sand Pack: Silica Sand

Sand Pack Thickness: 12 feet
Number of Bags of Sand: 4

Screen Slot Size: 0.01 in.
Screen Material: Schedule 80 PVC
Screen Diameter: 2 inches
Screen Length: 10 feet

Bottom of Screen: 237.83
Total Depth: 237.83

Bottom of Screen: - 247.00
Total Depth: - 247.00

Depth of Borehole Backfill: N/A
Collapse Footage: N/A

(Not to Scale)

4631 North St. Peters Parkway
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

Bridgeton Landfill
Bridgeton, Missouri

PZ-211-SD
As-Built Diagram

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM
MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REFERENCE NO	
C R NO	CHECK NO
STATE WELL NUMBER	REVENUE NO
ENTERED Ph1 Ph2 Ph3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR
NOTE THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME: Republic Services
CONTACT NAME: Bryan Sehie
VARIANCE GRANTED BY DNR NUMBER:
OWNER ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Bridgeton Sanitary Landfill
WELL NUMBER: PZ-211-SD
COUNTY: Saint Louis
SITE ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATIC WATER LEVEL: 26.24

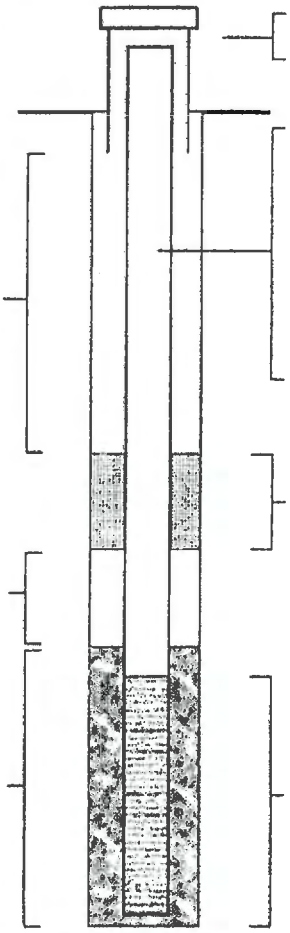
SURFACE COMPLETION
TYPE: ☑ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH AND DIAMETER OF SURFACE COMPLETION: LENGTH 2.5 FT. DIAMETER 5 IN.
DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: DIAMETER 5 IN. LENGTH 2.5 FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE ☐ OTHER

LOCATION OF WELL (D/M/S FORMAT ONLY)
LAT. 38 . 45 . 47.8
LONG. 90 . 26 . 30.6

SMALLEST ¼ LARGEST ¼ ¼
SECTION ____ TOWNSHIP 47 NORTH
RANGE 5 ☑ EAST ☐ WEST

MONITORING FOR: (CHECK ALL THAT APPLY)
☑ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☑ METALS ☑ VOC
☑ SVOCS ☑ PESTICIDES/HERBICIDES

PROPOSED USE OF WELL
☐ GAS MIGRATION WELL ☑ OBSERVATION
☐ EXTRACTION WELL ☐ OPEN HOLE
☐ PIEZOMETERS ☐ INJECTION WELL
☐ DIRECT PUSH



☑ LOCKING CAP
☑ WEEP HOLE
ELEVATION 485.21 FT.

ANNULAR SEAL
LENGTH 228 FT.
☑ SLURRY ☐ CHIPS
☐ PELLETS ☐ GRANULAR
☐ CEMENT/SLURRY
IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG 440 GAL.

SECONDARY FILTER PACK
LENGTH 0 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK 235 FT.

LENGTH OF PRIMARY FILTER PACK 12 FT.

SURFACE COMPLETION
☑ STEEL ☐ ALUMINUM ☐ PLASTIC

RISER
RISER PIPE DIAMETER 2 IN.
RISER PIPE LENGTH 239 FT.
DIAMETER OF DRILL HOLE 6 IN.
WEIGHT OR SDR# Sch80

MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

BENTONITE SEAL
LENGTH 5 Foot
☑ CHIPS ☐ PELLETS ☐ GRANULAR
☐ SLURRY
☑ SATURATED ZONE ☐ HYDRATED

SCREEN
SCREEN DIAMETER 2 IN.
SCREEN LENGTH 10 FT.
DIAMETER OF DRILL HOLE 6 IN.
DEPTH TO TOP 237 FT.

SCREEN MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

DEPTH TO	DEPTH FROM	FORMATION DESCRIPTION
0'	45'	Silty Clay
45'	247'	Limestone
TOTAL DEPTH:		247 Foot

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE & SIZE OF ALL CASING, HOLE DIAMETER & GROUT USED.

SIGNATURE (PRIMARY CONTACTOR): [signature]
PERMIT NUMBER: 003859M
DATE WELL DRILLING WAS COMPELTED: 10-7-13

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. ☐ PUMP INSTALLED

SIGNATURE (WELL DRILLER): [signature]
PERMIT NUMBER: 003456-M
SIGNATURE (OF APPRENTICE):
APPRENTICE PERMIT NUMBER:

MO 780-1415 (07-11)
DISTRIBUTION: WHITE/DIVISION CANARY/CONTACTOR PINK/OWNER
RETURN WHITE COPY WITH APPROPRIATE FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SS

Rock Log

Local Site Coordinates: 1067490.67 N, 517977.49 E Ground Surface Elevation: 480.15

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 18, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
0.0	**0.0 to 150.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	Blind-drilled enitire boring; no samples collected. Set 10 feet of 12-inch diameter steel temporary casing, then set 35 feet of 8-inch diameter steel temporary casing. Switched from air rotary to sonic and back as needed. O_2 (%), methane (%LEL), and VOCs (ppm) monitored at borehole.
10.0	Cuttings tan/brown silty clay.										20.3% O_2, 0% LEL, 0 ppm. Very wet cuttings at 10 feet below ground surface.
20.0	Cuttings gray/tan sand, silit, clay.										20.3% O_2, 0% LEL, 0 ppm. Wet cuttings 20 - 30 feet.
30.0	Cuttings contain larage limestone/sandstone cobbles and wood fragments										20.3% O_2, 0% LEL, 0 ppm.
35.0											Appear to hit rock at 34 feet.
40.0											20.3% O_2, 0% LEL, 0 ppm.
50.0											

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SS

Rock Log

Local Site Coordinates: 1067490.67 N, 517977.49 E Ground Surface Elevation: 480.15

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 18, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
50.0	**0.0 to 150.0 ft.** - Blind drilled. No sample collected.										
55.0											
60.0											20.9% O_2, 0% LEL, 0 ppm.
65.0											
70.0											
75.0											
80.0	Cuttings change from light gray limestone chips to brown sands and gravels.										
85.0											
90.0	Cuttings indicate back into Limestone.										Difficult to keep hole open since gravel appears to keep intruding the hole.
95.0											
100.0											20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helper: Rob Underwood

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SS

Rock Log

Local Site Coordinates: 1067490.67 N, 517977.49 E Ground Surface Elevation: 480.15

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 18, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
100.0	**0.0 to 150.0 ft.** - Blind drilled. No sample collected.										20.9% O_2, 0% LEL, 0 ppm.
105.0											
110.0											
115.0											Decided to use this borehole for PZ-212-SS and not core, since can't keep hole open to allow coring devices.
120.0											20.9% O_2, 0% LEL, 0 ppm.
125.0											
130.0											
135.0											
140.0											20.9% O_2, 0% LEL, 0 ppm.
145.0											
150.0											

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helper: Rob Underwood

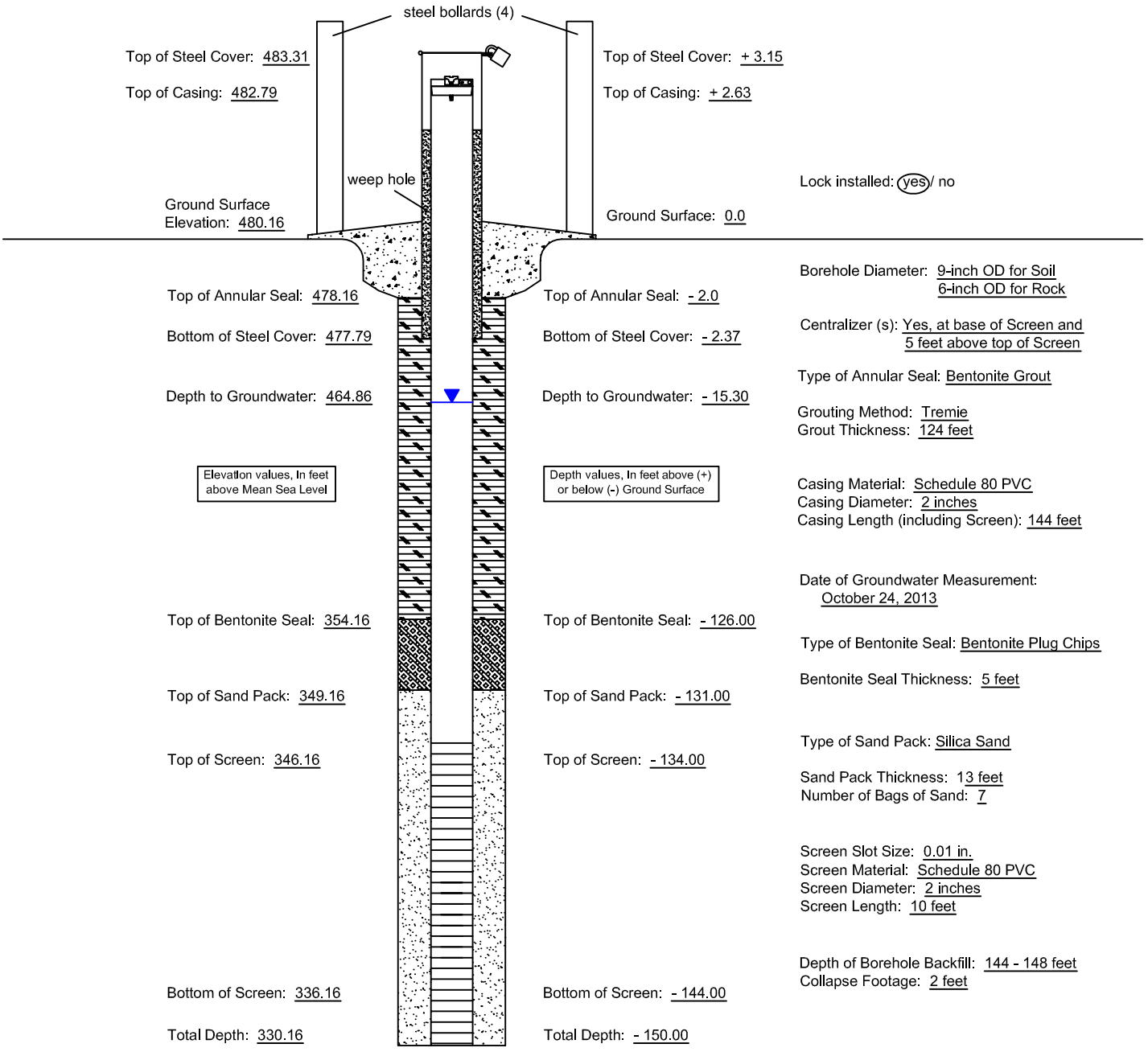
Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Steve Jett, Herst & Associates, Inc.

LIMESTONE

Well Coordinates:
N 1067490.987
E 517976.455

Drilling Contractor: Frontz Drilling
Lead Driller: Rob Hamilton
Drilling Dates: October 18, 2013



Top of Steel Cover: 483.31
Top of Casing: 482.79
Ground Surface Elevation: 480.16

Top of Steel Cover: + 3.15
Top of Casing: + 2.63
Ground Surface: 0.0

Lock installed: (yes) / no

Top of Annular Seal: 478.16
Bottom of Steel Cover: 477.79
Depth to Groundwater: 464.86

Top of Annular Seal: - 2.0
Bottom of Steel Cover: - 2.37
Depth to Groundwater: - 15.30

Elevation values, In feet above Mean Sea Level

Depth values, In feet above (+) or below (-) Ground Surface

Top of Bentonite Seal: 354.16
Top of Sand Pack: 349.16
Top of Screen: 346.16

Top of Bentonite Seal: - 126.00
Top of Sand Pack: - 131.00
Top of Screen: - 134.00

Bottom of Screen: 336.16
Total Depth: 330.16

Bottom of Screen: - 144.00
Total Depth: - 150.00

(Not to Scale)

Borehole Diameter: 9-inch OD for Soil
6-inch OD for Rock

Centralizer (s): Yes, at base of Screen and 5 feet above top of Screen

Type of Annular Seal: Bentonite Grout

Grouting Method: Tremie
Grout Thickness: 124 feet

Casing Material: Schedule 80 PVC
Casing Diameter: 2 inches
Casing Length (including Screen): 144 feet

Date of Groundwater Measurement:
October 24, 2013

Type of Bentonite Seal: Bentonite Plug Chips

Bentonite Seal Thickness: 5 feet

Type of Sand Pack: Silica Sand

Sand Pack Thickness: 13 feet
Number of Bags of Sand: 7

Screen Slot Size: 0.01 in.
Screen Material: Schedule 80 PVC
Screen Diameter: 2 inches
Screen Length: 10 feet

Depth of Borehole Backfill: 144 - 148 feet
Collapse Footage: 2 feet

4631 North St. Peters Parkway
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

Bridgeton Landfill
Bridgeton, Missouri

PZ-212-SS
As-Built Diagram

PZ-212-SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM
MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REFERENCE NO	
C.R. NO	CHECK NO
STATE WELL NUMBER	REVENUE NO
ENTERED Ph1 Ph2 Ph3	APPROVED BY / ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR
NOTE: THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME: Republic Services
CONTACT NAME: Bryan Sehie
VARIANCE GRANTED BY DNR NUMBER:
OWNER ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Bridgeton Sanitary Landfill
WELL NUMBER: PZ-212-SS
COUNTY: Saint Louis
SITE ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATIC WATER LEVEL: 19.11

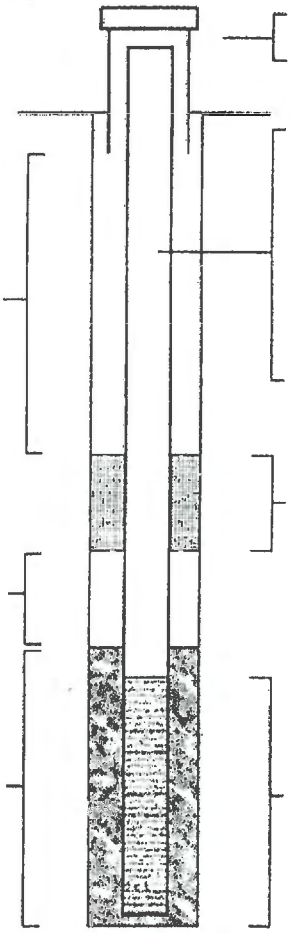
SURFACE COMPLETION
TYPE: ☑ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH AND DIAMETER OF SURFACE COMPLETION: LENGTH 2.5 FT. DIAMETER 5 IN.
DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: DIAMETER 5 IN. LENGTH 2.5 FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE ☐ OTHER

LOCATION OF WELL (D/M/S FORMAT ONLY)
LAT. 38 · 45 · 55.2"
LONG. 90 · 26 · 13"

SMALLEST ¼ LARGEST ¼ ¼
SECTION ____ TOWNSHIP 47 NORTH
RANGE 5 ☑ EAST ☐ WEST

MONITORING FOR: (CHECK ALL THAT APPLY)
☑ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☑ METALS ☑ VOC
☑ CVOCs ☑ PESTICIDES/HERBICIDES

PROPOSED USE OF WELL
☐ GAS MIGRATION WELL ☑ OBSERVATION
☐ EXTRACTION WELL ☐ OPEN HOLE
☐ PIEZOMETERS ☐ INJECTION WELL
☐ DIRECT PUSH



☑ LOCKING CAP
☑ WEEP HOLE
ELEVATION 484.18 FT.

ANNULAR SEAL
LENGTH 124 FT.
☑ SLURRY ☐ CHIPS
☐ PELLETS ☐ GRANULAR
☐ CEMENT/SLURRY
IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED ____
% OF BENTONITE USED ____
WATER USED/BAG 380 GAL.

SECONDARY FILTER PACK
LENGTH ____ FT.

DEPTH TO TOP OF PRIMARY FILTER PACK 131 FT.

LENGTH OF PRIMARY FILTER PACK 13 FT.

SURFACE COMPLETION
☑ STEEL ☐ ALUMINUM ☐ PLASTIC

RISER
RISER PIPE DIAMETER 2 IN.
RISER PIPE LENGTH 136 FT.
DIAMETER OF DRILL HOLE 6 IN.
WEIGHT OR SDR# Sch 80

MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

BENTONITE SEAL
LENGTH 5 Foot
☑ CHIPS ☐ PELLETS ☐ GRANULAR
☐ SLURRY
☑ SATURATED ZONE ☐ HYDRATED

SCREEN
SCREEN DIAMETER 2 IN.
SCREEN LENGTH 10 FT.
DIAMETER OF DRILL HOLE 6 IN.
DEPTH TO TOP 134 FT.

SCREEN MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC)
☐ OTHER

DEPTH TO	DEPTH FROM	FORMATION DESCRIPTION
0'	34'	Silty clay
34'	80'	Limestone
80'	85'	Sandstone Gravel
85'	144	Limestone
TOTAL DEPTH:		144 Foot

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE & SIZE OF ALL CASING, HOLE DIAMETER & GROUT USED.

SIGNATURE (PRIMARY CONTACTOR): [signature]
PERMIT NUMBER: 003839M
DATE WELL DRILLING WAS COMPELTED: 10-18-13

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. ☐ PUMP INSTALLED

SIGNATURE (WELL DRILLER): [signature]
PERMIT NUMBER: 003456-M
SIGNATURE (OF APPRENTICE):
APPRENTICE PERMIT NUMBER:

MO 780-1415 (07-11)
DISTRIBUTION: WHITE/DIVISION CANARY/CONTACTOR PINK/OWNER
RETURN WHITE COPY WITH APPROPRIATE FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
0.0	**0.0 to 129.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	Blind-drilled from 0 - 129 ft; no samples collected. Switched from air rotary to sonic and back as needed. O_2 (%), methane (%LEL), and VOCs (ppm) monitored at borehole.
5.0										60.2	
10.0										60.2	20.9% O_2, 0% LEL, 0 ppm.
15.0										60.2	
20.0										60.2	20.9% O_2, 0% LEL, 0 ppm.
25.0										60.2	
30.0										60.2	20.9% O_2, 0% LEL, 0 ppm.
35.0										60.2	20.9% O_2, 0% LEL, 0 ppm.
40.0										60.2	
45.0										60.2	
50.0										60.5	20.4% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
50.0	**0.0 to 129.0 ft.** - Blind drilled. No sample collected.									60.5	20.4% O_2, 0% LEL, 0 ppm.
55.0										60.5	
60.0										60.5	20.9% O_2, 0% LEL, 0 ppm.
65.0										60.5	
70.0										60.5	20.9% O_2, 0% LEL, 0 ppm.
75.0										60.5	
80.0										60.5	Set temporary 8-in. D casing to 80 ft. Continued drilling through casing. 20.9% O_2, 0% LEL, 0 ppm.
85.0										60.5	
90.0										60.5	
95.0										60.7	
100.0										60.7	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helper: Rob Underwood

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough

Fe-Iron, CL-Clay, CaCO3-Calcite

FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered

R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
100.0	**0.0 to 129.0 ft.** - Blind drilled. No sample collected.									60.7	20.9% O_2, 0% LEL, 0 ppm.
105.0										60.7	
110.0										60.7	
115.0										60.7	
120.0										60.7	21.2% O_2, 0% LEL, 0 ppm.
125.0										60.7	
129.0											20.9% O_2, 0% LEL, 0 ppm.

Change in scale see sheet 4 of 5

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
129.0											
130.0	**129.0 to 130.0 ft.** - LIMESTONE, light olive gray (5Y 6/1). With white (N9), greenish gray (5GY 6/1), and olive gray (5GY 4/1) spotting. Microcrystalline to fine-grained; massive; competent. Requires multiple hammer blows to fracture, but easily scratched with knife. Reactive with with 10% HCl solution.		1 of 4	4.7/5.0	4.7/4.7	0		F	R4	60.7	20.9% O_2, 0% LEL, 0 ppm.
131.0	**130.0 to 131.0 ft.** - LIMESTONE, as above, but with some lamination.					0		F	R3		
132.0	**131.0 to 132.0 ft.** - LIMESTONE, as above, but massive. With addition of very light gray (N8) spotting.					0		F	R4		
133.0	**132.0 to 133.0 ft.** - LIMESTONE, as above, but with addition of grenish gray (5G 6/1) spotting.					0		F	R4 to R5		
134.0	**133.0 to 134.0 ft.** - LIMESTONE, as above, but with faint grayish orange (10YR 7/4) staining at 133.5 ft. Some lamination from 133.5 - 133.7 ft. Possible moderately healed planar bedding joints. Olive gray (5Y 4/1) at healed joints.					0		F	R4 to R5		20.9% O_2, 0% LEL, 0 ppm.
135.0	**134.0 to 135.0 ft.** - LIMESTONE, light olive gray (5Y 6/1). With pale yellowish brown (10YR 6/2), white (N9), medium dark gray (N4), and olive gray (5Y 4/1) spotting. Microcrystalline; massive to laminated; competent. Easily broken by hand, easily scratched with knife. Reactive with 10% HCl solution. Slightly weathered: faint moderate yellowish brown (10YR 5/4) staining; weak along bedding planes, crumbly, can be flaked away with fingernail.		2 of 4	10.0/10.0	10.0/10.0	0		F to SW	R2 to R3	60.7	
136.0	**135.0 to 136.0 ft.** - LIMESTONE, as above, but greater lamination and more significant weathering. Surface discoloration of pale yellowish brown (10YR 6/2) and olive gray (5Y 4/1) on fracture.					1	[135.25] 90°, B, U, VR	SW	R2		
137.0	**136.0 to 137.0 ft.** - LIMESTONE, as above, but with white (N9), very light gray (N8), and olive black (5Y 2/1) spotting.					0		F to SW	R2		
138.0	**137.0 to 138.0 ft.** - LIMESTONE, as above, but with addition of pale yellowish brown (10YR 6/2), dark yellowish brown (10YR 4/2), and greenish gray (5G 6/1) spotting.					0		F	R2 to R3		
139.0	**138.0 to 139.0 ft.** - LIMESTONE, as above, but yellowish gray (5Y 8/1), light olive gray (5Y 6/1), and olive gray (5Y 4/1). With pale yellowish brown (10YR 6/2), grayish green (10G 4/2), white (N9), and greenish gray (5GY 6/1) spotting. Microcrystalline to fine-grained. Slightly weathered: weak along bedding planes, crumbly, can be flaked away with fingernail. However, less lamination than above.					0		F to SW	R2		

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
139.0											
	139.0 to 140.0 ft. - LIMESTONE, as above, but microcrystalline. Surface discoloration of olive gray (5Y 4/1) on fracture.					1	[139.3] 85°, B P, R	F to SW	R2 to R3		
140.0	**140.0 to 141.0 ft.** - LIMESTONE, as above, but pale yellowish brown (10YR 6/2) and light olive gray (5Y 6/1). With dark yellowish brown (10YR 4/2) and white (N9) spotting.					0		F to SW	R2 to R3		
141.0	**141.0 to 142.0 ft.** - LIMESTONE, as above, but light olive gray (5Y 6/1). With addition of medium gray (N5) and greenish gray (5GY 6/1) mottling. More lamination than above. Very weak along bedding planes, can easily be pulled apart by hand at bedding joints. Surface discoloration of olive gray (5Y 4/1) to dark greenish gray (5GY 4/1) on fracture. Fracture somewhat conchoidal in appearance.					1	[141.7] 85°, B, I, S	F to SW	R2	60.7	
142.0	**142.0 to 143.0 ft.** - LIMESTONE, as above, but with pale yellowish brown (10YR 6/2) and white (N9) spotting; rarely, grayish black (N2) flecks.					0		F to SW	R2		
143.0	**143.0 to 144.0 ft.** - LIMESTONE, as above, but yellowish gray (5Y 8/1) and light olive gray (5Y 6/1). With greenish gray (5GY 6/1) mottling. Faint grayish orange (10YR 7/4) staining from 143.6 - 143.7 ft. Moderately healed planar bedding joint at 143.65 ft. More massive and stronger (R4) after 143.7 ft.					0		F to SW	R2 to R3		
144.0											20.9% O_2, 0% LEL, 0 ppm.

Change in scale see sheet 6 of 7

Boring Depth: 244 ft. bgs.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
144.0	**144.0 to 229.0 ft.** - Blind drilled. No sample collected.									Meter: Solinst Model 107 TLC	
145.0										60.7	Blind-drilled from 144 - 229 ft; no samples collected; Borehole reamed to 6-inch diameter before setting well. 20.9% O_2, 0% LEL, 0 ppm.
150.0										60.7	
155.0										60.7	
160.0										60.7	
165.0										60.7	
170.0										60.7	
175.0										60.7	
180.0										60.7	
185.0										60.7	
190.0										60.5	20.9% O_2, 0% LEL, 0 ppm.

Drilling Contractor: Frontz Drilling, Inc.

Driller: Rob Hamilton

Helper: Rob Underwood

Certifying Geologist: Brian Fingers, Geotechnology, Inc.

Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
190.0	**0.0 to 129.0 ft.** - Blind drilled. No sample collected.									60.5	20.9% O_2, 0% LEL, 0 ppm.
195.0										60.5	
200.0										60.5	20.9% O_2, 0% LEL, 0 ppm.
205.0										60.5	
210.0										60.2	
215.0										60.2	
220.0										60.2	20.9% O_2, 0% LEL, 0 ppm.
225.0										60.1	
229.0											20.9% O_2, 0% LEL, 0 ppm.

Change in scale see sheet 8 of 9

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-Very Rough
Fe-Iron, CL-Clay, CaCO3-Calcite
FR-Fresh, SW-Slightly Weathered, MW-Moderately Weathered, HW- Highly Weathered, CW-Completely Weathered
R6- Extremely Strong, R5- Very Strong, R4- Strong, R3- Medium Strong, R2- Weak, R1-Very Weak, R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index FR SW MW HW CW	Strength Index R6 R5 R4 R3 R2 R1 R0	Temperature Profile (°F)	Notes
229.0											
	229.0 to 230.0 ft. - LIMESTONE, medium gray (N6). Medium-grainied, massive; strong		3 of 4	5.0 / 5.0	3.4 / 5.0	1	90°, U	F	R5	60.1	20.9% O_2, 0% LEL, 0 ppm.
230.0											
						3	90°, U; 90°, U; 90°, I	F	R5		
231.0											
						2	90°, I; 90°, I	F	R5		
232.0											
						3	90°, I; 45°, I; 45°, I	F	R5		
233.0											
	233.0 to 234.0 ft. - LIMESTONE, as above, but Crystalline (233-234 ft).					1	90°, PL	F	R5		Extremely fractured, majority are 90 degrees and undulating; 1 vertical fracture at 240.1 feet, which is 0.4 ft long.
234.0											
	234.0 to 235.0 ft. - LIMESTONE, gray (N7). Medium-grained and crystalline; massive; strong (where not fractured); laminated to thinly bedded.		4 of 4	10.0 / 10.0	1.1 / 10.0	7	90°, U	F	R5	60.1	
235.0											
						10	90°, U	F	R5		
236.0											
						9	90°, U	F	R5		
237.0											
						10	90°, U	F	R5		
238.0											
						10	90°, U	F	R5		
239.0											

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

HERST & ASSOCIATES, INC.®

Hole Number: PZ-212-SD

Rock Log

Local Site Coordinates: 1067494.79 N, 517980.49 E Ground Surface Elevation: 480.48

Project: Bridgeton Landfill Groundwater Assessment Well Installations

Project No.: 120131675

Site Location: Bridgeton, Missouri

Method of Drilling: 6 inch Dia. Air Rotary and Sonic

Rig Type: Versa-Drill Versa Sonic, 50K Sonicor Head

Drilling Date(s): October 19, 2013

J-Joint	PL-Planar	P-Polished	Fe-Iron	FR-Fresh	R6- Extremely Strong
F-Fault	C-Curved	K-Slickensided	CL-Clay	SW-Slightly Weathered	R5- Very Strong
S-Shear	U-Undulating	SM-Smooth	CaCO3-Calcite	MW-Moderately Weathered	R4- Strong
B-Bedding	ST-Stepped	R-Rough		HW- Highly Weathered	R3- Medium Strong
F-Foliation	I-Irregular	VR-Very Rough		CW-Completely Weathered	R2- Weak
					R1-Very Weak
					R0- Extremely Weak

Depth Scale (feet)	Rock Description	Graphic Log	Run No.	Core Recovery	RQD	Discontinuity Data: Fractures per Foot	Discontinuity Data: Type and Description	Weathering Index (FR SW MW HW CW)	Strength Index (R6 R5 R4 R3 R2 R1 R0)	Temperature Profile (°F)	Notes
239.0											
240.0						7	90°, U	F	R5	59.9	
	240.0 to 241.0 ft. - LIMESTONE, tan-gray (5Y 7/2). Aphantitic to fine-grained; massive; strong; dark gray (N5) layers 241.3-241.6 ft and 242.4-243.3 ft).					6	90°, U	F	R5		
241.0											
						3	90°, U	F	R5		
242.0											
						7	90°, U	F	R5		
243.0											
	244.0 ft. - LIMESTONE, aphantitic to fine-grained; massive; strong; dark gray (N5) layers 241.3-241.6 ft and 242.4-243.3 ft).					7	90°, U	F	R5		
244.0										59.9	Temperature readings in open borehole with no water.

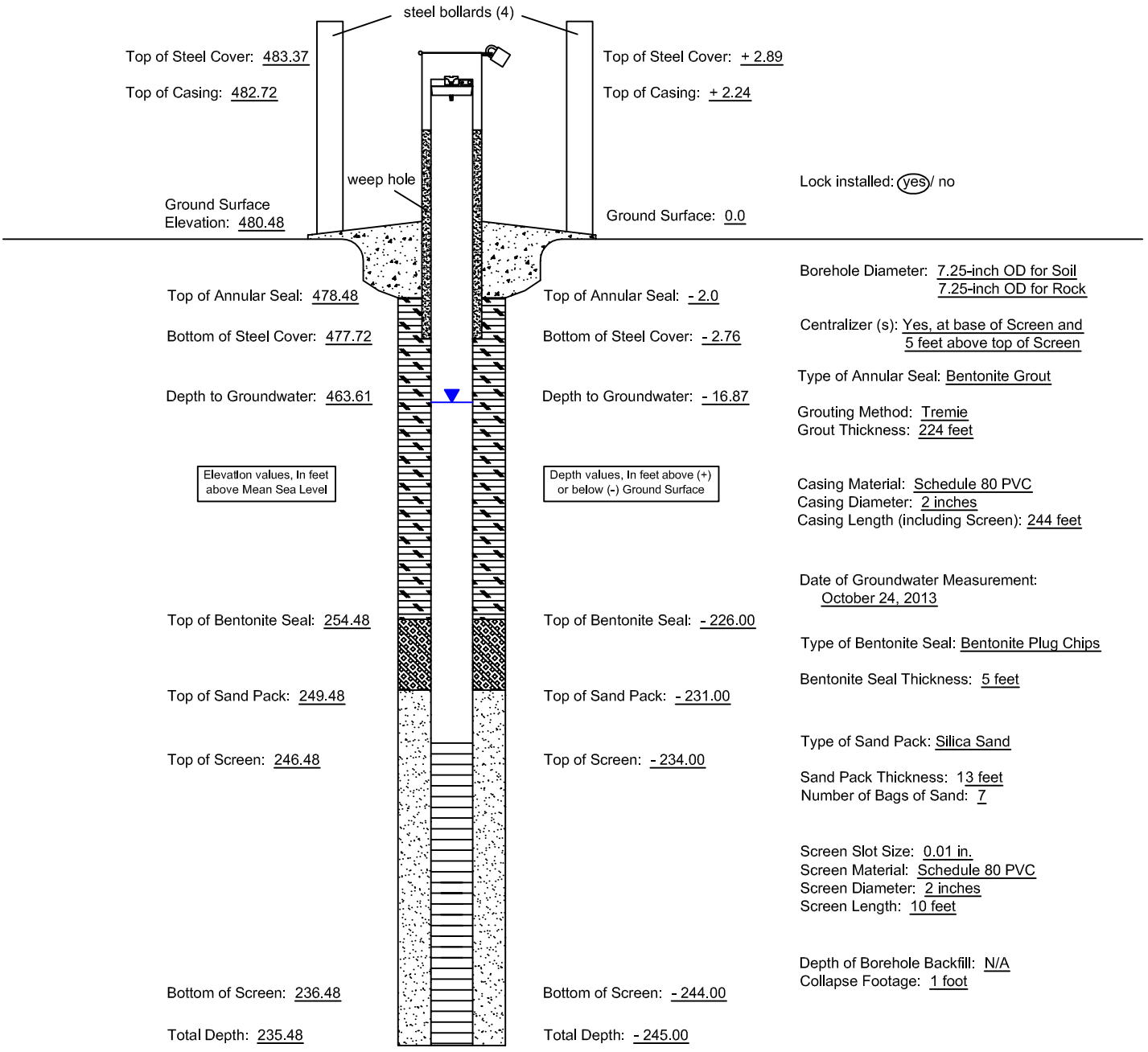
Boring Depth: 244 ft. bgs.

Drilling Contractor: Frontz Drilling, Inc.
Driller: Rob Hamilton
Helper: Rob Underwood
Certifying Geologist: Brian Fingers, Geotechnology, Inc.
Logged By: Andrew Wyatt & Steve Jett Herst & Associates, Inc.

LIMESTONE

Well Coordinates:
N 1067495.693
E 517980.384

Drilling Contractor: Frontz Drilling
Lead Driller: Rob Hamilton
Drilling Dates: October 19 - 21, 2013



Top of Steel Cover: 483.37
Top of Casing: 482.72
Ground Surface Elevation: 480.48

Top of Steel Cover: + 2.89
Top of Casing: + 2.24
Ground Surface: 0.0

Lock installed: (yes) / no

Top of Annular Seal: 478.48
Bottom of Steel Cover: 477.72
Depth to Groundwater: 463.61

Top of Annular Seal: - 2.0
Bottom of Steel Cover: - 2.76
Depth to Groundwater: - 16.87

Elevation values, In feet above Mean Sea Level

Depth values, In feet above (+) or below (-) Ground Surface

Top of Bentonite Seal: 254.48
Top of Sand Pack: 249.48
Top of Screen: 246.48

Top of Bentonite Seal: - 226.00
Top of Sand Pack: - 231.00
Top of Screen: - 234.00

Bottom of Screen: 236.48
Total Depth: 235.48

Bottom of Screen: - 244.00
Total Depth: - 245.00

(Not to Scale)

Borehole Diameter: 7.25-inch OD for Soil
7.25-inch OD for Rock

Centralizer (s): Yes, at base of Screen and 5 feet above top of Screen

Type of Annular Seal: Bentonite Grout

Grouting Method: Tremie
Grout Thickness: 224 feet

Casing Material: Schedule 80 PVC
Casing Diameter: 2 inches
Casing Length (including Screen): 244 feet

Date of Groundwater Measurement: October 24, 2013

Type of Bentonite Seal: Bentonite Plug Chips

Bentonite Seal Thickness: 5 feet

Type of Sand Pack: Silica Sand

Sand Pack Thickness: 13 feet
Number of Bags of Sand: 7

Screen Slot Size: 0.01 in.
Screen Material: Schedule 80 PVC
Screen Diameter: 2 inches
Screen Length: 10 feet

Depth of Borehole Backfill: N/A
Collapse Footage: 1 foot

4631 North St. Peters Parkway
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

Bridgeton Landfill
Bridgeton, Missouri

PZ-212-SD
As-Built Diagram

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED	
REFERENCE NO.		
C.R. NO.	CHECK NO.	
STATE WELL NUMBER	REVENUE NO.	
ENTERED Ph1 Ph2 Ph3	APPROVED BY	ROUTE

INFORMATION SUPPLIED BY PRIMARY CONTRACTOR OR DRILLING CONTRACTOR

NOTE: THIS FORM IS NOT TO BE USED FOR NESTED WELLS

OWNER NAME: Republic Services
CONTACT NAME: Bryan Sehie
VARIANCE GRANTED BY DNR NUMBER:
OWNER ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATE: MO
ZIP CODE: 63044
SITE NAME: Bridgeton Sanitary Landfill
WELL NUMBER: PZ-212-SD
COUNTY: Saint Louis
SITE ADDRESS: 13570 Saint Charles Rock Rd.
CITY: Bridgeton
STATIC WATER LEVEL: 17.93

SURFACE COMPLETION

TYPE: ☑ ABOVE GROUND ☐ FLUSH MOUNT
LENGTH AND DIAMETER OF SURFACE COMPLETION: LENGTH 2.5 FT. DIAMETER 5 IN.
DIAMETER AND DEPTH OF THE HOLE SURFACE COMPLETION WAS PLACED: DIAMETER 5 IN. LENGTH 2.5 FT.
SURFACE COMPLETION GROUT: ☑ CONCRETE ☐ OTHER

☑ LOCKING CAP
☑ WEEP HOLE

ELEVATION 484.18 FT

ANNULAR SEAL
LENGTH 224 FT.
☑ SLURRY ☐ CHIPS ☐ PELLETS ☐ GRANULAR ☐ CEMENT/SLURRY
IF CEMENT/BENTONITE MIX:
BAGS OF CEMENT USED
% OF BENTONITE USED
WATER USED/BAG 780 GAL.

SECONDARY FILTER PACK
LENGTH 6 FT.

DEPTH TO TOP OF PRIMARY FILTER PACK 231 FT.

LENGTH OF PRIMARY FILTER PACK 13 FT.

SURFACE COMPLETION
☑ STEEL ☐ ALUMINUM ☐ PLASTIC

RISER
RISER PIPE DIAMETER 2 IN.
RISER PIPE LENGTH 236 FT.
DIAMETER OF DRILL HOLE 6 IN.
WEIGHT OR SDR# Sch 80

MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC) ☐ OTHER

BENTONITE SEAL
LENGTH 5 Foot
☑ CHIPS ☐ PELLETS ☐ GRANULAR ☐ SLURRY
☑ SATURATED ZONE ☐ HYDRATED

SCREEN
SCREEN DIAMETER 2 IN.
SCREEN LENGTH 10 FT.
DIAMETER OF DRILL HOLE 6 IN.
DEPTH TO TOP 234 FT.

SCREEN MATERIAL
☐ STEEL ☑ THERMOPLASTIC (PVC) ☐ OTHER

LOCATION OF WELL (D/M/S FORMAT ONLY)
LAT. 38 · 45 · 55.2"
LONG. 90 · 26 · 19.1"

SMALLEST ¼ LARGEST ¼
SECTION ____ TOWNSHIP 47 NORTH
RANGE 5 ☑ EAST ☐ WEST

MONITORING FOR: (CHECK ALL THAT APPLY)
☑ RADIONUCLIDES ☐ PETROLEUM PRODUCTS ONLY
☐ EXPLOSIVES ☑ METALS ☑ VOC
☑ SVOCS ☑ PESTICIDES/HERBICIDES

PROPOSED USE OF WELL
☐ GAS MIGRATION WELL ☑ OBSERVATION
☐ EXTRACTION WELL ☐ OPEN HOLE
☐ PIEZOMETERS ☐ INJECTION WELL
☐ DIRECT PUSH

DEPTH TO	DEPTH FROM	FORMATION DESCRIPTION
0'	34'	Silty clay
34'	129'	Limestone
129'	244'	Limestone
TOTAL DEPTH:		244 Foot

FOR CASED WELLS, SUBMIT ADDITIONAL AS BUILT DIAGRAMS SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE & SIZE OF ALL CASING, HOLE DIAMETER & GROUT USED.

SIGNATURE (PRIMARY CONTACTOR) | PERMIT NUMBER 003839M | DATE WELL DRILLING WAS COMPELTED 10-21-13

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH MISSOURI DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. ☐ PUMP INSTALLED

SIGNATURE (WELL DRILLER) | PERMIT NUMBER 003456-M | SIGNATURE (OF APPRENTICE) | APPRENTICE PERMIT NUMBER

MO 780-1445 (07-11)

DISTRIBUTION: WHITE/DIVISION CANARY/CONTACTOR PINK/OWNER
RETURN WHITE COPY WITH APPROPRIATE FEE TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY, WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1065198.44
DATUM EASTING: 513867.83 ELEVATION 448.5

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-300-AS

SHEET 1 OF 2

					DRILLING START	DRILLING FINISH
WATER LEVEL	11.7 FT.					
TIME	9:40				TIME 8:00	TIME 12:00
DATE	9/23/95				DATE 9/22/95	DATE 9/22/95
CASING DEPTH	33.4 FT.					

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 5 4 5	1.8'/2.0' (90%)			(0.0-1.5 ft.) Loose, moderate yellowish brown (5YR 5/4), SILT, little to some Clay, NR, damp, (ML), (LOESS)	SP (1)	
2	5 6 5 4	1.8'/2.0' (90%)			(1.5-5.0 ft.) Compact, yellowish gray to dusky yellow (5Y 7/2 to 5Y 6/4), SILT, trace Clay, NR, (ML)	SP (2)	
3							
4	2 3 2 2	1.6'/2.0' (80%)				SP (3)	
5					(5.0-8.5 ft.) Loose, dark yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (ML), (LOESS)		
6	1 2 1 2	1.8'/2.0' (90%)				SP (4)	
7							
8	2 3 4 5	1.9'/2.0' (95%)			(440.0) 8.5 (8.5-16.5 ft.) Loose, olive gray (5Y 4/1), SILT and CLAY, NR, damp, (CL-ML), (LOESS)	SP (5)	
9							
10	1 1 2 3	1.4'/2.0' (70%)				SP (6)	
11					@ 11.5 Ft., moist		
12	2 2 2 4	2.0'/2.0' (100%)				SP (7)	
13					@ 13.2 Ft., wet		
14	1 2 2 3	2.0'/2.0' (100%)			@ 14.4 Ft., moist	SP (8)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ300AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1065198.44
DATUM EASTING: 513867.83 ELEVATION 448.5

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	11.7 FT.			
TIME	9:40			
DATE	9/23/95			
CASING DEPTH	33.4 FT.			

BORING NO. PZ-300-AS

SHEET 2 OF 2

DRILLING

START	FINISH
TIME 8:00	TIME 12:00
DATE 9/22/95	DATE 9/22/95

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
16	1 1	2.0' / 2.0' (100%)			(8.5-16.5 ft.) Loose, olive gray (5Y 4/1), SILT and CLAY, NR, damp, (CL-ML), (LOESS)	SP	8	
					(432.0) 16.5			
17	1 1				(16.5-20.0 ft.) Very loose, olive gray (5Y 4/1), SILT, trace Clay, NR, wet, (ML), (LOESS)	SP	9	
18	1 2	1.8' / 2.0' (90%)				SP	10	
19								
20					(428.5) 20.0			
					End of Soil Borehole Log at 20.0 ft.			
21								
22								
23								
24								
25								
26								
27								
28								
29								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

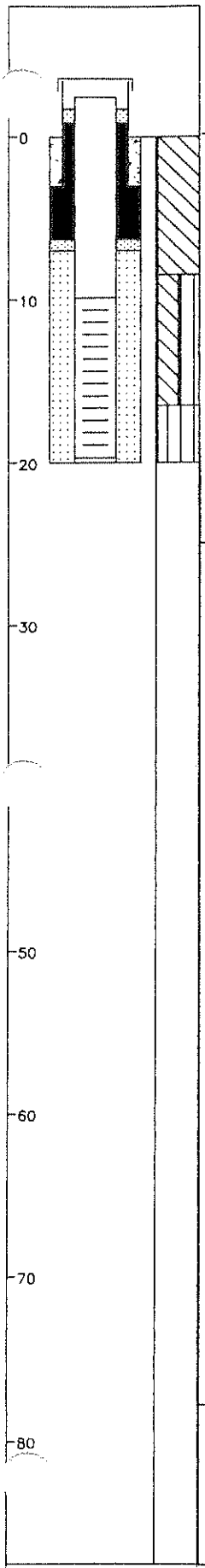
JOB NO.: 943-2848

FILENAME: PZ300AS

Well No. PZ-300-AS

Boring No. X-Ref: PZ-300-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1065198 ft. Easting: 513868 ft.

Elevation Ground Level 448.5 ft. NGVD

Top of PVC Casing 450.66 ft. NGVD

Drilling Summary:

Total Depth 20.0 ft.

Borehole Diameter 8 1/4" (0.0-20.0')

Casing Stickup Height 2.16 ft.

Driller Layne-Western
St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/26/95	16:15	9/26/95	17:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/26/95	17:00	9/26/95	17:05
Filter Placement:	9/26/95	17:05	9/26/95	17:15
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	9/26/95	17:15	9/26/95	17:25

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.16	-	9.90	C1	450.66	-	438.60
9.90	-	19.70	S1	438.60	-	428.80
19.70	-	20.00	C2	428.80	-	428.50
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 7.0-20.0'

Filter Pack: 100 mesh Silica Sand 6.3-7.0'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-6.3'

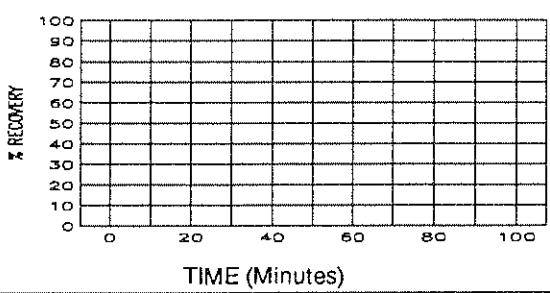
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ300AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145095	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-300AS
SITE ADDRESS: ST. CHARLES ROCK ROAD
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3740
OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
1100' S.W. OF BANK OF LEACHATE RETENSION POND, SOUTH OF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 448.5
SMALLEST ¼ ____ ¼ ____ ¼ LARGEST ¼ ____ ¼
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38 · 45 · 32 · LONG. 90 · 27 · 05 ·

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANOFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5' FT. | DIAMETER OF CASING 8"x8" IN. | WEIGHT OR SDR # Q188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 20 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 2.5 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT
MATERIAL ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS: LENGTH 12 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH.40 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☐ BENTONITE SLURRY ☒ NON SLURRY BENTONITE TYPE: MED. CHIPS ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED % BENTONITE USED WATER USED/BAG GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☐ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 3.8 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16/35	13 FT.	POURED THRU H.S.A.			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	0.7 FT.	POURED THRU H.S.A.	Depth to bottom of Protective Casing Seal:	2.5	0-20 silty clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 0.010	WEIGHT OR SDR # SCH.40	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	6.3	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER			Depth to Base of Bentonite Seal:	6.3	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE			Depth to Top of Primary Filter Pack:	7.0	
						Depth to Top of the Screen:	10	
						Depth to Bottom of the Screen:	20	
						Total Depth:	20	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER
ELEVATION OF MEASURING POINT 450.66
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER
DATE WELL DRILLING WAS COMPLETED 9-26-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT # [signature] DATE 11-14-95
SIGNATURE DRILLER/PERMIT # [signature] DATE 11-14-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1065213.84
DATUM EASTING: 513828.06 ELEVATION 448.1

DRILLING METHOD:
4.25 inch I.D. Hollow Stem Auger
3.625 inch Mud Rotary

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-300-AD

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME					13:00	16:00
DATE					DATE	DATE
CASING DEPTH					9/24/95	9/24/95

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ300AD

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	0 0 0 2	2.0' / 2.0' (100%)			(0.0-30.0 ft.) No samples collected, see Soil Borehole Log PZ-300-SS for descriptions	SP ①	
32	0 1 3 4	1.6' / 2.0' (80%)			(30.0-39.7 ft.) Very loose, olive gray (5Y 4/1), SILT, trace fine Sand, NR, wet, (ML), (LOESS)	SP ②	
34	0 0 1 2	1.9' / 2.0' (95%)				SP ③	
36	0 0 0 2	2.0' / 2.0' (100%)				SP ④	
38	0 0 0 2	2.0' / 2.0' (100%)				SP ⑤	
39					(408.4) 39.7		
40	1 2 3 3	1.5' / 2.0' (75%)			(39.7-42.2 ft.) Loose, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP ⑥	
42					(405.9) 42.2		
43	2 50	0.7' / 2.0' (35%)			(42.2-42.8 ft.) Loose, light olive gray (5Y 5/2), well graded SAND, NR, wet, (SW), (ALLUVIUM)	SP ⑦	
44					(42.8-43.0 ft.) Very dense, very light gray (N5), highly weathered LIMESTONE bedrock, SR, wet, (WEATHERED BEDROCK) (405.3) 42.8		
					End of Soil Borehole Log at 42.8 ft.		

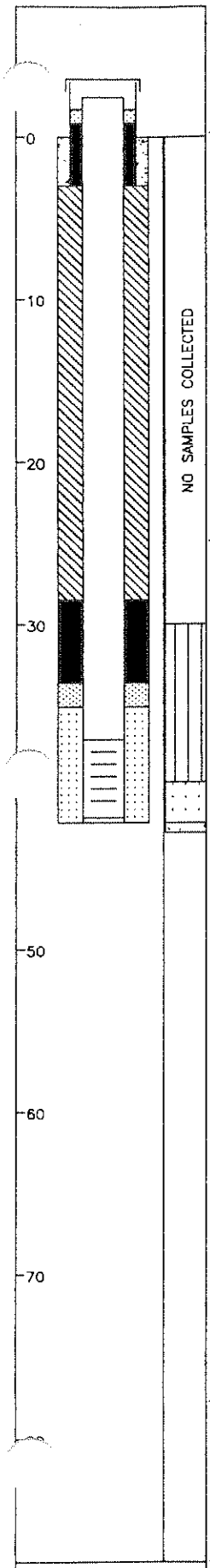
Well No. PZ-300-AD

Boring No. X-Ref: PZ-300-AD

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1065214 ft.
Easting: 513828 ft.

Elevation Ground Level 448.1 ft. NGVD
Top of PVC Casing 449.62 ft. NGVD



Drilling Summary:

Total Depth 42.2 ft.
Borehole Diameter 8 1/4" (0.0-42.2')
Casing Stickup Height 1.52 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling CME 750	9/24/95	13:00	9/24/95	16:00
Geophys.Logging:				
Casing: 2" I.D. PVC	9/24/95	17:05	9/24/95	17:10
Filter Placement:	9/24/95	17:10	9/24/95	18:15
Cementing:				
Development				
Bentonite Grout	9/24/95	18:20	9/24/95	18:45
Bentonite Seal	9/24/95	18:15	9/24/95	18:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.52	-	37.10	C1	449.62	-	411.00
37.10	-	41.90	S1	411.00	-	406.20
41.90	-	42.20	C2	406.20	-	405.90

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 35.1-42.2'

Filter Pack: 100 mesh Silica Sand 33.6-35.1'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-28.5'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 28.5-33.6'

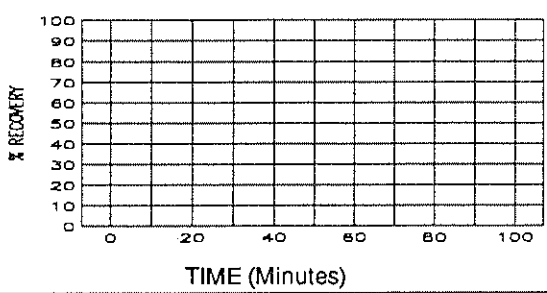
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ300AD

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145096	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-300AD
SITE ADDRESS: ST. CHARLES ROCK RD. CITY: BRIDGETON STATE: MO ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC. TELEPHONE: 314-241-3740
OWNER ADDRESS: 1838 N. BROADWAY CITY: ST. LOUIS STATE: MO ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO DATE ISSUED: VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
1120' SOUTHWEST OF BANK OF LEACHATE RETENSION RAWW POND, SOUTH OF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 448.1
SMALLEST ¼ LARGEST ¼
SEC. ____ TWN. 47 N.RNG. 5 (E) OR W
LAT. 38 ° 45 ' 32 " LONG. 90 ° 27 ' 06 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC. PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 42.2 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO | WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 38.7 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE ☐ CEMENT/BENTONITE SLURRY TYPE: ____ BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS. ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 5.1 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	7.1 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.5 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-30 Not sampled
WELL SCREEN	LENGTH OF SCREEN 5 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	28.5	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER	Depth to Base of Bentonite Seal:	33.6	30-38 Silt
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE	Depth to Top of Primary Filter Pack:	35.1	
				Depth to Top of the Screen:	37.2	
				Depth to Bottom of the Screen:	42.2	38-42.2 Silty sand
				Total Depth:	42.2	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 449.62
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
DATE WELL DRILLING WAS COMPLETED 9-24-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT # [signature] DATE 11-14-95
SIGNATURE DRILLER/PERMIT # [signature] DATE 11-14-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

DATUM NORTHING: 1065204.75 EASTING: 513849.81 ELEVATION 448.4

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME					16:30	10:30
DATE					DATE	DATE
CASING DEPTH					9/22/95	9/23/95

BORING NO. PZ-300-SS

SHEET 1 OF 3

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 4 5 4	1.8'/2.0' (90%)			(0.0-2.2 ft.) Loose, moderate yellowish brown (10YR 5/4), SILT, trace Clay, NR, dry, (ML), (LOESS)	SP (1)	
2	3 4 7 7	1.9'/2.0' (95%)			(2.2-4.9 ft.) Compact, dusky yellow (5Y 6/4), SILT, NR, dry, (ML), (LOESS)	SP (2)	
4	3 3 4 4	1.5'/2.0' (75%)			(4.9-8.1 ft.) Loose, olive gray (5Y 4/1), SILT, little Clay, NR, dry, (ML), (LOESS)	SP (3)	
6	2 2 3 3	1.8'/2.0' (90%)				SP (4)	
8	1 2 3 4	2.0'/2.0' (100%)			(440.3) 8.1 (8.1-10.0 ft.) Loose, olive gray (5Y 3/2), plastic SILT, NR, damp, (MH), (LOESS) (438.4) 10.0	SP (5)	
10	1 1 1 2	1.6'/2.0' (80%)			(10.0-16.0 ft.) Very loose, moderate olive brown to light olive gray (5Y 4/4 to 5Y 5/2), SILT, NR, moist, trace iron staining, (ML), (LOESS) @ 11.4 ft., wet	SP (6)	
12	1 1 1 1	0.9'/2.0' (45%)			@ 13.0 ft., moist	SP (7)	
14	1 1 2 2	2.0'/2.0' (100%)				SP (8)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ300SS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION: LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	BORING NO. PZ-300-SS SHEET 2 OF 3

					DRILLING START	DRILLING FINISH
WATER LEVEL						
TIME					16:30	10:30
DATE					DATE	DATE
CASING DEPTH					9/22/95	9/23/95

DATUM NORTHING: 1065204.75 EASTING: 513849.81 ELEVATION 448.4

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 2 1 2	1.9' / 2.0' (95%)			(10.0-16.0 ft.) Very loose, moderate olive brown to light olive gray (5Y 4/4 to 5Y 5/2), SILT, NR, moist, trace iron staining, (ML), (LOESS)	SP (8)	
17					(16.0-21.5 ft.) Very loose, moderate olive brown (5Y 4/4), SILT, trace fine Sand, NR, wet, (ML), (LOESS)	SP (9)	
18	0 1 2 2	1.9' / 2.0' (95%)				SP (10)	
19							
20	0 2 1 2	2.0' / 2.0' (100%)				SP (11)	9/22/95 @ 17:30 Stopped drilling at 20.0 ft. 9/23/95 @ 7:30 Resumed drilling
21							
22	1 1 2 2	1.7' / 2.0' (85%)			(21.5-35.4 ft.) Very loose, olive gray (5Y 4/1), SILT, trace Clay and fine Sand, NR, wet, (ML), (LOESS)	SP (12)	
23							
24	0 0 2 1	2.0' / 2.0' (100%)				SP (13)	
25							
26	0 0 0 1	2.0' / 2.0' (100%)				SP (14)	
27							
28	0 0 1 2	2.0' / 2.0' (100%)				SP (15)	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ300SS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-300-SS
SHEET	3 OF 3
DRILLING	START / FINISH
WATER LEVEL	
TIME	START: 16:30 / FINISH: 10:30
DATE	START: 9/22/95 / FINISH: 9/23/95
CASING DEPTH	
DATUM	NORTHING: 1065204.75 EASTING: 513849.81
ELEVATION	448.4
DRILL RIG	CME 750
ANGLE	90°
BEARING	NA
SAMPLE HAMMER	
SURFACE CONDITIONS	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	1 2 1 4	2.0'/2.0' (100%)			(21.5-35.4 ft.) Very loose, olive gray (5Y 4/1), SILT, trace Clay and fine Sand, NR, wet, (ML), (LOESS)	SP 16	
32	0 0 0 1	1.6'/2.0' (80%)				SP 17	
33							
34	0 2 2 4	1.5'/2.0' (75%)				SP 18	
35					(413.0) 35.4		
36	1 1 3 5	0.6'/2.0' (30%)			(35.4-35.9 ft.) Loose, olive gray (5Y 4/1), fine SILTY SAND, NR, wet, (SM), (ALLUVIUM) (412.5) 35.9 (35.9-39.9 ft.) Loose, dark greenish gray (5GY 4/1), well graded SAND, some fine Gravel, NR, wet, (SW), (ALLUVIUM)	SP 19	36.0-38.0 ft. 5 ft. heave in augers, switch to mud rotary at 38.0 ft.
37							
38	4 3 6 10	1.2'/2.0' (60%)				SP 20	
39					(408.5) 39.9		
40	16 50	0.6'/0.7' (86%)			(39.9-42.0 ft.) Very dense, light olive gray (5Y 6/1), highly weathered LIMESTONE bedrock, little Sand and Gravel, SR, wet, (GP), (WEATHERED BEDROCK)	SP 21	
41							
42					(406.4) 42.0 End of Soil Borehole Log at 42.0 ft. See PZ-300-SS Record of Drillhole for rock descriptions.		
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ300SS

RECORD OF DRILLHOLE PZ-300-SS

Sheet 1 of 4

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDTETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/23/95-9/24/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1065204.8
AZIMUTH:

COLLAR ELEV: 448.4
E: 513649.8
INCLINATION: -90

ROCK TYPE
J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-41.0 ft. See Soil Borehole Log PZ-300-SS														
34															
36															
38															
40															
			407.40												
	41.0-42.0 ft. LIMESTONE GRAVEL		41.00 406.90						Core Loss						
			406.90 41.50												
42	42.0-47.1 ft. Fresh, very thinly to thinly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Occasional stylolites								J,I,R						
									B,PL,R(2)						
									J,I,R						
44									J,PL,R(2)						
									J,C,SM						
				1	94%				J,PL,SM						
									B,PL,SM						
46															
	47.1-67.8 ft. Fresh, very thinly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong LIMESTONE, (ST. LOUIS FORMATION) Stylolites								B,I,SM						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. HARRINGTON
CHECKED: B. TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-300-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDTETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/23/95-9/24/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1065204.8
AZIMUTH:

COLLAR ELEV: 448.4
E: 513849.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX: SW FR, MW, HW, CW	STRENGTH INDEX: R6, R5, R4, R3, R2, R1	POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	47.1-67.8 ft. Fresh, very thinly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			1	94%				B,PL,SM						
									F,I,R						
									J,I,R(2)						
			398.90						J,I,R						
			49.50												9/23/95 @ 14:25 End Run 1
50	50.-50.5 ft. Vuggy								B,PL,SM						
									J,I,R						
									B,PL,SM						
									J,PL,R						
									B,PL,SM(2)						
52															
									B,PL,R						
									B,C,R						
									J,I,R						
									B,PL,SM						
54									J,PL,R						
									B,I,R						
	54.5 ft. 0.1 ft. seam of CHERT			2	97%				B,PL,SM						
56									B,PL,SM,CL						
58	58.2-59.2 ft. Layer of greenish gray (5G 6/1), ARGILLACEOUS LIMESTONE														
									B,PL,SM						
			388.90												
			59.50												9/23/95 @ 15:50 End Run 2
60									J,I,R						
									B,I,R						
	61.2-62.6 ft. Layer of light olive gray (5Y 5/2), weak, ARGILLACEOUS DOLOMITIC LIMESTONE			3	100 %										
62									B,PL,SM						
									J,I,R						
									B,PL,SM						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. HARRINGTON
CHECKED: B. TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-300-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDTETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/23/95-9/24/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1065204.8
AZIMUTH:

COLLAR ELEV: 448.4
E: 513849.8
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FT)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (RT, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	47.1-67.8 ft. Fresh, very thinly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong LIMESTONE, (ST. LOUIS FORMATION) Stylolites								B,PL,SM						
									B,PL,SM						
66				3	100 %										
68	67.8-73.0 ft. Fresh, medium bedded, pale olive (10Y 4/2), very finely crystalline, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs to 69.0 ft.		378.90 / 69.50												9/23/95 @ 16:50 End Run 4
70															
72									J,I,R						
74	73.0-77.5 ft. Fresh, very thinly bedded, grayish olive, (10Y 4/2), finely crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites			4	100 %				B,PL,SM						
									B,U,SM						
76									B,PL,SM						
78	77.5-80.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs to 78.5 ft., occasional stylolites		368.90 / 79.50	5	99%										9/23/95 @ 17:55 End Run 4
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. HARRINGTON
CHECKED: B. TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-300-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/23/95-9/24/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1065204.8
AZIMUTH:

COLLAR ELEV: 448.4
E: 513849.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Silkensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R5, R6, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (T1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	80.7-88.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Frequent stylolites								B,PL,SM,CL						
									J,I,R						
82									B,PL,SM						
									F,PL,SM						
									F,PL,SM(2)						
									J,PL,SM						
									J,I,R						
84	84.5-84.7 ft. Chert nodules			5	99%				J,I,R						
									J,I,R						
	85.0-86.0 ft. Greenish gray (5G 6/1), clay in fractures								B,I,R,CL(2)						
									J,I,R						
86									J,I,R						
									B,PL,SM						
88	88.2-92.5 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), very finely crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		358.90												
			89.50												9/23/95 @ 17:50 End Run 5 9/24/95 @ 8:00 Begin Run 6
90									J,I,SM,calcite						
									J,I,SM						
92				6	100 %				J,PL,SM						
	92.5-95.0 ft. Fresh, very thinly bedded, light olive gray (5Y 5/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM						
									B,C,SM						
94			353.40												9/24/95 @ 9:50 End Run 6
	End of Record of Drillhole at 95.0 ft.		95.00												
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. HARRINGTON
CHECKED: B. TILTON
DATE: 10/9/95

Golder Associates

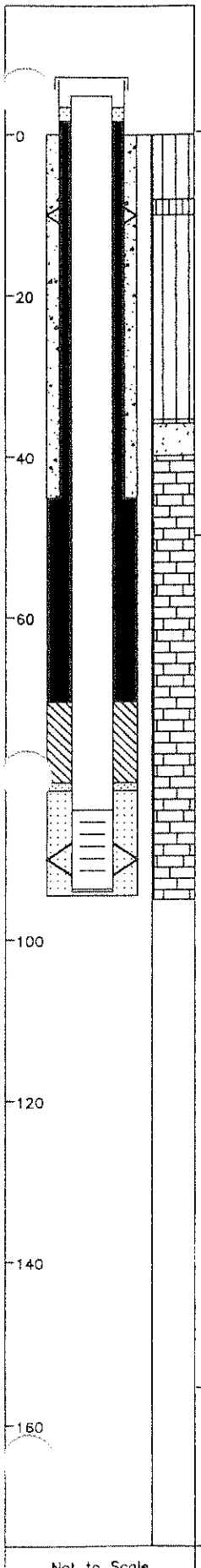
Well No. PZ-300-SS

Boring No. X-Ref: PZ-300-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1065205 ft.
Easting: 513850 ft.

Elevation Ground Level 448.4 ft. NGVD
Top of PVC Casing 449.60 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth	94.5 ft.
Borehole Diameter	9 7/8" (0.0-46.0') 5 7/8" (46.0-93.0')
Casing Stickup Height	1.20 ft.
Driller	Layne-Western
	St. Louis, MO
Rig	CME 750 Schramm Rotadrill T660H
Bit(s)	4 1/4" ID Hollow Stem Auger Bit,
	NX Core, 5 7/8" Button Bit for Reaming
Drilling Fluid	NX Core Water, Air and Bentonite
	Mud Rotary
Protective Casing	8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (Auger)	9/22/95	16:30	9/23/95	10:30
Schramm Rotary	9/25/95	10:30	9/25/95	13:00
CME 75 (Core)	9/23/95	13:05	9/23/95	9:15
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/26/95	10:45	9/26/95	10:55
6" I.D. Steel	9/25/95	13:00	9/25/95	16:00
Filter Placement:	9/26/95	10:50	9/26/95	11:00
Cementing:				
Development				
Bentonite Grout	9/26/95	11:30	9/26/95	12:35
Bentonite Seal	9/26/95	11:00	9/26/95	11:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.20	-	83.88	C1	449.60	-	364.52
83.88	-	93.70	S1	364.52	-	354.70
93.70	-	94.00	C2	354.70	-	354.40
+ 0.80	-	46.00	C3	447.60	-	402.40
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33') (C3-see comments)

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 81.5-94.5'

Filter Pack: 100 mesh Silica Sand 80.5-81.5'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 70.5-81.5'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-70.5'

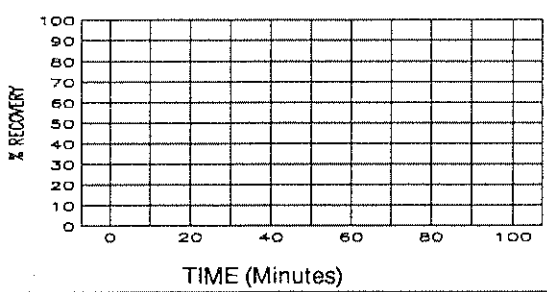
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Neat cement grout used to seal annulus between 6 7/8 in. OD steel casing and 9 7/8 in. diameter

Supervised by B. Tilton
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ300SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145097	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-3005S
SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: Mo | ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: Mo | ZIP CODE: 63102

VARIANCE ISSUED ☐ YES ☒ NO | DATE ISSUED | VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
1110' SOUTHWEST OF BANK OF LEACHATE RETENSION POND, SOUTH OF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 448.4
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E OR W)
LAT. 38 ° 45 ' 32 " LONG. 90 ° 27 ' 05 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN Co., INC. | PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co., INC. | PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 46 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO | WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER ☐ NO ☒ YES LOCATED AT 10', 50', 90' | MATERIAL ☒ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 84.9 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 6⅞ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 11' | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	13 FT.	TREMIE			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.0 FT.	TREMIE	Depth to bottom of Protective Casing Seal:	3.0	0-35.5 Silt
WELL SCREEN	LENGTH OF SCREEN 10 FT. / DIAMETER 2 IN. / SLOT SIZE 10 / WEIGHT OR SDR # SCH80 / MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER				Depth to Base of Annular Seal:	70.5	35.5-39.5 Sand
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER		Depth to Base of Bentonite Seal:	80.5	39.5-94.5 Limestone
BACK FILL	WAS THE WELL BACK FILLED? ☒ YES ☐ NO	MATERIAL USED 16-35 SAND	LENGTH OF BACK FILLED BORE HOLE 9.0'		Depth to Top of Primary Filter Pack:	81.5	
					Depth to Top of the Screen:	83.7	
					Depth to Bottom of the Screen:	93.7	
					Total Depth:	94.5	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 449.60
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
DATE WELL DRILLING WAS COMPLETED 9-26-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Robert T. Maher Jr.	11-14-95	Lorman D. Mahurin Jr.	11-14-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

DATUM NORTHING: 1064801.68 EASTING: 515516.99 ELEVATION 513.1

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-301-SS

SHEET 1 OF 2

	DRILLING START	DRILLING FINISH
WATER LEVEL		
TIME	11:30	14:15
DATE	9/19/95	9/19/95
CASING DEPTH		

DRILL RIG CME 750

SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ301SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 4 5	1.6'/2.0' (80%)			(0.0-6.0 ft.) Loose, moderate yellowish brown (10YR 5/4), SILT, trace iron staining, NR, damp, (ML), (LOESS)	SP (1)	
2 3	2 3 4 5	1.8'/2.0' (90%)				SP (2)	
4 5	1 2 3 4	2.0'/2.0' (100%)			From 4.0-6.8 ft., SILT becomes moist	SP (3)	
6 7	1 1 2 2	2.0'/2.0' (100%)			(6.0-9.6 ft.) Very loose, pale to moderate yellowish brown (10YR 6/2 to 10YR 5/4), SILT, little Fe staining, NR, intermittent wet zones beginning at 6.8 ft., (ML), (LOESS)	SP (4)	
8 9	1 3 3 11	2.0'/2.0' (100%)				SP (5)	
					(503.5) 9.6		
10 11	3 36 50	1.0'/2.0' (50%)			(9.6-18.0 ft.) Very dense, dark yellowish orange (10YR 6/6), SILTSTONE, thickly laminated, NR, damp, (CHELTENHAM FORMATION)	SP (6)	
12 13	30 50	0.8'/2.0' (40%)				SP (7)	
14	50	0.5'/2.0' (25%)				SP (8)	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

DATUM NORTHING: 1064801.68 EASTING: 515516.99 ELEVATION 513.1

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME					11:30	14:15
DATE					DATE	DATE
CASING DEPTH					9/19/95	9/19/95

BORING NO. PZ-301-SS

SHEET 2 OF 2

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	50	0.5' / 2.0' (25%)			(9.6-18.0 ft.) Very dense, dark yellowish orange (10YR 6/6), SILTSTONE, thickly laminated, NR, damp, (CHELTENHAM FORMATION)	SP (8)	
17					(16.0-18.0 ft.) Advanced augers to 18.0 ft. to prepare for core drilling, no samples collected		
18					(495.1) 18.0 End of Soil Borehole Log at 18.0 ft. See PZ-301-SS Record of Drillhole for rock descriptions.		
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ301SS

RECORD OF DRILLHOLE PZ-301-SS

Sheet 1 of 10

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill

SCALE Dt. (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R5 R6, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-16.0 ft. See Soil Borehole Log PZ-301-SS 16.0-19.1 ft. No samples collected		494.00												
18															
			494.00												
20	19.1-26.0 ft. Moderately weathered, very thinly bedded to thinly laminated, dark yellowish orange (10YR 6/6), very fine grained, extremely weak, SILTSTONE, (CHELTENHAM FORMATION)		19.10						B,I,SM B,P,SM J,I,R						
22									J,I,R B,I,R J,I,R,intact J,I,R J,I,SM B,I,SM B,I,SM,CL B,I,SM						
24	23.6 ft. Dark yellowish orange (10YR 6/6), soft clay seam			1	93%				B,P,SM(5)						
26									J,I,R,CL,Fe J,PL,SM						
28	26.3-28.5 ft. Moderately weathered, very thinly bedded, olive gray (5Y 4/1) to medium dark gray (N4), very fine grained, extremely weak, SILTY CLAYSTONE, (CHELTENHAM FORMATION)								J,I,R(2) J,I,R J,I,SM B,PL,SM(3) J,PL,SM J,PL,SM(2)						9/14/95 @ 17:00 End Run 1
			484.60												
	28.5-36.0 ft. Highly weathered, thinly bedded, medium gray (N5), very fine grained, extremely weak, SILTY CLAYSTONE, (CHELTENHAM FORMATION)		28.50						Core Loss						
			484.00												
30			29.10						B,PL,SM,Fe J,C,R,Fe J,I,R B,I,R B,I,R,Fe J,I,R						9/20/95 @ 8:15 Begin Run 2
				2	97%				B,I,R,Fe						
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

Sheet 2 of 10

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N 1084801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
ROCK TYPE											SW FR / NW HW / CW	R5 R6 / R4 / R3 / R2 / R1	R1 30 / R2 150 / R3 300 / R4 600 / R5 1500 / R6		
32	28.5-36.0 ft. Highly weathered, thinly bedded, medium gray (N5), very fine grained, extremely weak, SILTY CLAYSTONE, (CHELTENHAM FORMATION)			2	97%										
			477.10												
34															
36	36.0-37.7 ft. Slightly weathered, medium bedded, grayish black (N2) to black (N1), very fine grained, very weak, LIGNITE COAL, (CHELTENHAM FORMATION)		36.00												
			475.40												
38	37.7-53.0 ft. Highly weathered, medium bedded, light gray (N7) to light brownish gray (5YR 6/1), very fine grained, extremely weak, CLAYSTONE, (CHELTENHAM FORMATION)		37.70												9/20/95 @ 9:30 End Run 2
			474.30												
			38.80												
			474.00						Core Loss						
			39.10												39.0-60.0 ft. Numerous drilling induced fractures due to extremely weak rock
40															
42				3	61%										
44															
			468.10												
			45.00												
46									Core Loss						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

Sheet 3 of 10

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	37.7-53.0 ft. Highly weathered, medium bedded, light gray (N7) to light brownish gray (5YR 6/1), very fine grained, extremely weak, CLAYSTONE, (CHELTENHAM FORMATION)		461.70 / 51.40						Core Loss						9/20/95 @ 11:00 End Run 3
50															
52															
54	53.0-60.4 ft. Moderately weathered, thinly bedded, olive gray (5Y 4/1) to dark gray (N3), very fine grained, very weak, SILTY CLAYSTONE, (CHELTENHAM FORMATION)			4	66%										
56			457.90 / 55.20						Core Loss						
58			455.90 / 57.20												
60	60.0 ft. CLAYSTONE becomes sandy		452.70						J,I,R						
	60.4-62.5 ft. Fresh, thickly laminated, light olive gray (5Y 6/1), fine to medium grained, strong, LIMESTONE, (CHELTENHAM FORMATION)		60.40	5	79%				J,I,R J,C,SM J,I,R J,I,R(2) J,I,R J,I,R						
62			450.60												
	62.5-71.5 ft. Moderately weathered, thinly bedded, greenish gray (5G 6/1), very fine grained, very weak, CLAYSTONE, (CHELTENHAM FORMATION) Some gravel sized Chert and Limestone		62.50						J,I,R J,I,R(2)						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infil

DISCONTINUITY DATA

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DIP w/r CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	62.5-71.5 ft. Moderately weathered, thinly bedded, greenish gray (5G 6/1), very fine grained, very weak, CLAYSTONE, (CHELTENHAM FORMATION) Some gravel sized Chert and Limestone		448.30 / 64.80	5	79%				J,I,R		SW FR, MW, HW, CW	R5 R6, R4, R3, R2, R1	R1 30, R2 150, R3 300, R4 600, R5 1500, R6		9/20/95 @ 13:00 End Run 5
66									J,I,R(2)						
									B,I,R						
									J,I,R						
68				6	96%										
70									J,I,R						9/20/95 @ 14:00 End Run 6
		441.90	441.90												
		71.20 441.60	71.20 441.60						Core Loss						
	71.5-88.0 ft. Fresh, thinly bedded, light gray (N7), very finely crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)	71.50	71.50						J,I,R						
72									J,I,R						
									J,I,R						
									J,I,R(4)						
									J,I,R(4)						
74									J,I,R						
									J,PL,SM(2)						
									B,PL,SM(3)						
				7	100 %				J,C,SM						
76									J,I,R						
									B,PL,SM						
									B,PL,R						
78									B,C,R						
									B,PL,SM						9/20/95 @ 15:45 End Run 8
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

Sheet 5 of 10

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (ft)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	71.5-88.0 ft. Fresh, thinly bedded, light gray (N7), very finely crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)		432.90 / 80.20	7	100 %				B,PL,SM(2)						
									J,U,SM						
									B,PL,SM(2)						
									B,C,SM,CL						
82									B,I,SM						
									B,I,R(2)						
				8	95%										
84									B,PL,SM(2)						
									B,I,R(2)						
									J,PL,SM,CL						
86									B,PL,R(3)						
			425.70 / 87.40	425.70 / 87.40											
			425.10	425.10					Core Loss						
88	88.0-88.5 ft. Moderately weathered layer of CHERT		88.00 / 424.60 / 88.50	88.00					J,I,R,CL						
									B,I,R						
									J,I,R,CL						
									J,I,R,CL						
	88.5-104.9 ft. Fresh, thinly bedded, light brownish gray (5YR 6/1), microcrystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)								B,PL,SM,CL						
				8	95%				J,I,R						
90			422.90 / 90.20												9/20/95 @ 15:45 End Run 9
									B,PL,SM						
									B,I,SM						
92									J,C,R						
				9	99%				B,PL,SM(2)						
									B,C,R						
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: S.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

Sheet 6 of 10

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1084801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DL SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (90 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP w/r CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	88.5-104.9 ft. Fresh, thinly bedded, light brownish gray (5YR 6/1), microcrystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)								B,I,SM B,I,SM B,I,SM						
98				9	99%										
100			412.90												9/20/95 @ 15:00 End Run 9
			100.20						B,C,R J,I,R,CL						
102									B,PL,SM(3)						
									B,PL,SM						
104									B,I,SM						
	104.9-119.3 ft. Fresh, thinly bedded, olive gray (5Y 3/2), micro-crystalline, strong, ARGILLACEOUS DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Frequent vugs, fossiliferous 106.6 ft. Seam of grayish blue green (5BG 5/2) clay (<1/2")			10	100 %				B,PL,SM,CL						
106															
108															
110	109.8 ft. Color change to yellowish gray, less argillaceous and less vuggy		402.90 110.20												9/20/95 @ 18:00 End Run 10 9/21/95 @ 7:15 Begin Run 11
				11	100 %										
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

Sheet 7 of 10

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	104.9-119.3 ft. Fresh, thinly bedded, olive gray (5Y 3/2), micro-crystalline, strong, ARGILLACEOUS DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Frequent vugs, fossiliferous														
114	114.0 ft. Vugs no longer present														
116				11	100 %										
118								90	B,PL,SM						
120	119.3-137.3 ft. Fresh, medium to thinly bedded, light olive gray (5Y 5/2), very finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		392.90 / 120.20												9/21/95 @ 8:10 End Run 11
122								90	B,PL,SM						
								90	B,PL,SM,CL						
124				12	101 %										
	124.6 ft. Calcite crystals in formation														
126															
	127.0 ft. Intermittent stylolites							90	B,PL,SM						
128	128.0-129.5 ft. Iron pyrite crystals														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	119.3-137.3 ft. Fresh, medium to thinly bedded, light olive gray (5Y 5/2), very finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			12	101 %				B,PL,SM						
									J,C,SM						
									B,PL,SM,CL						
130	130.0 ft. Frequent stylolites		382.90												9/21/95 @ 9:20 End Run 12
			130.20						B,PL,SM						
									B,C,SM						
132									B,PL,SM						
134															
				13	100 %				B,PL,R						
136															
	137.3-138.0 ft. Fresh, medium bedded, grayish blue green (5BG 5/2), very finely crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								B,PL,SM,CL						
138	138.0-160.3 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), micro-crystalline, medium strong, ARGILLACEOUS DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)														
140			372.90												9/21/95 @ 10:35 End Run 13
			140.20						J,PL,SM						
142				14	100 %				J,PL,SM						
									B,PL,R						
									J,I,R						
									B,PL,SM						
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	138.0-160.3 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), micro-crystalline, medium strong, ARGILLACEOUS DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)								B,C,SM						
146															
148				14	100 %										
150			362.80 / 150.30												9/21/95 @ 11:30 End Run 14
152									J,I,SM						
154									B,PL,R						
156	156.5-159.0 ft. Alternating beds of light olive gray and grayish blue green			15	100 %				B,PL,SM						
158															
160									B,C,SM,CL J,I,R,CL						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & Water
DRILLING DATE: 9/19/95-9/21/95
DRILL RIG: CME 750

DATUM: MSL
COORDINATES N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160			352.80	15	100 %										9/21/95 @ 12:35 End Run 15
	352.80														
	End of Record of Drillhole at 160.3 ft. 160.30		160.30												
162															
164															
166															
168															
170															
172															
174															
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

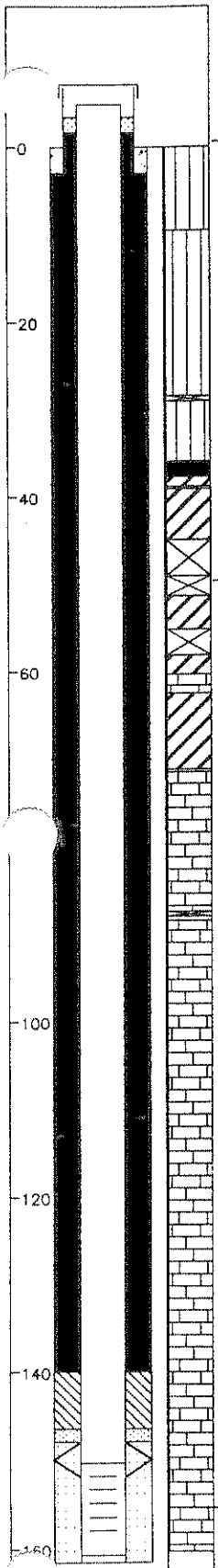
Well No. PZ-301-SS

Boring No. X-Ref: PZ-301-SS

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1064802 ft.
Easting: 515517 ft.

Elevation Ground Level 513.1 ft. NGVD
Top of PVC Casing 514.71 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 161.5 ft.
Borehole Diameter 8 1/4" (0.0-19.0') 5 7/8" (19.0-161.5')
Casing Stickup Height 1.61 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 4 1/4" ID Hollow Stem Auger Bit,
NX Core, 5 7/8" Button Bit for Reaming
Drilling Fluid NX Core Water, Air Rotary

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (Auger)	9/19/95	11:30	9/19/95	14:15
Schramm Rotary	9/22/95	9:15	9/23/95	11:30
CME 75 (Core)	9/19/95	16:00	9/21/95	12:35
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/23/95	12:00	9/23/95	12:15
Filter Placement:	9/23/95	12:15	9/23/95	13:00
Cementing:				
Development				
Bentonite Grout	9/23/95	13:15	9/23/95	13:45
Bentonite Seal	9/23/95	13:45	9/23/95	15:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.61	-	150.90	C1	514.71	-	362.20
150.90	-	160.70	S1	362.20	-	352.40
160.70	-	161.00	C2	352.40	-	352.10
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 148.0-161.5'

Filter Pack: Less than 50 mesh Silica Sand 146.5-148.0'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 140.0-146.5'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-140.0'

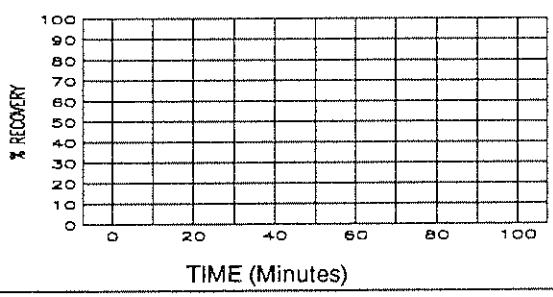
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ301SS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145098	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-3015S
SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: Mo | ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: Mo | ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO | DATE ISSUED | VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
1750' SOUTH OF SOUTH ENTRANCE TO LANDFILL, SOUTH OF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 513.1
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E OR W)
LAT. 38 ° 45 ' 28 " LONG. 90 ° 26 ' 44 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN Co, INC. | PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co., INC. | PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8.25 IN. 19 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO | WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. | TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☐ NO ☒ YES LOCATED AT 30', 70', 110', 150' | MATERIAL ☒ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 152.8 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH. 80 | DIAMETER OF DRILL HOLE 5 7/8 IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 6.5' | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE 16-35 | LENGTH OF FILTER PACK 13.5 FT. | METHOD OF INSTALLATION TREMIE
SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE | GRAIN SIZE 16-35 | LENGTH OF FILTER PACK 1.5 FT. | METHOD OF INSTALLATION TREMIE
WELL SCREEN: LENGTH OF SCREEN 10 FT. | DIAMETER 2 IN. | SLOT SIZE 10 | WEIGHT OR SDR # SCH 80 | MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER
SUMP DETAILS: LENGTH OF SUMP | DIAMETER OF SUMP | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____
BACK FILL: WAS THE WELL BACK FILLED? ☒ YES ☐ NO | MATERIAL USED 16-35 SAND | LENGTH OF BACK FILLED BORE HOLE 0.5'

Information in this column to be supplied in the Feet from Surface column

	FEET FROM SURFACE
Depth to bottom of Protective Casing Seal:	3.0
Depth to Base of Annular Seal:	140.0
Depth to Base of Bentonite Seal:	146.5
Depth to Top of Primary Filter Pack:	148.0
Depth to Top of the Screen:	151.0
Depth to Bottom of the Screen:	161.0
Total Depth:	161.5'

FORMATION DESCRIPTION
0-10 silt
10-28.5 Siltstone
28.5-59.5 Claystone
59.5-62 Limestone
62-70.5 Claystone
70.5-161.5 Limestone

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 514.71

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 4.25 H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
DATE WELL DRILLING WAS COMPLETED

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT # Timothy J. Mahurin | DATE 11-15-95 | SIGNATURE DRILLER/PERMIT # Lamar H. Mahurin | DATE 11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger 3.625 inch Mud Rotary
SAMPLING METHOD:	CALIFORNIA SAMPLER: 2.0" I.D. (CA) SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-302-AI
SHEET	1 OF 2
DRILLING START / FINISH	TIME: 8:15 / 11:30 DATE: 9/26/95 / 9/26/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DATUM	NORTHING: 1067210.24 EASTING: 514720.49
ELEVATION	450.0
DRILL RIG	CME 750
SURFACE CONDITIONS	
ANGLE	90°
BEARING	NA
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16					(0.0-22.0 ft.) No samples collected, see Soil Borehole Log PZ-302-AS for descriptions		
17							
18							
19							
20							
21							
22 (428.0)	4 2 7 6	0.1' 2.0' (5%)			(22.0-25.4 ft.) Loose, pale yellowish brown (10YR 6/2), f-m SAND with trace iron staining, NR, wet, (SP), (ALLUVIUM)	SP 1	
23							
24	3 2 3 10	1.2' 2.0' (60%)				SP 2	
25							0.0 ppm PID
26	10 7 9 14	1.6' 2.0' (80%)			(25.4-26.1 ft.) Compact, olive gray (5Y 4/1), f-m SAND, trace Silt, iron staining, NR, wet, (SP), (ALLUVIUM) (26.1-37.4 ft.) Compact to dense, light olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP 3	
27							
28	8 8 12 10	1.0' 2.0' (50%)				SP 4	
29							

DRILLING CONTR: LAYNE-WESTERN

LOGGED BY: B. HARRINGTON

DATE: 10/9/95

CHK'D BY: B. TILTON

JOB NO.: 943-2848

FILENAME: PZ302AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger		PZ-302-AI
	3.625 inch Mud Rotary		SHEET
	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)		2 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START	FINISH
	WATER LEVEL	TIME	TIME
	TIME	8:15	11:30
	DATE	DATE	DATE
	CASING DEPTH	9/26/95	9/26/95

NORTHING: 1067210.24
DATUM EASTING: 514720.49 ELEVATION 450.0

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	8 9 10 13	1.4'/2.0' (70%)			(26.1-37.4 Ft.) Compact to dense, light olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP (5)	
32	11 9 10 14	1.6'/2.0' (80%)				SP (6)	
33							
34	16 18 20 24	1.1'/2.0' (55%)				CA (7)	
35							
36	7 7 10 14	1.2'/2.0' (60%)				SP (8)	
37					(412.6) 37.4		
38	6 11 11 12	1.3'/2.0' (65%)			(37.4-42.0 Ft.) Compact, olive gray (5Y 4/1), well graded SAND, NR, wet, (SW), (ALLUVIUM)	SP (9)	
39							
40	10 14 14 12	1.3'/2.0' (65%)				SP (10)	
41							
42					(408.0) 42.0		0.0 ppm PID
43					End of Soil Borehole Log at 42.0 ft.		
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ302AI

Well No. PZ-302-AI

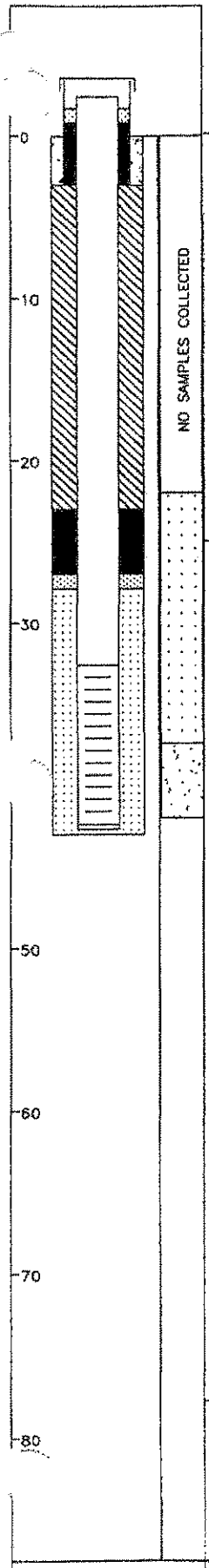
Boring No. X-Ref: PZ-302-AI

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1067210 ft. Easting: 514720 ft.

Elevation Ground Level 450.0 ft. NGVD

Top of PVC Casing 451.15 ft. NGVD



Drilling Summary:

Total Depth 43.0 ft.

Borehole Diameter 8 1/4" (0.0-43.0')

Casing Stickup Height 1.15 ft.

Driller Layne-Western
St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit,
3 5/8" Tricone Bit

Drilling Fluid Bentonite Drilling Mud (20.0-42.0')

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling CME 750	9/26/95	8:15	9/26/95	11:30
Geophys.Logging:				
Casing: 2" I.D. PVC	9/26/95	12:50	9/26/95	12:55
Filter Placement:	9/26/95	13:05	9/26/95	13:40
Cementing:				
Development				
Bentonite Grout	9/26/95	14:00	9/26/95	14:15
Bentonite Seal	9/26/95	13:40	9/26/95	13:50

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.15	-	32.60	C1	451.15	-	417.40
32.60	-	42.40	S1	417.40	-	407.60
42.40	-	42.70	C2	407.60	-	407.30
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 27.9-43.0'

Filter Pack: 100 mesh Silica Sand 27.0-27.9'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-23.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 23.0-27.0'

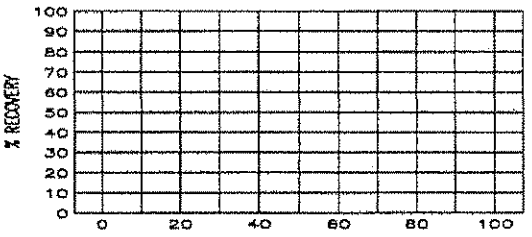
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ302AI

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145100	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-302AI
SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: Mo | ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: Mo | ZIP CODE: 63102

VARIANCE ISSUED ☐ YES ☒ NO | DATE ISSUED | VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
15' INSIDE FENCE LINE, 720' NORTHWEST OF SOUTH ENTRANCE OFF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 450.5
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 ° 45 ' 52 " LONG. 90 ° 26 ' 54 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN Co, INC. | PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co, INC. | PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T. ____
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8 x 8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 43 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CASING GROUT DETAILS: CAP VENTED ☒ YES ☐ NO; WEEP HOLE? ☒ YES ☐ NO | MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. | TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT | DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 34.2 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 4.0 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE 16-35 | LENGTH OF FILTER PACK 15.1 FT. | METHOD OF INSTALLATION HSA POUR

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE | GRAIN SIZE 100 | LENGTH OF FILTER PACK 0.9 FT. | METHOD OF INSTALLATION HSA POUR

WELL SCREEN: LENGTH OF SCREEN 10 FT. | DIAMETER 2 IN. | SLOT SIZE 10 | WEIGHT OR SDR # SCH 80 | MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP | DIAMETER OF SUMP | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO | MATERIAL USED | LENGTH OF BACK FILLED BORE HOLE

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3.0	0-15 Silty clay
Depth to Base of Annular Seal:	23.0	15-43 Silty sand
Depth to Base of Bentonite Seal:	27.0	
Depth to Top of Primary Filter Pack:	27.4	
Depth to Top of the Screen:	33.0	
Depth to Bottom of the Screen:	43.0	
Total Depth:	43.0	
DATE WELL DRILLING WAS COMPLETED	9-26-95	

STATIC WATER LEVEL FEET FROM MEASURING POINT: ____
DATE OF STATIC WATER LEVEL: ____
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 451.15

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Timothy J. Mahurin Jr.	11-15-95	Timothy J. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					PZ-302-AS
						SHEET
	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)					1 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
	WATER LEVEL	18 FT.				TIME / TIME
	TIME	14:00				11:45 / 14:35
	DATE	9/25/95				DATE / DATE
NORTHING: 1067197.73 DATUM EASTING: 514737.29 ELEVATION 449.5	CASING DEPTH	20 FT.				9/25/95 / 9/25/95

DRILL RIG CME 750 — SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
1	5 7 5 5	1.6' / 2.0' (80%)			(0.0-1.5 ft.) Compact, dark yellowish orange (5YR 6/6), CLAYEY SILT, Fine Gravel sized pebbles, (FILL)	SP	1	
2	4 5 5 6	1.5' / 2.0' (75%)			(1.5-15.0 ft.) Loose, olive gray (5Y 4/1), SILT, NR, dry to wet, some inter-mixed fill to 2.5 ft., (SM), (LOESS)	SP	2	
3								
4		1.7' / 2.0' (85%)			@ 3.5 ft., damp	ST	3	0.0 ppm PID
5								
6	1 1 1 2	1.9' / 2.0' (95%)			@ 6.7 ft., moist	SP	4	
7								
8	0 0 0 1	1.9' / 2.0' (95%)				SP	5	
9								
10	1 2 2 2	1.4' / 2.0' (70%)				SP	6	0.0 ppm PID
11					From 11.5-11.7 ft., wet From 11.7-13.1 ft., moist			
12	1 2 1 4	2.0' / 2.0' (100%)				SP	7	
13					From 13.1-13.6 ft., wet			
14	4 5 6 3	1.2' / 2.0' (60%)			From 13.6-15.0 ft., moist	SP	8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ302AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1067197.73
DATUM EASTING: 514737.29 ELEVATION 449.5

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-302-AS

SHEET 2 OF 2

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL	18 FT.					
TIME	1400				1145	1435
DATE	9/25/95				DATE 9/25/95	DATE 9/25/95
CASING DEPTH	20 FT.					

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 9 8 6	1.5' 2.0' (75%)			(15.0-21.9 ft.) Loose, olive gray (5Y 4/1), medium SAND, NR, wet, (SP),(ALLUVIUM)	SP (8)	
17						CA (9)	
18	1 3 5 9	2.0' 2.0' (100%)					0.0 ppm PID
19					From 19.2-21.0 ft, trace to little Silt in Sand	SP (10)	
20	3 5 5 4	1.6' 2.0' (80%)					
21					(21.9-24.0 ft.) Loose, dark yellowish brown (10YR 6/2), f-m SAND, little iron staining, NR, wet, (ALLUVIUM)	SP (11)	
22	0 0 1 2	2.0' 2.0' (100%)					0.0 ppm PID
23						SP (12)	
24					(-24.0) 24.0		
25					End of Soil Borehole Log at 24.0 ft.		
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

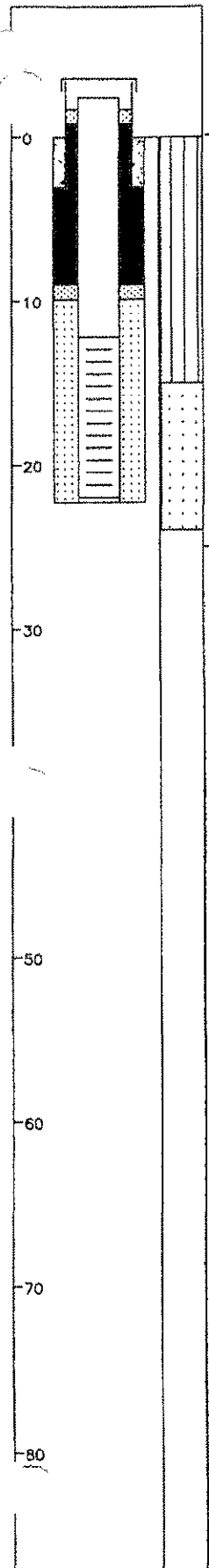
JOB NO.: 943-2848

FILENAME: PZ302AS

Well No. PZ-302-AS

Boring No. X-Ref: PZ-302-AS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067198 ft. Easting: 514737 ft.

Elevation Ground Level 449.5 ft. NGVD

Top of PVC Casing 451.42 ft. NGVD

Drilling Summary:

Total Depth 22.3 ft.

Borehole Diameter 8 1/4" (0.0-22.3')

Casing Stickup Height 1.92 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/25/95	11:45	9/25/95	14:35
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/25/95	14:55	9/25/95	15:00
Filter Placement:	9/25/95	15:00	9/25/95	15:40
Cementing:				
Development				
Bentonite Grout Bentonite Seal	9/25/95	15:40	9/25/95	15:60

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.92	-	12.20	C1	451.42	-	437.30
12.20	-	22.00	S1	437.30	-	427.50
22.00	-	22.30	C2	427.50	-	427.20

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 9.9-22.3'

Filter Pack: 100 mesh Silica Sand 9.0-9.9'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-9.0'

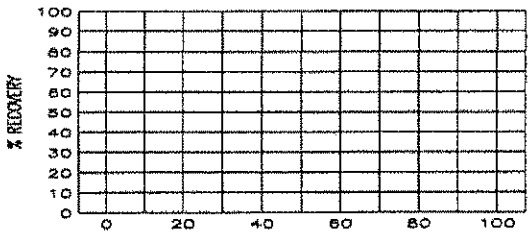
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ302AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145099	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-302AS
SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: Mo | ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: Mo | ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO | DATE ISSUED: | VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
20' INSIDE FENCE LINE, 700' NORTHWEST OF SOUTH ENTRANCE OFF OLD ST CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 449.2
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 ° 45 ' 52 " LONG. 90 ° 26 ' 54 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN Co, INC. | PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN Co, INC. | PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 22.3 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO | WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 14.2 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE ☐ CEMENT/BENTONITE SLURRY TYPE: ____ BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 6.0 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	12.4 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	0.9 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-15 Silty clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	9.0	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____			Depth to Base of Bentonite Seal:	9.0	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE			Depth to Top of Primary Filter Pack:	9.9	
						Depth to Top of the Screen:	12.3	
						Depth to Bottom of the Screen:	22.3	15-22.3 Silty sand
						Total Depth:	22.3	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 451.42
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
DATE WELL DRILLING WAS COMPLETED 9-25-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Loman J. Mahurin M.	11-15-95	Loman J. Mahurin M.	11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-303-AS
		SHEET 1 OF 2
	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
	WATER LEVEL	
	TIME	TIME: 16:45 / 8:45
	DATE	DATE: 10/4/95 / 10/5/95
	CASING DEPTH	
DATUM NORTHING: 1067763.32 EASTING: 514425.53 ELEVATION 450.8		
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ303AS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3, 5, 7, 9	1.9'/2.0' (95%)			(0.0-3.1 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL)	SP ①	
2	7, 7, 6, 8	1.8'/2.0' (90%)			(3.1-4.6 ft.) Compact, olive gray (5Y 4/1), SANDY SILT, NR, dry, (ML), (LOESS)	SP ②	
3							
4	2, 3, 5, 5	1.8'/2.0' (90%)			(446.2) 4.6	SP ③	
5					(4.6-7.4 ft.) Loose, olive gray (5Y 4/1), Fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)		0.0 ppm PID
6	1, 3, 2, 3	1.9'/2.0' (95%)				SP ④	
7					(7.4-12.2 ft.) Loose, olive black, fine SAND, NR, moist, (SP), (ALLUVIUM)		
8	1, 1, 6, 6	1.7'/2.0' (85%)				SP ⑤	Faint petroleum odor @ 7.4 ft.
9							
10	2, 2, 2, 2	1.2'/2.0' (60%)				SP ⑥	0.1 ppm PID
11							
12	3, 6, 7, 8	1.8'/2.0' (90%)			(12.2-26.0 ft.) Compact to dense, medium dark gray (N4), f-m SAND, NR, damp, (SP), (ALLUVIUM)	SP ⑦	Strong petroleum odor
13							
14	6, 5, 9, 10	1.8'/2.0' (90%)				SP ⑧	0.9 ppm PID

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:		BORING NO.
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger		PZ-303-AS
			SHEET 2 OF 2
	SAMPLING METHOD:		DRILLING
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)		START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)		
	WATER LEVEL		TIME 16:45 / TIME 8:45
	TIME		
	DATE		DATE 10/4/95 / DATE 10/5/95
	CASING DEPTH		

DATUM NORTHING: 1067763.32 EASTING: 514425.53 ELEVATION 450.8

DRILL RIG CME 750 SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	5 3 4 12	1.8"/2.0" (90%)			(12.2-26.0 Ft.) Compact to dense, medium dark gray (N4), F-m SAND, NR, damp to wet, (SP), (ALLUVIUM)	SP (8)	
17					from 15.3-15.6 ft, seam of olive black sandy SILT @ 17.0 ft, wet	SP (9)	
18	6 17 28 49	1.8"/2.0" (90%)			From 17.5-17.8 ft, seam of olive black SILT	SP (10)	
19							
20	11 19 13 10	2.0"/2.0" (100%)				SP (11)	6.6 ppm PID
21							
22	3 5 10 11	1.9"/2.0" (95%)				SP (12)	Petroleum sheen in Split Spoon
23							
24	3 16 26 39	2.0"/2.0" (100%)				SP (13)	3.7 ppm PID
25							
26					(424.8) 26.0 End of Soil Borehole Log at 26.0 ft.		
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

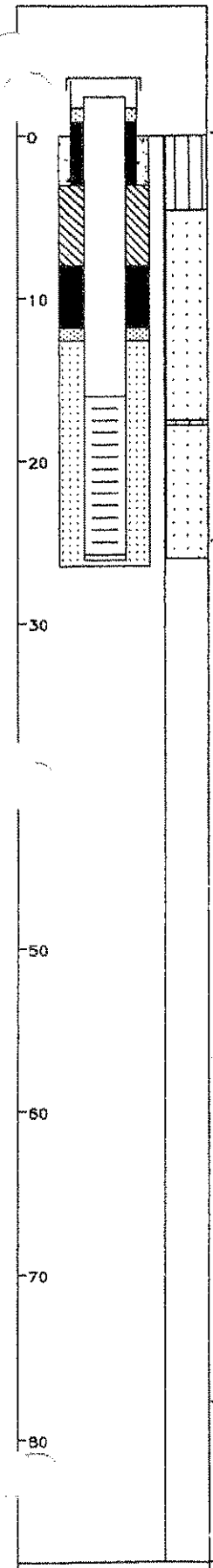
JOB NO.: 943-2848

FILENAME: PZ303AS

Well No. PZ-303-AS

Boring No. X-Ref: PZ-303-AS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067763 ft.
Easting: 514426 ft.

Elevation Ground Level 450.8 ft. NGVD
Top of PVC Casing 453.18 ft. NGVD

Drilling Summary:

Total Depth 26.5 ft.
Borehole Diameter 8 1/4" (0.0-26.5')
Casing Stickup Height 2.38 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/4/95	16:45	10/5/95	8:45
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/5/95	9:00	10/5/95	9:05
Filter Placement:	10/5/95	9:05	10/5/95	9:55
Cementing:				
Development				
Bentonite Grout	10/5/95	10:15	10/5/95	10:20
Bentonite Seal	10/6/95	9:55	10/6/95	10:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.38	-	16.00	C1	453.18	-	434.80
16.00	-	25.80	S1	434.80	-	425.00
25.80	-	26.10	C2	425.00	-	424.70
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 12.6-26.5'

Filter Pack: Less than 50 mesh Silica Sand 11.8-12.6'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-8.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 8.0-11.8'

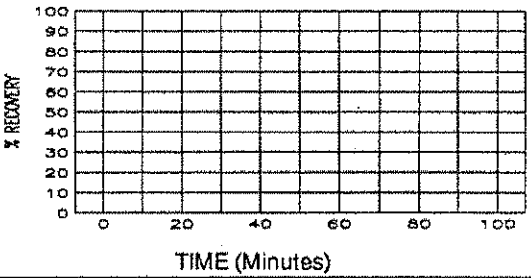
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ303AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145101	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW @ BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-303AS

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1839 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
AT FENCE LINE, 360' NORTH OF SOUTHWEST FENCE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY
SURFACE ELEVATION: 450.8
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38 ° 45 ' 58 " LONG. 90 ° 26 ' 58 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ONLY

PROTECTIVE CASING DETAILS (IF USED):
LENGTH: 5.0 FT.
DIAMETER OF CASING: 8x8 IN.
WEIGHT OR SDR #: 0.188"
DIAMETER AND DEPTH OF DRILL HOLE: 8¼ IN. 26.5 FT.
JOINTS: ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER
MATERIAL: ☒ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER TYPE
LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS:
LENGTH: 18.9 FT.
DIAMETER OF RISER PIPE: 2 IN.
WEIGHT OR SDR #: SCH80
DIAMETER OF DRILL HOLE: 8¼ IN.
JOINTS: ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER
MATERIAL: ☐ STEEL ☒ THERMO PLASTIC ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE ☐ CEMENT/BENTONITE SLURRY
TYPE:
BAGS OF CEMENT USED
% BENTONITE USED
WATER USED/BAG GAL.

BENTONITE SEAL: MATERIAL: BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS
LENGTH OF SEAL: 3.8
BENTONITE SEAL INSTALLED IN: ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL
GRAIN SIZE: 16-35
LENGTH OF FILTER PACK: 13.9 FT.
METHOD OF INSTALLATION: H.S.A. POUR

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE
GRAIN SIZE: < 50
LENGTH OF FILTER PACK: 0.8 FT.
METHOD OF INSTALLATION: H.S.A. POUR

WELL SCREEN:
LENGTH OF SCREEN: 10 FT.
DIAMETER: 2 IN.
SLOT SIZE: 10
WEIGHT OR SDR #: SCH 80
MATERIAL: ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS:
LENGTH OF SUMP
DIAMETER OF SUMP
MATERIAL: ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

BACK FILL:
WAS THE WELL BACK FILLED? ☐ YES ☒ NO
MATERIAL USED
LENGTH OF BACK FILLED BORE HOLE

Information in this column to be supplied in the Feet from Surface column

FEET FROM SURFACE	FORMATION DESCRIPTION
	0-4.5 Silty clay
Depth to bottom of Protective Casing Seal: 3.0	
	4.5-26.5 Silty sand
Depth to Base of Annular Seal: 8.0	
Depth to Base of Bentonite Seal: 11.8	
Depth to Top of Primary Filter Pack: 12.6	
Depth to Top of the Screen: 16.5	
Depth to Bottom of the Screen: 26.5	
Total Depth: 26.5	
DATE WELL DRILLING WAS COMPLETED 10-05-95	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER
ELEVATION OF MEASURING POINT: 453.18

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Tomas J. Mahurin M.	11-15-95	Tomas J. Mahurin M.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068125.91
DATUM EASTING: 514434.70 ELEVATION 451.6

DRILLING METHOD:
4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger
3.625 inch Mud Rotary

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	18.5 FT.				
TIME	16:00				
DATE	10/2/95				
CASING DEPTH	40.0 FT.				

BORING NO. PZ-304-AI

SHEET 1 OF 3

DRILLING START	DRILLING FINISH
TIME 8:00	TIME 14:15
DATE 10/2/95	DATE 10/2/95

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ304AI

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
16					(0.0-28.0 Ft.) No samples collected, see Soil Borehole Log PZ-304-AS for descriptions			
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28 (423.6)					28.0			
29	12 15 14 12	1.6' 2.0' (80%)			(28.0-39.3 Ft.) Compact, light olive gray (5Y 5/2), well graded, SAND, NR, wet, (SW), (ALLUVIUM)	SP ①		0.0 ppm PID

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068125.91
DATUM EASTING: 514434.70 ELEVATION 451.6

DRILLING METHOD:
4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger
3.625 inch Mud Rotary

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	18.5 FT.				
TIME	16:00				
DATE	10/2/95				
CASING DEPTH	40.0 FT.				

BORING NO. PZ-304-AI

SHEET 2 OF 3

DRILLING

START	FINISH
TIME 8:00	TIME 14:15
DATE 10/2/95	DATE 10/2/95

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	8 11 12 13	1.6'/2.0' (80%)			(28.0-39.3 ft.) Compact, light olive gray (5Y 5/2), well graded, SAND, NR, wet, (SW), (ALLUVIUM)	SP (2)	
32	8 15 15 12	1.1'/2.0' (55%)				SP (3)	
33							
34	5 8 4 3	1.2'/2.0' (60%)				SP (4)	0.0 ppm PID
35							
36	1.1 6 6 7 8	2.0'/2.0' (100%)			from 35.6-35.8 ft, Lignite coal partical	SP (5)	
37							
38	9 9 17 16	1.3'/2.0' (65%)			(412.3) 39.3	SP (6)	
39					(39.3-46.0 ft.) Compact to dense, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)		
40	10 18 28 27	1.8'/2.0' (90%)				SP (7)	0.0 ppm PID
41							
42	7 11 12 14	1.4'/2.0' (70%)			from 43.0-43.5 ft, seam of compact, olive gray (5Y 4/1), well graded SAND	SP (8)	
43							
44	15 17 10 14	0.7'/2.0' (35%)				SP (9)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					PZ-304-AJ
	3.625 inch Mud Rotary					SHEET 3 OF 3
	SAMPLING METHOD:					DRILLING
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	WATER LEVEL	18.5 FT.				TIME: 8:00 / 14:15
	TIME	16:00				
	DATE	10/2/95				DATE: 10/2/95 / 10/2/95
NORTHING: 1068125.91 DATUM EASTING: 514434.70 ELEVATION 451.6	CASING DEPTH	40.0 FT.				

DRILL RIG CME 750 — SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46					(39.3-46.0 Ft.) Compact to dense, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM) (405.6) 46.0	SP 9	0.0 ppm PID
47	3 3 6 6	1.2'/2.0' (60%)			(46.0-48.4 Ft.) Loose, olive gray (5Y 4/1), well graded SAND, some fine Gravel, NR, wet, (SW), (ALLUVIUM)	SP 10	
48					(403.2) 48.4		
49	9 12 17 15	1.3'/2.0' (65%)			(48.4-50.0 Ft.) Compact, olive gray (5Y 4/1), f-m SAND, trace coarse Sand and fine Gravel, NR, wet, (SP), (ALLUVIUM)	SP 11	
50					(401.6) 50.0		0.0 ppm PID
					End of Soil Borehole Log at 50.0 ft.		
51							
52							
53							
54							
55							
56							
57							
58							
59							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AJ

Well No. PZ-304-AI

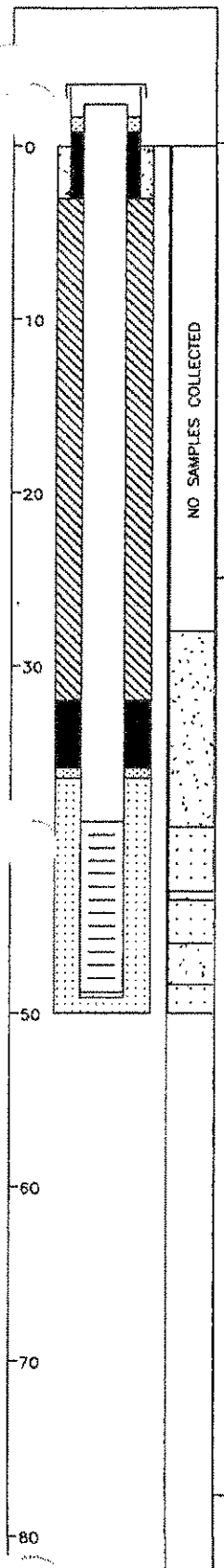
Boring No. X-Ref: PZ-304-AI

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1068126 ft. Easting: 514435 ft.

Elevation Ground Level 451.6 ft. NGVD

Top of PVC Casing 454.02 ft. NGVD



Drilling Summary:

Total Depth 50.0 ft.

Borehole Diameter 8 1/4" (0.0-50.0')

Casing Stickup Height 2.42 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 4 1/4" ID Hollow Stem Auger Bit; 3/8" Tricone Bit

Drilling Fluid Bentonite Drilling Mud (23.0-50.0')

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/2/95	8:00	10/2/95	14:15
Geophys. Logging:				
Casing:				
2" I.D. PVC	10/2/95	14:20	10/2/95	14:25
Filter Placement:	10/2/95	14:25	10/2/95	15:10
Cementing:				
Development				
Bentonite Grout	10/2/95	15:45	10/2/95	16:45
Bentonite Seal	10/2/95	15:15	10/2/95	15:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.42	-	39.00	C1	454.02	-	412.60
39.00	-	48.80	S1	412.60	-	402.80
48.80	-	49.10	C2	402.80	-	402.50

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 36.5-50.0'

Filter Pack: 100 mesh Silica Sand 35.9-36.5'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-32.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 32.0-35.9'

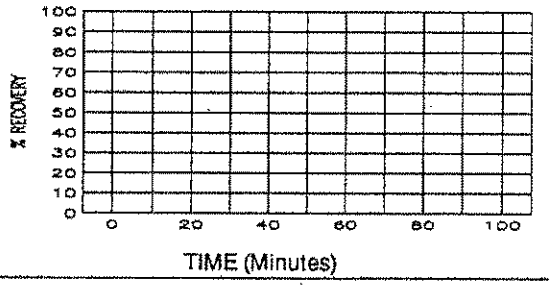
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ304AI

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145103	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-304AI
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1538 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
AT WEST FENCE LINE, 720' NORTH OF SOUTHWEST FENCE CORNER.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 451.6
SMALLEST ¼ ____ ¼ ____ ¼ ____ LARGEST ¼ ____ ¼
SEC. ____ TWN. 47 N,RNG. 5 (E OR W)
LAT. 38° 46' 01" LONG. 40° 26' 58"

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 50 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE | LOCKING CAP? ☒ YES ☐ NO

CASING GROUT DETAILS: CAP VENTED ☒ YES ☐ NO; WEEP HOLE? ☒ YES ☐ NO | MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. | TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT | DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS: LENGTH 42.4 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE ☐ CEMENT/BENTONITE SLURRY
TYPE: ____ BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 3.9 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	13.5 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	0.6 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-15 Gray silty clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	32.0	15-18 Silty sand 18-28 Sand & gravel
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER		Depth to Base of Bentonite Seal:	35.9	28-50 Sand
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	36.5	
					Depth to Top of the Screen:	40.0	
					Depth to Bottom of the Screen:	50.0	
					Total Depth:	500	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER
ELEVATION OF MEASURING POINT 454.02
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER
DATE WELL DRILLING WAS COMPLETED 10-02-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Lorman D. Mahurin Jr. | DATE: 11-15-95
SIGNATURE DRILLER/PERMIT #: Lorman D. Mahurin Jr. | DATE: 11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068146.47
DATUM EASTING: 514434.57 ELEVATION 451.4

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

BORING NO. PZ-304-AS

SHEET 1 OF 2

DRILLING

START	FINISH
TIME 10:10	TIME 12:10
DATE 9/27/95	DATE 9/27/95

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 4 4 7	1.8' 2.0' (90%)			(0.0-3.7 Ft.) Loose, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL)	SP 1	
					@ 0.6 Ft., damp		
2	6 8 7 8	1.5' 2.0' (75%)			(3.7-6.8 Ft.) Compact, olive gray (5Y 4/1), SILT, NR, damp, (ML), (LOESS)	SP 2	
3					@ 6.0 Ft., trace organic material		
4	3 4 5 5	1.7' 2.0' (85%)				SP 3	
5	6						
6	2 3 4 4	1.6' 2.0' (80%)				SP 4	0.0 ppm PID
7					(6.8-10.4 Ft.) Loose, olive gray (5Y 4/1), Fine SANDY SILT, NR, damp, (ML), (LOESS)		
8	2 1 2 2	1.2' 2.0' (60%)				SP 5	
9					@ 8.4 Ft., moist		
10	1 3 5 5	1.7' 2.0' (85%)			(10.4-13.0 Ft.) Loose, olive gray (5Y 4/1), SILT, NR, damp, (ML), (LOESS)	SP 6	
11							
12	1 2 4 11	1.6' 2.0' (80%)			(438.4) 13.0	SP 7	0.0 ppm PID
13					(13.0-14.2 Ft.) Loose, olive gray (5Y 4/1), SILTY Fine SAND, NR, moist, (SM), (ALLUVIUM)		
14	5 7 10 20	1.7' 2.0' (85%)			(437.2) 14.2 (14.2-27.1 Ft.) Compact to dense, light olive gray (5Y 6/1), Fine SAND, NR, damp, (SP), (ALLUVIUM)	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ304AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MD
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068146.47
DATUM EASTING: 514434.57 ELEVATION 451.4

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

BORING NO. PZ-304-AS

SHEET 2 OF 2

DRILLING START		DRILLING FINISH	
TIME	DATE	TIME	DATE
10:10	9/27/95	12:10	9/27/95

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	9 15 17 11	1.4' 2.0' (70%)			(14.2-27.1 ft.) Compact to dense, light olive gray (5Y 6/1), fine SAND, NR, damp, (SP), (ALLUVIUM)	SP 8	
17						SP 9	
18	5 6 14 24	1.8' 2.0' (90%)			@ 17.7 ft., moist @ 18.0 ft., wet	SP 10	0.0 ppm PID Slight organic odor
19							
20	2 15 18 14	1.7' 2.0' (85%)				SP 11	
21							
22	3 5 8 14	0.7' 2.0' (35%)				SP 12	0.1 ppm PID
23							
24	3 5 14 15	1.6' 2.0' (80%)				SP 13	
25							
26	5 11 12 13	1.2' 2.0' (60%)				SP 14	0.0 ppm PID
27					(27.1-28.0 ft.) Compact, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)		
28					(423.4) 28.0 End of Soil Borehole Log at 28.0 ft.		
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

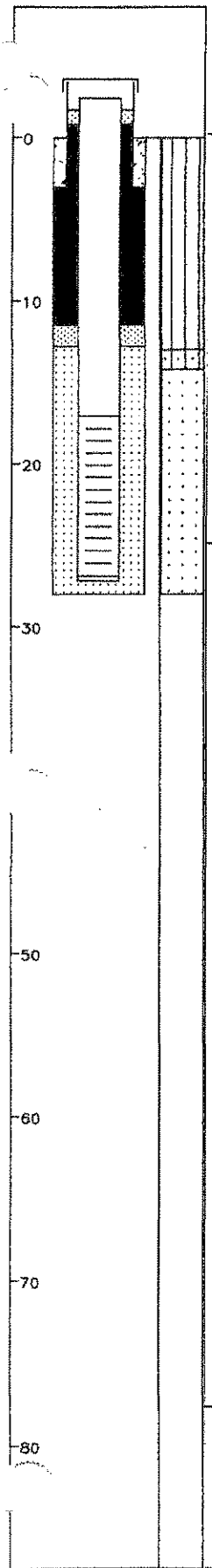
JOB NO.: 943-2848

FILENAME: PZ304AS

Well No. PZ-304-AS

Boring No. X-Ref: PZ-304-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068146 ft. Easting: 514435 ft.

Elevation Ground Level 451.4 ft. NGVD

Top of PVC Casing 453.71 ft. NGVD

Drilling Summary:

Total Depth 28.0 ft.

Borehole Diameter 8 1/4" (0.0-28.0')

Casing Stickup Height 2.31 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 750

Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/27/95	10:10	9/27/95	12:10
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/27/95	13:40	9/27/95	13:45
Filter Placement:	9/27/95	13:45	9/27/95	14:30
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	9/27/95	14:30	9/27/95	14:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.31	-	17.10	C1	453.71	-	434.30
17.10	-	26.90	S1	434.30	-	424.50
26.90	-	27.20	C2	424.50	-	424.20
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 12.8-28.0'

Filter Pack: 100 mesh Silica Sand 11.5-12.8'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-11.5'

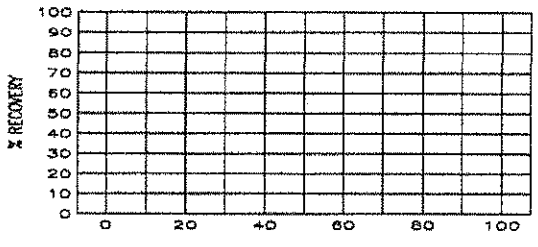
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Harrington

Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ304AS

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145102	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-304AS
SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: Mo
ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710
OWNER ADDRESS: 1936 N. BROADWAY
CITY: ST. LOUIS
STATE: Mo
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
AT WEST FENCE LINE, 740' NORTH OF SOUTHWEST FENCE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 451.4
SMALLEST ¼ ____ ¼ ____ ¼ LARGEST ¼ ____ ¼
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38° 46' 01" LONG. 90° 26' 58"

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x5 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 28 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS: LENGTH 20.3 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED % BENTONITE USED WATER USED/BAG GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 8.5 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	15.2 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.3 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-13 Silt
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	11.5	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER			Depth to Base of Bentonite Seal:	11.5	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE			Depth to Top of Primary Filter Pack:	12.8	
						Depth to Top of the Screen:	18.0	13-28 Sand
						Depth to Bottom of the Screen:	28.0	
						Total Depth:	28.0	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER
ELEVATION OF MEASURING POINT 453.71
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER
DATE WELL DRILLING WAS COMPLETED 9-27-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lowell J. Mahurin Jr.	11-15-95	Lowell J. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068064.93
DATUM EASTING: 515633.57 ELEVATION 457.6

DRILLING METHOD: 4.25 inch x 8.25 inch Hollow Stem Auger to 38.5 ft; 3.625 inch Mud Rotary 42.0-63.0 ft; 4.25 inch x 8.25 inch Hollow Stem Auger 38.5-64.0 ft.

SAMPLING METHOD: CALIFORNIA BARREL (CB)

SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)

SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	22.85 FT				
TIME	8:05				
DATE	10/19/95				
CASING DEPTH	40.0 FT.				

BORING NO. PZ-305-AI

SHEET 1 OF 3

DRILLING START	DRILLING FINISH
TIME 11:00	TIME 8:30
DATE 10/18/95	DATE 10/19/95

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS Gravel road base.

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31					(0.0-36.0 Ft.) No samples collected, see Soil Borehole Log LR-104 for descriptions		
32							
33							
34							
35							
36 (421.6)					36.0		
	6 8 21 50	1.4' 2.0' (70%)			(36.0-54.5 Ft.) Compact to dense, dark gray (N3), fine SAND, trace to little Silt, NR, wet, (SP), (ALLUVIUM)	SP 1	
37					From 37.5-42.0 ft., becomes very dense		
38	12 41 50	1.1' 2.0' (55%)				SP 2	
39							
40	21 43 53 45	2.0' 2.0' (100%)				SP 3	
41							
42	4 5 6 9	1.2' 2.0' (60%)			From 42.0-45.0 ft., becomes compact, with occasional thin (1/2 in.) layers of medium gray (N4), SANDY CLAY, (CL)	SP 4	@ 42.0 ft., switched over to mud rotary
43							
44	5 9 20 30	1.4' 2.0' (70%)				SP 5	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ305AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

DATUM NORTHING: 1068064.93 EASTING: 515633.57 ELEVATION 457.6

DRILLING METHOD: 4.25 inch x 8.25 inch Hollow Stem Auger to 38.5 Ft; 3.625 inch Mud Rotary 42.0-63.0 Ft; 4.25 inch x 8.25 inch Hollow Stem Auger 38.5-64.0 Ft.

SAMPLING METHOD: CALIFORNIA BARREL (CB)

SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)

SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. PZ-305-AI

SHEET 2 OF 3

					DRILLING START	DRILLING FINISH
WATER LEVEL	22.85 FT				TIME 11:00	TIME 8:30
TIME	8:05					
DATE	10/19/95				DATE 10/18/95	DATE 10/19/95
CASING DEPTH	40.0 FT.					

DRILL RIG CME 750

SURFACE CONDITIONS Gravel road base.

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	19 26 24 30	1.3' 2.0' (65%)			(36.0-54.5 Ft.) Compact to dense, dark gray (N3), fine SAND, trace to little Silt, NR, wet, (SP), (ALLUVIUM)	SP 5	
47						SP 6	
48	16 28 34 33	1.7' 2.0' (85%)				SP 7	
49							
50	22 23 16 15	1.7' 2.0' (85%)				SP 8	
51							
52	10 12 50 22	1.0' 2.0' (50%)				SP 9	
53							
54	10 13 20 23	1.4' 2.0' (70%)			(54.5-64.0 Ft.) Compact to dense, medium dark gray (N4), f-m SAND, trace Silt, NR, wet, (SP), (ALLUVIUM)	SP 10	
55							
56	12 14 20 26	1.1' 2.0' (55%)				SP 11	
57							
58	11 14 22 28	1.0' 2.0' (50%)				SP 12	
59							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ305AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068064.93
DATUM EASTING: 515633.57 ELEVATION 457.6

DRILLING METHOD: 4.25 inch x 8.25 inch Hollow Stem Auger to 38.5 ft; 3.625 inch Mud Rotary 42.0-63.0 ft; 4.25 inch x 8.25 inch Hollow Stem Auger 38.5-64.0 ft.

SAMPLING METHOD: CALIFORNIA BARREL (CB)
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL	22.85 FT				
TIME	8:05				
DATE	10/19/95				
CASING DEPTH	40.0 FT.				

BORING NO. PZ-305-AI

SHEET 3 OF 3

DRILLING

START	FINISH
TIME 11:00	TIME 8:30
DATE 10/18/95	DATE 10/19/95

DRILL RIG CME 750

SURFACE CONDITIONS Gravel road base.

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
61	14 13 14 19	1.0'/2.0' (50%)			(54.5-64.0 Ft.) Compact to dense, medium dark gray (N4), f-m SAND, trace Silt, NR, wet, (SP), (ALLUVIUM)	SP (13)	
62	14 14 15 17	1.1'/2.0' (55%)				SP (14)	
63					(393.6) 64.0		
64					End of Soil Borehole Log at 64.0 ft.		
65							
66							
67							
68							
69							
70							
71							
72							
73							
74							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ305AI

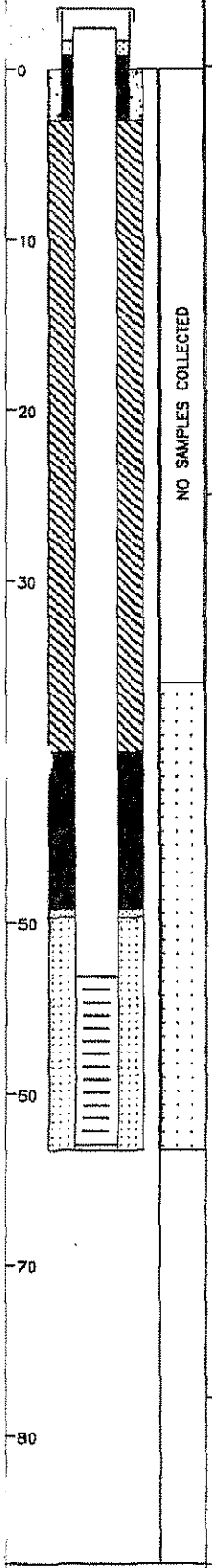
Well No. PZ-305-AI

Boring No. X-Ref: PZ-305-AI

PIEZOMETER CONSTRUCTION SUMMARY

Survey Coords: Northing: 1068065 ft.
Easting: 515634 ft.

Elevation Ground Level 457.6 ft. NGVD
Top of PVC Casing 459.28 ft. NGVD



Not to Scale

Drilling Summary:

Total Depth 64.0 ft.
Borehole Diameter 8 1/4" (0.0-64.0')
Casing Stickup Height 1.68 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit
3/8" Tricone Bit
Drilling Fluid Bentonite Mud below 28.0'

Protective Casing 8x8" Square Steel, by 5' long

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.68	-	53.20	C1	459.28	-	404.40
53.20	-	63.00	S1	404.40	-	394.60
63.00	-	63.30	C2	394.60	-	394.30
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 49.7-63.3'

Filter Pack: 100 mesh Silica Sand 49.2-49.7'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-40.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 40.0-49.2'

Concrete: 0.0-3.0'

Construction Time log:

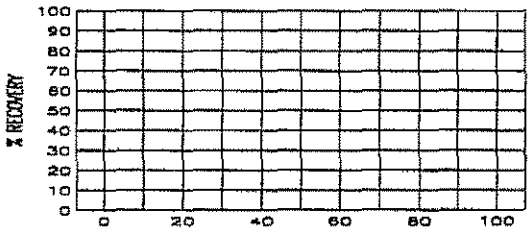
Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/16/95	11:00	10/19/95	8:30
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/19/95	10:22	10/19/95	10:30
Filter Placement:	10/19/95	10:39	10/19/95	10:24
Cementing:				
Development				
Bentonite Grout	10/19/95	10:32	10/19/95	11:15
Bentonite Seal	10/19/95	10:24	10/19/95	10:32

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by M. Sandfort
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ305AI

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145104	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-305AI
SITE ADDRESS: ST. CHARLES ROCK RD. CITY: BRIDGETON STATE: Mo ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC. TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY CITY: ST. LOUIS STATE: Mo ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO — DATE ISSUED: — VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
SOUTH OF OVERHEAD CONVEYOR, 90' SOUTHEAST OF ROADWAY, 150' WEST OF SMALL BUILDING.

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 457.6
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 E OR W
LAT. 38 ° 46 ' 01 " LONG. 90 ° 26 ' 44 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001358 WIPM
DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. PERMIT NUMBER: 001358 WIPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T. ____
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. — DIAMETER OF CASING 8x8 IN. — WEIGHT OR SDR # 0.188" — DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. FT. — JOINTS ☐ MECHANICAL ☐ WELDED ☐ THREADED ☐ OTHER ____ — MATERIAL ☒ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER TYPE ____ — LOCKING CAP? ☒ YES ☐ NO

CASING GROUT DETAILS: CAP VENTED ☒ YES ☐ NO — WEEP HOLE? ☒ YES ☐ NO — MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. — TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT — DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ — MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 55.7 FT. — DIAMETER OF RISER PIPE 2 IN. — WEIGHT OR SDR # SCH80 — DIAMETER OF DRILL HOLE 8¼ IN. — JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL 9.2 — BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL — GRAIN SIZE 16-35 — LENGTH OF FILTER PACK 14.3 FT. — METHOD OF INSTALLATION TREMIE

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE — GRAIN SIZE 100 — LENGTH OF FILTER PACK 0.5 FT. — METHOD OF INSTALLATION TREMIE

WELL SCREEN: LENGTH OF SCREEN 10 FT. — DIAMETER 2 IN. — SLOT SIZE 10 — WEIGHT OR SDR # SCH80 — MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP ____ — DIAMETER OF SUMP ____ — MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO — MATERIAL USED ____ — LENGTH OF BACK FILLED BORE HOLE ____

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3.0	0-2 Gravel 2-10 Silty clay
Depth to Base of Annular Seal:	40.0	10-18 Silt 18-25 Silty clay
Depth to Base of Bentonite Seal:	49.2	25-64 Sand
Depth to Top of Primary Filter Pack:	49.7	
Depth to Top of the Screen:	54.0	
Depth to Bottom of the Screen:	64.0	
Total Depth:	64.0	
DATE WELL DRILLING WAS COMPLETED	10-19-95	

STATIC WATER LEVEL FEET FROM MEASURING POINT: ____
DATE OF STATIC WATER LEVEL: ____
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 459.28

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Lomax J. Mahurin Jr. — DATE: 11-15-95
SIGNATURE DRILLER/PERMIT #: Lomax J. Mahurin Jr. — DATE: 11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
WL-204	07.0803035.003.002	1 of 1

Start/Finish Date	**Site Name and Location**
8/1/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 2
Hart Environmental Drilling	**Ground Surface Elevation:** 443.3
Driller	**Northing:** 1069685.83
Max Tinnin	**Easting:** 514205.01

Drilling Equipment	**McLaren/Hart Geologist/Office**
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	25'	S-1

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-204 5'	Background (0.03-0.05)	0.0-25.0' Native Alluvium: olive brown clayey silt grading to dark brown, fine-grained sand; moist to wet.
10	WL-204 10'	Background (0.03-0.05)	@ 8' wet
15	WL-204 15'	Background (0.03-0.05)	
20	WL-204 20'	Background (0.03-0.05)	
25	WL-204 25'	Background (0.03-0.05)	Boring terminated @ 25.0'

Notes:

Radiological samples collected at 5 and 25 feet below ground surface.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

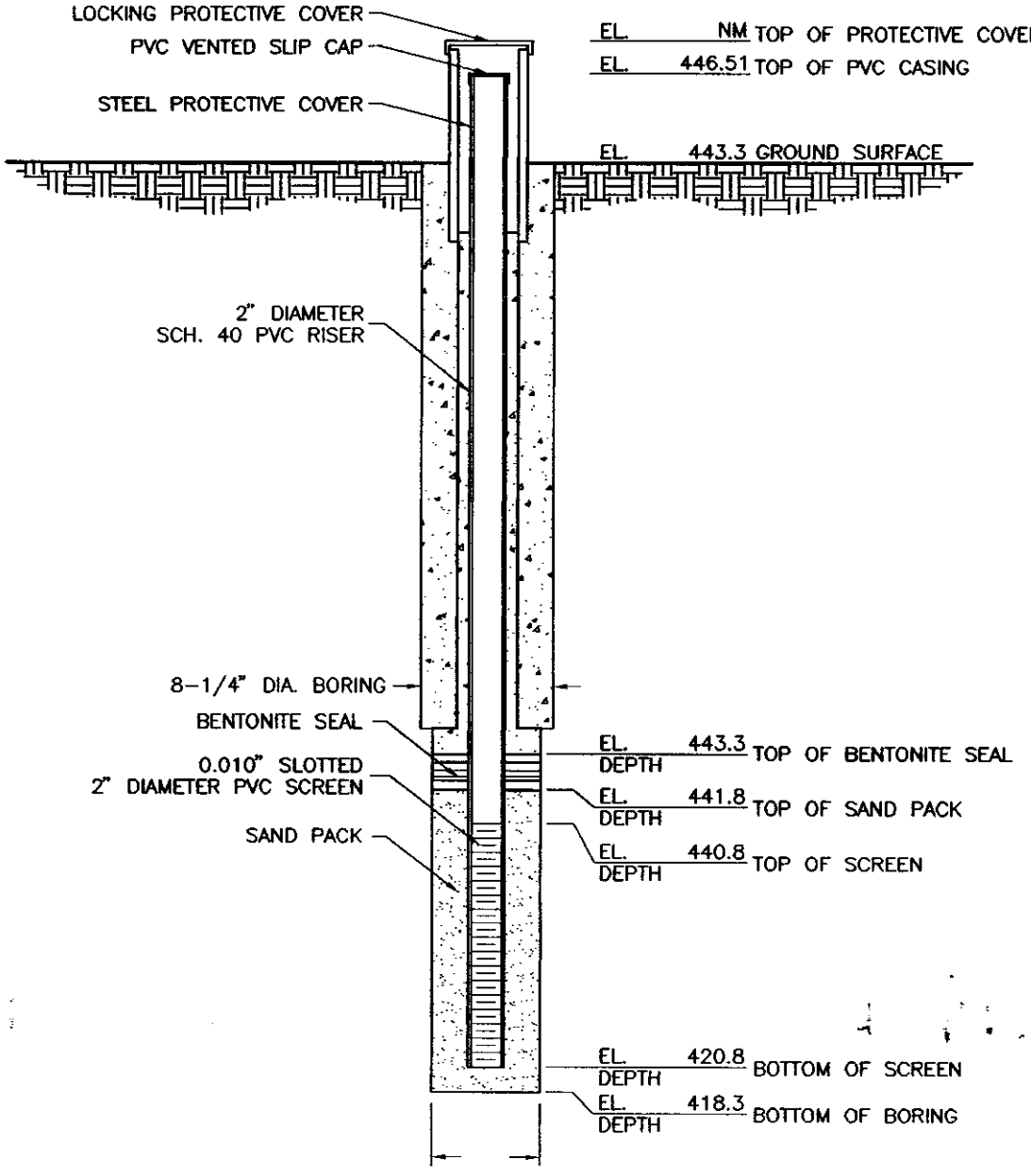
Groundwater encountered at 8 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. S-1

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 8/2/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-204 FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED

(W1.DWG)

MISSOURI DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY PROGRAM

MONITORING WELL PLUGGING REGISTRATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO. 514516	
C.R. NO.	CHECK NO. / TRANSMITTAL NO.
STATE WELL NUMBER	APPROVED BY / DATE APPROVED
ENTERED Ph1 Ph2 Ph3	ROUTE

INFORMATION SUPPLIED BY WELL OR PUMP INSTALLATION CONTRACTOR

OWNER NAME	TELEPHONE NUMBER	VARIANCE NUMBER (IF APPLICABLE)
ENGINEERING MGMT.SUPPORT INC. EMSI. PAUL ROSASCO		6023

OWNER ADDRESS	CITY	STATE	ZIP CODE
7220 W. JEFFERSON AVE. SUITE 406	LAKEWOOD	CO	80235

ADDRESS OF WELL SITE	CITY	STATE	ZIP CODE	REFERENCE NUMBER OF ORIGINAL WELL (IF KNOWN)
13570 ST. CHARLES ROCK ROAD	BRIDGETON	MO	63044	N/A

SITE NAME	WELL NUMBER	DATE
WEST LAKE LANDFILL	S - 1	

LOCATION OF WELL: LAT. 38 ° 46 ' 16.5 " LONG. 90 ° 27 ' 2.0 "

DRILL AREA: AREA 1

COUNTY: ST. LOUIS

SMALLEST ¼ ____ ¼ ____ ¼ LARGEST — Sec. ____ Township ____ North Range ____ ☐ East ☐ West

PLUGGING INFORMATION

ORIGINAL DRILLER (IF KNOWN)	DATE ORIGINALLY DRILLED	STATIC WATER LEVEL	DRILLER NOTES
N/A	N/A		

☑ MONITORING WELL

DEPTH OF WELL	LENGTH OF RISER
23 FT.	N/A FT. BGS

SCREEN/RISER DIAMETER	WELL SCREEN AND RISER REMOVED?
2 IN.	☐ Yes ☑ No

PUMP AND SAMPLING EQUIPMENT REMOVED?	CASING REMOVED?
☐ Yes ☑ N/A ☐ No	☑ Yes ☐ N/A ☐ No

☐ SOIL BORING(S) Boring Diameter: ____ IN.

QUANTITY	DEPTH
TOTAL ____ BORING(S)	TOTAL ____ FT.

TYPE OF FILL MATERIAL: ☐ Gravel ☐ Sand ☐ Other

AMOUNT OF FILL USED: ____ ☐ TONS ☐ CUBIC YARDS

DEPTH TO TOP OF FILL: ____ FT.

GROUT INSTALLATION METHOD	GROUT MATERIAL USED	HOW MANY GALLONS OF WATER MIXED PER BAG OF CEMENT OR BENTONITE?	TOTAL NUMBER OF BAGS OF GROUT USED
☐ Gravity ☑ Tremie ☐ Excavation	Neat Cement Bentonite ☐ Hi-Early ☑ Slurry ☐ Granular ☐ Pellets ☐ Type 1 ☐ Chips ☐ Other ____	5 ☐ Hydrated to Saturation	2

POUNDS OF GROUT PER BAG: 50

DATE 1ST WELL PLUGGED	DATE LAST WELL PLUGGED	FINISHED SURFACE MATERIAL	SURFACE MATERIAL LENGTH
04/13/2016	04/15/2016	☑ Soil ☐ Concrete ☐ Asphalt ☐ Other	____ FT. ____ IN.

REMARKS	REASON FOR ABANDONMENT
(REDI JOB# 162075-AB)	

I hereby certify that the monitoring well herein described was plugged in accordance with the Department of Natural Resources requirements for the plugging of wells.

SIGNATURE (PRIMARY CONTRACTOR)	PERMIT NUMBER	DATE	SIGNATURE (CONTRACTOR)	PERMIT NUMBER	DATE
	336E - M	5/17/2016	Pat Seymour	4438 M	5/12/16

SIGNATURE (APPRENTICE) — PERMIT NUMBER — DATE

MO-780-2161 (1-12)

REMIT TO: MISSOURI DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGY AND LAND SURVEY
WELLHEAD PROTECTION SECTION, PO BOX 250, ROLLA, MO 65402 573-368-2165

ENCLOSE $50 FEE WITH REGISTRATION RECORD WITHIN 60 DAYS AFTER WELL PLUGGING OR WITHIN 180 DAYS AFTER THE PLUGGING OF TEMPORARY WELLS

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
S-5 WL-105C	07.0803035.003.002	1 of 1

Start/Finish Date	**Site Name and Location**
8/15/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 1
Hart Environmental Drilling	**Ground Surface Elevation:** 465.7
Driller	**Northing:** 1069155.84
Max Tinnin	**Easting:** 515901.03

Drilling Equipment	**McLaren/Hart Geologist/Office**
CME-55 Drill Rig, Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole	5' Continuous Sampler	43'	S-5

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	None Taken	0.7	0.0-30.0' Landfill Debris: trashy debris consisting of cloth, wood, rope, and plastic; soil consisting of brown and gray silt, and crushed rock; dry to moist.
10	None Taken	0.2	
15	None Taken	Background (0.02-0.04)	
20	None Taken	Background (0.02-0.04)	
25	None Taken	Background (0.02-0.04)	
30	None Taken	Background (0.02-0.04)	@ 30' wet
35	None Taken	Background (0.02-0.04)	30.0-43.0' Native Alluvium: dark gray clayey silt grading to fine to coarse-grained sand and gravel; wet.
40	None Taken	Background (0.02-0.04)	
45	None Taken	Background (0.02-0.04)	Boring terminated @ 43.0'

Notes:

Radiological samples not collected during boring activities; downhole logging indicated elevated gamma readings from 1.5-5.5'

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

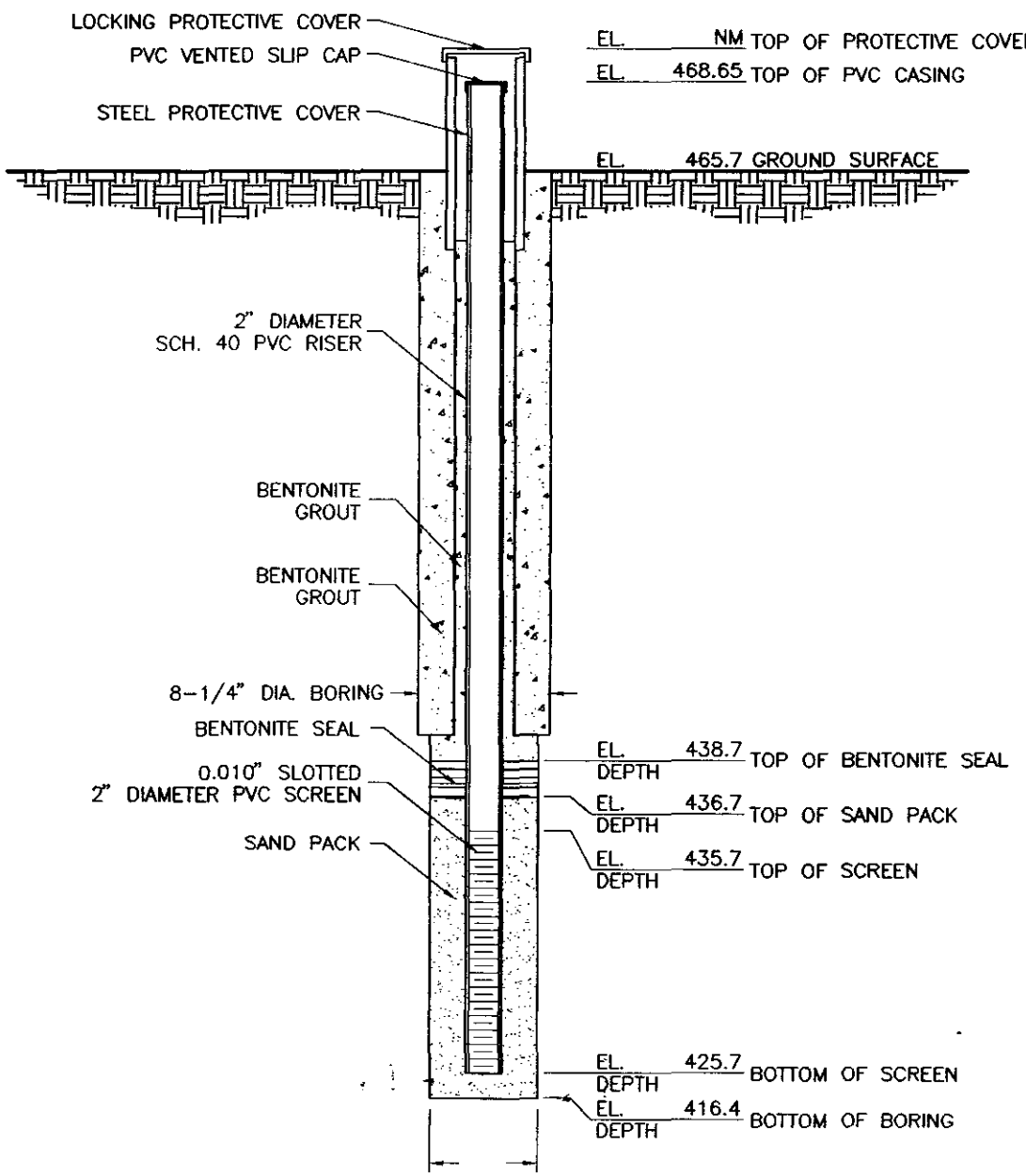
Groundwater encountered at 30 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. S-5

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 8/15/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-105C FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED

(W5.DWG)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
S-8 WL-228	07.0803035.003.002	1 of 1

Start/Finish Date	Site Name and Location
9/15/95	West Lake Landfill; Bridgeton, Missouri

Drilling Contractor	Boring Location:	Area 2
Hart Environmental Drilling	Ground Surface Elevation:	441.6
Driller	Northing:	1071044.35
Max Tinnin	Easting:	514724.16

Drilling Equipment	McLaren/Hart Geologist/Office
CME-55 Drill Rig; Hollow Stem Augers	Tim Biggs / St. Louis

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4"ID; 8 1/4" Hole	5' Continuous Sampler	29.3'	S-8

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	WL-228 5'	Background (0.01-0.04)	0.0-29.3' Native Alluvium: olive brown sandy silt and silty clay grading to dark gray medium to coarse-grained sand; dry to wet.
10	WL-228 10'	Background (0.01-0.04)	@ 10' wet
15	WL-228 15'	Background (0.01-0.04)	
20	WL-228 20'	Background (0.01-0.04)	
25	WL-228 25'	Background (0.01-0.04)	
30	None Taken	Background (0.01-0.04)	Boring terminated @ 29.3'

Notes:

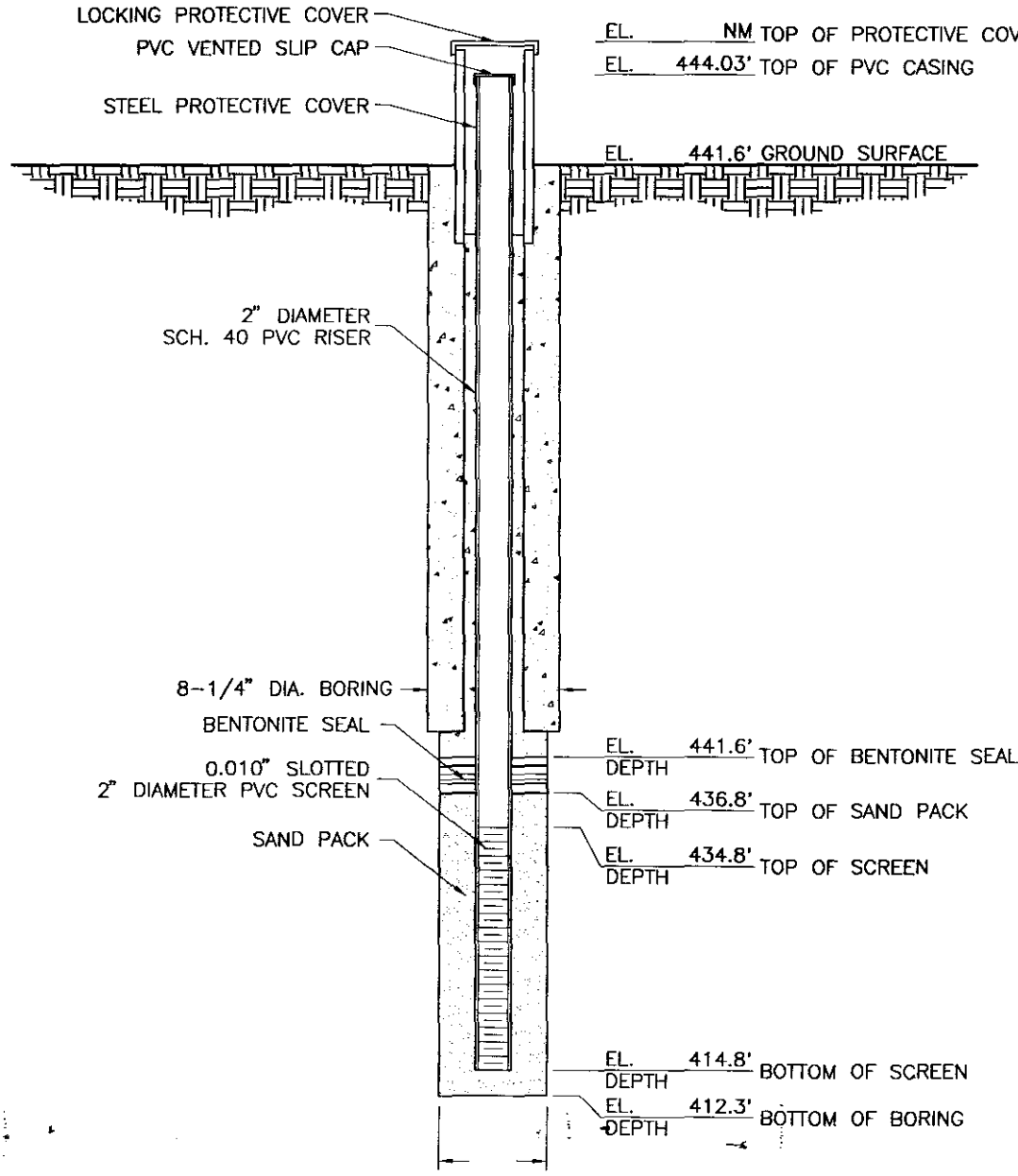
Radiological samples collected at 5 and 15 feet below ground surface.
Non-radiological samples not collected during boring activities.
Perched water not encountered during boring activities.
Groundwater encountered at 10 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. S-8

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 9/15/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-228 FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED.

(W8)

Soil Boring Log

McLaren Hart

Boring No.	Project No./Name	Page:
S-10 WL-216B (WL-232)	07.0803035.003.002	1 of 1

Start/Finish Date	**Site Name and Location**
8/30/95 / 9/19/95	West Lake Landfill; Bridgeton, Missouri
Drilling Contractor	**Boring Location:** Area 1
Hart Environmental Drilling	**Ground Surface Elevation:** 477.5
Drilling Service Company	**Northing:** 1069827.87
Driller	**Easting:** 514931.35
Max Timmin	**McLaren/Hart Geologist/Office**
Bruce Murphy	Tim Biggs / St. Louis

Drilling Equipment CME-55 Drill Rig, Hollow Stem Augers
LDH-30T Drill Rig, Large Diameter Auger

Bit Size/Type	Sample Method	T.D. Borehole	Well Installed?
4 1/4" ID; 8 1/4" Hole 24" OD Solid Auger	5' Continuous Sampler Grab from Auger	54.5'	S-10

Remarks:

Depth (ft)	Sample ID #	Geiger Reading (mR/hr)	Description
5	None Taken	Background (0.01-0.03)	0.0-22.0' Landfill Debris: soil consisting of grayish brown to olive brown silty clay to gray, very-fine grained sand, and crushed rock; no trashy debris encountered; dry to moist.
10	None Taken	Background (0.01-0.03)	
15	None Taken	Background (0.01-0.03)	
20	None Taken	Background (0.01-0.03)	
25	None Taken	None Taken	22.0-54.5' Native Alluvium: gray, silty, very fine-grained sand grading to coarse-grained sand; moist to wet.
30	None Taken	None Taken	
35	None Taken	None Taken	
40	None Taken	None Taken	@ 40' wet
45	None Taken	None Taken	
50	None Taken	None Taken	
55	None Taken	None Taken	Boring terminated @ 54.5'

Notes:

Radiological samples not collected during boring activities; downhole logging indicated elevated gamma readings from 3.0-5.0'.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

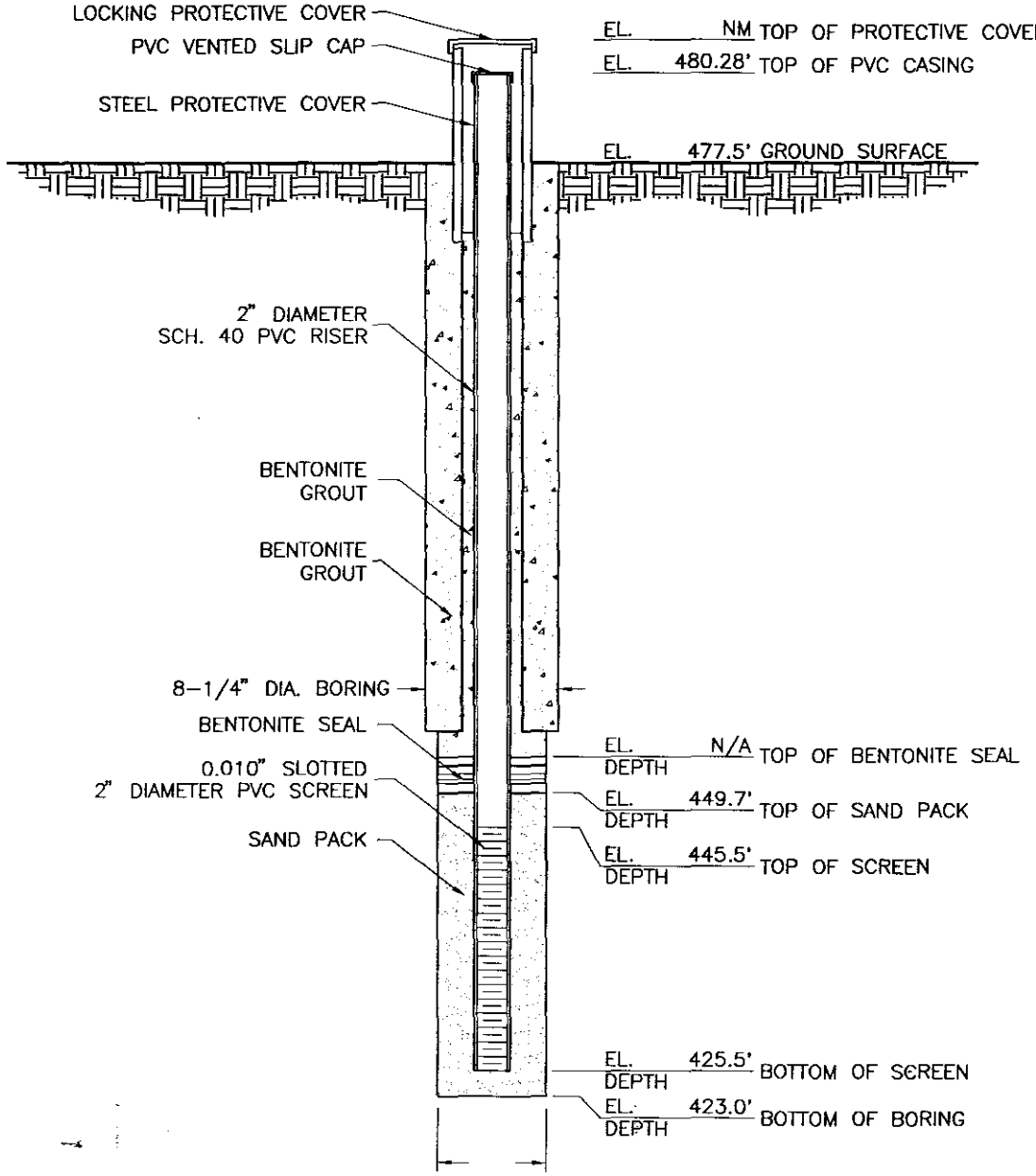
Groundwater encountered at 40 feet below ground surface.

McLaren Hart
ENVIRONMENTAL ENGINEERING CORPORATION

MONITORING WELL DETAILS

PROJECT NO. 070803035
WELL NO. S-10

PROJECT NAME WEST LAKE LANDFILL
WELL LOCATION BRIDGETON, MISSOURI DATE 9/19/95 BY HART ENVIRONMENTAL DRILLING



NOTES:

1. REFER TO SOIL BORING WL-216B FOR SOIL DESCRIPTION.
2. DETAIL NOT TO SCALE.
3. NM = NOT MEASURED.
4. N/A = NOT APPLICABLE; BENTONITE GROUT/CHIPS USED TO SEAL WELL UP TO SURFACE.

(W10)

SUBSURFACE EXPLORATION DATA

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-23-78
Finished 6-23-78

Boring No. 37-A
Coordinates Sheet 1 of 2
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill Client's Job No.

Job Location St. Charles Rock Road City Bridgeton State Mo.

Casing O.D. I.D. Sampler O.D. 2" I.D. 1-3/8"

Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall

W. D. Co. Foreman Gary Johanning Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration Of Sampler (inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Brown, sandy clay and trash	Used 6" H.S. auger
2'0"					Moist to wet, brown and gray, sandy clay	
7'0"					Limestone boulder 1'0" minus	
19'0"					Moist, brown, firm to medium stiff, sandy clay	
26'0"					Wet, brown, medium dense, fine, sand and clay layers	
30'0"					Gray, moist, stiff, plastic, clay with traces of rust stains	
35'0"					Wet, brown, medium dense, fine, sand with gravel	(Cont'd.)

DNR 0157

SUBSURFACE EXPLORATION DATA

by

WABASH DRILLING COMPANY

110 Angelica St. • St. Louis, Mo. 63147 • 421-2460

Date of Drilling:
Started 6-23-78
Finished 6-23-78

Boring No. 37-A
Coordinates Sheet 2 of
Surf. Elev.
Gr. Water Elev. --

Client Westlake Quarry & Material Co.

Job Name Westlake Landfill Client's Job No.

Job Location St. Charles Rock Road City Bridgeton State Mo.

Casing O.D. I.D. Sampler O.D. 2" I.D 1-3/8"

Casing Hammer lbs. fall Sampler Hammer 140 lbs. 30" fall

N. D. Co. Foreman Gary Johannin; Client's Inspector

Depth Below Ground Surface	Blows On Casing	Sample Number	Blows On Sampler	Penetration of Sampler (Inches)	FIELD IDENTIFICATION OF SOIL (Include relative firmness, relative moisture, color, mention all soil constituents, etc.)	REMARKS
					Wet, gray, fine, medium dense, sand with traces of gravel	Set bottom of well point @ 50'0" and back filled hole with ½" minus rock.
50'0"					Total depth of boring 50'0"	

Drilling Log

Project Name	WESTLAKE					Boring No.	S-80
Project No.	84-075-4-002					Page	1 of 2
Ground Elevation	448.4	Location	Southwest of Site, Figure I-2			Total Footage	22.0
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SOLID AUGERS	5"	22.0'	0	4	0	SEE REMARKS	-
Drilling Co.	WABASH DRILLING CO.				Driller (s)	DORL THORNTON	
Drilling Rig.	ACKER AP-5, TRUCK				Type of Penetration Test	STANDARD	
Date	8-28-84	To	8-29-84		Field Observer (s)	GLEN ERNSTMANN	

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
1	DARK BROWN SANDY SILT AND ORGANIC MATTER, DAMP					5" SOLID AUGER 0' TO 20'.
2	LIGHT BROWN FINE SANDY SILT, LOW PLASTICITY, VERY LOOSE, DAMP					
3						
4						
5					5.0	
6			2/2/1	9"/18"	SS-1	
					6.5	
7	GRAY-BROWN SILTY CLAY, MEDIUM PLASTICITY, MEDIUM STIFF TO SOFT, MOIST					
8						
9						
10					10.0	
			1/3/2	18"/19"	SS-2	
11					11.5	
12						
13	GRAY-BROWN FINE SANDY SILT, SOME CLAY, VERY SOFT, SATURATED					

Drilling Log

Project Name: WESTLAKE						Boring No.: S-82	
Project No.: 84-075-4-002						Page: 1 of 2	
Ground Elevation: 447.7	Location: NW Central Section of Site; Fig I-2					Total Footage: 26.5'	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	SEE REMARKS	26.5'	0	5	0	SEE REMARKS	-
Drilling Co.: WABASH DRILLING CO.				Driller (s): DORL THORNTON			
Drilling Rig.: ACKER MP-5, TRUCK				Type of Penetration Test: STANDARD			
Date: 8-24-84 To 8-27-84				Field Observer (s): GLEN ERNSTMANN			

Depth	Description	Class.	Blow Count	Recov.	Sample or Box No.	Remarks
1	BROWN SANDY CLAY, SOME GRAVEL, MEDIUM PLASTICITY, STIFF TO VERY STIFF, DAMP TO MOIST (FILL)					5" SOLID AUGERS 0' TO 20'.
2						
3						
4						
5					5.0	
6			5/4/8	14" / 18"	SS-1	
7					6.5	
8						
9	BROWN FINE SANDY SILT, LOW TO NON-PLASTIC, STIFF, MOIST TO SATURATED					
10					10.0	SATURATED MATERIAL ENCOUNTERED @ 11' TO 13'. UNSATURATED 13' TO 17',
11			2/3/3	17" / 18"	SS-2	
12					11.5	
13	LIGHT BROWN FINE TO MEDIUM SAND, DAMP					

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. S-82

Project Name WESTLAKE

Page 2 of 2

Project No. 84-075-4002

Date 8-27-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
15	LIGHT BROWN FINE TO MEDIUM SAND, DAMP						
	BROWN SILTY CLAY, MEDIUM PLASTICITY, VERY STIFF, MOIST		3/7/13	16"/18"	15.0	SS-3	
16					16.5		
17	BROWN-GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED						SATURATED MATERIAL BELOW APPROX. 17' TO 18'.
18							
19							CASING WAS DRIVEN TO 20' & HOLE WAS WASH-BORED FROM 20' TO 25'.
20			4/7/12	15"/18"	20.0	SS-4	
21					21.5		STOPPED 8-24-84
22							RESUMED 8-27-84
23	GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED						NOTE: HOLE HAS COLLAPSED TO 13.3' BELOW G.S. OVER THE WEEKEND.
24	PRIMARILY QUARTZ, SOME CHERT FRAGMENTS AND MAFIC MINERALS						
25			7/14/29	17"/18"	25.0	SS-5a	A 2" dia. PVC piezometer was installed to 25.5' PVC is flush-jointed, threaded couplings.
26	GRAY, SILTY FINE TO MED. SAND, SATURATED					SS-5b	Bottom 10' is .010" machine slotted screen.
27	TOTAL DEPTH 26.5'				26.5		Bottom 12.5' is gravel packed with a 2' thick bentonite pellet seal above.
28							Annulus is grouted from seal to surface.
29							T.O.P. is 3.0' above ground surface.
30							WATER LEVEL IS 18.2' BELOW T.O.P. IMMEDIATELY AFTER PIEZOMETER INSTALLATION 1:45 p.m. 8-27-84.

Drilling Log

Project Name: WESTLAKE						Boring No. S-84	
Project No.: 84-075-4-002						Page 1 of 3	
Ground Elevation: 452.9	Location: NE section of Site; Fig I-2					Total Footage: 31.5'	
Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. of Samples	No. Core Boxes	Depth To Water	Date Measured
SEE REMARKS	5"	31.5	0	4	0	SEE REMARKS	—

Drilling Co.	WABASH DRILLING CO.	Driller (s)	DOAL THORNTON
Drilling Rig.	ACKER MP-5, TRUCK	Type of Penetration Test	STANDARD
Date	8-24-84 To 8-24-84	Field Observer (s)	GLEN ERNSTMANN

Depth	Description	Class.	Blow Count	Recov.		Sample or Box No.	Remarks
1	LIGHT BROWN SAND, SILT AND GRAVEL, DAMP TO DRY (FILL)						5" DIA. SOLID AUGERS 0' TO 30'.
2							
3							
4	GREENISH GRAY TO DARK GRAY SILTY FINE SAND, VERY LOOSE,						
5	DAMP (FILL)				5.0		
6			2/2/2	18"/18"		SS-1	
7					6.5		
8				0			
9							
10							
11							FEW THIN SATURATED SANDY ZONES BELOW 12'.
12	GREENISH GRAY SILTY FINE SAND, ZONES OF DARK GRAY CLAYEY SILT, MOIST TO						
13	SATURATED (FILL)	A-22					

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. S-84
Page 2 of 3
Project Name WESTLAKE
Project No. 84-075-4-002
Date 8-24-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss	Box or Sample No.	Remarks
15				15.0		
	GREENISH GRAY SILTY FINE SAND, ZONES OF DARK GRAY CLAYEY SILT, MOIST TO SATURATED (FILL)			24"/24"	ST-2	Q_p = N.A.
17				17.0		
18						
19						
20						ALL MATERIAL SATURATED BELOW APPROX. 20'.
21						
22						
23	GRAY-BROWN FINE TO MEDIUM SAND, TRACE SILT, MEDIUM DENSE					
24						
25				25.0		
26			9/9/12	18"/18"	SS-3	
27				26.5		APPROX. 6 FT. OF SLOUGH IN HOLE WHEN SAMPLE SS-4 WAS FIRST ATTEMPTED. CASING WAS DRIVEN TO 30' THEN SLOUGH WASH-BORED OUT W/ TRICONE BIT. NO BENTONITE WAS USED.
28						
29	GRAY MEDIUM TO COARSE SAND, MEDIUM DENSITY, SATURATED					
30		A-23	5/6/9	30.0 12"/18"	SS-4	

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Drilling Log (continued)

Boring No. S-84

Project Name WESTLAKE — Page 3 of 3

Project No. 84-675-4-002 — Date 8-24-84

Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
	(SEE ABOVE)				31.5	SS-4	
32	TOTAL DEPTH 31.5'						
33							A 2" dia. PVC piezometer was installed to 30.9'.
34							PVC is flush-jointed, threaded couplings. Bottom 10' is .010" machine slotted screen.
35							
36							Gravel pack 31.5' to 20.0' with a 1.8' thick bentonite pellet seal above.
37							
38							Annulus is grouted from seal to ground surface.
39							T.O.P. is 4.0 above ground surface.
40							
							WATER LEVEL IMMEDIATELY AFTER PIEZOMETER INSTALLATION IS 23.7' BELOW T.O.P. 12:20pm 8-24-84.
							WATER LEVEL IS 23.91' BELOW T.O.P. 7:15am 8-27-84

A-24

WATER
MANAGEMENT
CONSULTANTS

5988 MID RIVERS MALL DRIVE
ST. CHARLES, MISSOURI 63304, USA

TELEPHONE (314) 939 4926
TELEFAX (314) 939 9631

Mr. Matt Kingsley
Bridgeton Landfill, LLC.
13570 St. Charles Rock Road
Bridgeton, Missouri 63044

April 21, 1998

Dear Mr. Kingsley:

Groundwater Monitoring Well Construction Information
Bridgeton Landfill, April 1998

Pursuant to our conversation, enclosed are the tabulated will construction details. This information has been compiled from existing reports submitted to Allied from Golder Associates and McLaren Hart.

Please let me know if you have any questions or comments regarding this information.

Sincerely,

WATER MANAGEMENT CONSULTANTS, INC.

John D Regan
Project Hydrogeologist

Ward Herst, CPHG, CEM
Operations Manager

Enclosures

W.M.C 1998

Well #	State ID	Northing	Easting	Top of Casing Elevation	Ground Surface Elevation	Bottom of Well Elevation	Top of Screen Elevation
PZ-100-KS	1209	1068842	517212	485.64	483.8	99.63	109.76
PZ-100-SD	1208	1068852	517195	485.82	484.4	239.42	249.55
PZ-100-SS	1207	1068868	517175	485.84	484.4	390.42	410.39
PZ-101-SS	1210	1068473	516623	476.68	474.9	335.28	345.41
PZ-102-SS	N/A	1068088	516888	483.85	482.1	391.22	402.35
PZ-102R-SS	1211	1068132	516859	485.62	484.5	394.54	404.67
PZ-103-SS	1212	1067660	516724	480.17	477.8	332.95	343.08
PZ-104-KS	1215	1066993	516821	484.04	482.3	74.82	84.95
PZ-104-SD	1214	1067013	516834	483.69	482.1	236.77	246.90
PZ-104-SS	1213	1067028	516847	483.63	481.6	336.93	347.06
PZ-105-SS	1216	1066421	516230	483.61	481.2	332.59	342.72
PZ-106-KS	1219	1066704	515432	464.26	461.8	87.87	98.02
PZ-106-SD	1218	1066715	515416	463.42	461.5	260.52	270.66
PZ-106-SS	1217	1066726	515400	462.70	461.0	295.52	305.65
PZ-107-SS	1220	1067163	515255	464.66	462.6	359.90	370.03
PZ-108-SS	1221	1067678	515973	456.20	454.1	310.44	320.58
PZ-109-SS	1222	1068012	516144	458.50	456.8	320.94	331.07
PZ-110-SS	1223	1068336	515920	458.91	456.8	345.54	355.94
PZ-111-KS	1225	1068621	515850	460.87	459.2	91.88	102.03
PZ-111-SD	1224	1068638	515835	461.55	459.2	249.72	259.82
PZ-112-AS	1226	1069002	515674	459.83	457.9	423.20	428.33
PZ-113-SS	1229	1069242	515777	461.77	460.0	301.26	311.39
PZ-113-AD	1228	1069233	515760	461.46	459.9	351.13	361.26
PZ-113-AS	1227	1069224	515748	461.42	459.9	420.89	431.02
PZ-114-AS	1230	1069419	516768	451.31	449.8	419.75	429.88
PZ-115-SS	1231	1069409	516755	452.30	450.6	365.80	375.93
PZ-116-SS	1232	1066410	515844	484.87	483.1	321.74	331.67
PZ-200-SS	N/A	1068496	516972	485.63	483.6	385.64	473.99
PZ-201-SS	N/A	1067820	516862	480.33	478.0	389.37	468.26
PZ-201A-SS	1233	1067832	516746	480.16	478.4	388.22	398.35
PZ-202-SS	1234	1067320	517102	481.17	479.0	389.58	438.81
PZ-203-SS	1235	1066662	516608	486.59	484.2	374.48	384.58
PZ-204-SS	N/A	1066427	515533	469.63	467.0	377.35	456.08
PZ-204A-SS	1236	1066430	515556	468.16	466.7	377.23	387.16
PZ-205-SS	1238	1067484	515478	461.78	459.5	360.83	370.96
PZ-205-AS	1237	1067464	515463	460.99	459.3	410.65	420.78
PZ-206-SS	1239	1068031	515809	460.20	458.4	333.38	343.38
PZ-207-AS	1240	1069645	516038	463.57	461.9	421.85	426.98
PZ-208-SS	1241	1069219	517169	474.25	472.5	373.70	383.83
PZ-1201-SS	1201	1067302	516904	482.42	480.4	332.78	342.71
PZ-302-AI	N/A	1067210	514720	451.15	450.0	407.30	417.40
PZ-302-AS	N/A	1067198	514737	451.42	449.5	427.20	437.30
PZ-303-AS	N/A	1067763	514426	453.18	450.8	424.70	434.80

WMC 1998

Well #	State ID	Northing	Easting	Top of Casing Elevation	Ground Surface Elevation	Bottom of Well Elevation	Top of Screen Elevation
PZ-304-AS	N/A	1068146	514435	453.71	451.4	424.20	434.30
PZ-304-AI	N/A	1068126	514435	454.02	451.6	402.50	412.60
PZ-305-AI	N/A	1068065	515634	459.28	457.6	394.30	404.40
LR-100	N/A	1067294	514894	469.12	467.2	442.40	447.50
LR-102	N/A	1068937	514788	513.52	512.0	452.00	457.10
LR-103	N/A	1068527	515217	461.28	460.1	421.40	431.50
LR-104	N/A	1068079	515623	459.73	458.0	419.50	429.60
LR-105	N/A	1067710	514525	486.79	484.2	447.90	458.00
MW-F-1-S	N/A	1068595	515890	No data	No data	No data	No data
MW-F-1-D	N/A	1068600	515805	No data	No data	No data	No data
MW-1204	1204	1066421	515823	485.63	483.3	259.80	269.80
S-1	N/A	1069686	514205	446.51	443.3	421.30	441.30
S-5	N/A	1069156	515901	468.65	465.7	425.70	435.70
S-8	N/A	1071044	514724	444.03	441.6	414.60	434.60
S-10	N/A	1069828	514931	480.28	477.5	425.50	445.50
S-51	N/A	1066140	514200	447.72	446.3	420.50	423.50
S-53	N/A	1066880	514500	449.00	444.8	421.10	424.10
S-61	N/A	1070160	514580	450.17	445.6	424.10	No data
S-75	N/A	1067270	514730	459.90	458.8	432.80	435.80
S-82	N/A	1069312	514273	450.70	447.7	422.20	432.20
S-84	N/A	1069685	516455	455.30	452.9	422.00	432.00
S-88	N/A	1068390	515270	462.20	460.0	418.50	430.00
I-2	N/A	1069698	514212	446.41	443.2	396.20	406.20
I-4	N/A	1069148	515890	468.57	466.0	390.00	400.00
I-7	N/A	1070743	514300	446.97	444.5	397.50	407.50
I-9	N/A	1069329	514269	450.99	448.5	395.50	405.50
I-11	N/A	1069819	514925	480.27	477.6	386.60	396.60
I-51	N/A	DAMAGED	UNUSABLE				
I-53	N/A	DAMAGED	UNUSABLE				
I-62	N/A	1070960	514675	446.08	444.1	400.10	410.10
I-65	N/A	1070940	515435	441.80	438.5	402.50	412.50
I-66	N/A	1070520	515935	441.80	437.7	400.80	410.80
I-67	N/A	1070090	516260	439.08	436.5	401.10	411.10
I-68	N/A	1069570	516690	448.32	440.9	409.70	419.70
I-73	N/A	1067680	515575	465.40	462.7	412.70	415.70
D-3	N/A	1069136	515872	470.32	467.2	361.20	371.20
D-6	N/A	1070194	514550	447.60	444.4	338.40	348.40
D-12	N/A	1069836	514936	479.91	477.4	333.40	343.40
D-13	N/A	1070486	515602	471.10	468.4	335.40	345.40
D-14	N/A	1068947	516523	487.77	484.5	425.50	430.50
D-81	N/A	1067338	514464	450.80	447.8	387.80	402.80
D-83	N/A	1070940	514660	447.70	444.4	347.40	367.40
D-85	N/A	1069680	516445	455.65	453.1	371.10	391.10
D-87	N/A	1069210	515400	462.55	460.0	349.00	369.00

WMC 1998

Well #	State ID	Northing	Easting	Top of Casing Elevation	Ground Surface Elevation	Bottom of Well Elevation	Top of Screen Elevation
D-93	N/A	1069318	514270	450.70	448.3	336.30	356.30
MW-101	N/A	No data	No data	447.66	445.36	420.36	430.36
MW-102	N/A	No data	No data	448.98	446.68	422.18	432.18
MW-103	N/A	No data	No data	441.16	438.46	422.76	432.76
MW-104	N/A	No data	No data	441.88	438.98	421.98	431.98
MW-107	N/A	No data	No data	449.25	No data	No data	No data
MW-F3	N/A	1070380	515880	No data	No data	No data	No data
MW-F2	N/A	1067685	514417	450.10	447.90	422.60	437.60

1997

Bridgeton

Well Summary - West Lake Landfill

Installation Date	Original Designation	Current Designation	Current Status	Coordinates North	Coordinates East	Ground Surface	Top of Casing	Depth	Screen Interval	Boring Log	Well Construction Info	Drilling Company	Consultant
10/83	N-1	I-50		5,200	3,840	449.0	453.48	40.6	418.4-408.4	No	No	?	Reitz & Jens
81	HL-3	S-51	Missing	6,140	4,200	446.3	447.72	25.8	423.5-420.5	No	No	?	Reitz & Jens
81	HL-2	S-52		6,470	4,200	444.7	447.08	25.2	422.5-419.5	No	No	?	Reitz & Jens
81	HL-1	S-53		6,880	4,500	444.8	449.00	23.7	424.1-421.1	No	No	?	Reitz & Jens
?	36	S-54	Abandoned 10/92	1,067,606	514,468	470.0	N/A	40.4	N/A	No	No	?	?
6/78	35	I-55	Abandoned 10/92	1,067,787	514,475	471.9	N/A	60.0	N/A	Yes	Yes	Wabash Drilling	None
6/78	34	I-56	Abandoned 10/92	1,068,057	514,487	475.1	N/A	61.1	N/A	Yes	Yes	Wabash Drilling	None
6/78	40	I-58	Abandoned 10/92	1,068,874	514,458	477.5	N/A	60.0	N/A	Yes	Yes	Wabash Drilling	None
10/83	N-2	I-59	Abandoned 10/92	1,069,332	514,289	444.9	N/A	43.5	N/A	No	No	?	Reitz & Jens
7/81	S-2	S-60		9,750	4,310	443.1	446.93	21.0	?-422.1	No	No	?	?
7/81	S-1	S-61		70,160	4,580	445.6	450.17	21.5	?-424.1	No	No	?	?
10/83	N-3	I-62		70,960	4,675	444.1	446.08	44.0	410.1-400.1	No	No	?	Reitz & Jens
10/83	N-4	I-65		70,940	5,435	438.5	441.80	36.0	412.5-402.5	No	No	?	Reitz & Jens
10/83	N-5	I-66		70,520	5,935	437.7	441.80	36.9	410.8-400.8	No	No	?	Reitz & Jens
10/83	N-6	I-67		70,090	6,260	436.5	439.08	35.4	411.1-401.1	No	No	?	Reitz & Jens
10/83	N-7	I-68		9,570	6,690	440.9	448.32	31.2	419.7-409.7	No	No	?	Reitz & Jens
6/78	39	I-72		7,890	5,345	462.7	465.4	50.0	415.7-412.7	Yes	Yes	Wabash Drilling	None
6/78	38	I-73		7,680	5,575	458.9	462.6	50.0	415.7-412.7	Yes	Yes	Wabash Drilling	None
?	37	S-75		7,270	4,730	458.8	459.9	26.0	435.8-432.8	No	No	?	?
6/78	37A	S-76	Abandoned 10/92	1,067,406	514,569	474.4	N/A	50.0	N/A	Yes	Yes	Wabash Drilling	None

Continued...

1997

Installation Date	Original Designation	Current Designation	Current Status	Coordinates North	Coordinates East	Ground Surface	Top of Casing	Depth	Screen Interval	Boring Log	Well Construction Info	Drilling Company	Consultant
6/78	41	41	Abandoned 10/92	1,069,287	514,377	?	N/A	?	N/A	Yes	Yes	Wabash Drilling	None
8/84	S-80	S-80		5,190	3,870	448.4	453.38	20.0	438.4-428.4	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/84	D-81	D-81		1,067,338	514,464	447.8	450.91	60.0	402.8-387.8	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/84	S-82	S-82		1,069,312	514,273	447.7	450.66	25.5	432.2-422.2	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/84	D-83	D-83		70,940	4,660	444.4	447.62	97.0	367.4-347.4	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/84	S-84	S-84		9,685	6,455	452.9	456.92	30.9	432.0-422.0	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/84	D-85	D-85		9,680	6,445	453.1	457.15	82.0	391.1-371.1	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/84	D-87	D-87		9,210	5,400	460.0	463.04	111	369.0-349.0	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/84	S-88	S-88		8,390	5,270	460.0	462.73	40	430.0-420.0	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/84	D-89	D-89		6,970	5,100	454.1	457.10	49	420.1-405.1	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/85	D-90	D-90		6,160	4,300	446.0	450.60	47	409-399	Yes	Yes	Wabash Drilling	Burns & McDonnell
8/85	D-91	D-91	Missing	5,220	3,770	448.0	453.37	45	413-403	Yes	Yes	Wabash Drilling	Burns & McDonnell
4/85	D-92	D-92	Missing	9,760	5,090	475.5	475.37	143	352.5-332.5	Yes	Yes	Wabash Drilling	Burns & McDonnell
4/85	D-93	D-93		1,069,318	514,270	448.0	449.95	112	356-336	Yes	Yes	Wabash Drilling	Burns & McDonnell
4/85	D-94	D-94		70,645	5,820	438.5	442.68	106	352.5-332.5	Yes	Yes	Wabash Drilling	Burns & McDonnell
4/85	D-95	D-95	Missing	?	?	450.0	453.09	101	369-349	Yes	Yes	Wabash Drilling	Burns & McDonnell
3/85	4/3	1201		1,067,303	516,903	480.6	482.84	250	427.6-230.6	Yes	Yes	Drilling Service Co.	Burns & McDonnell
3/85	14/3	1202	Abandoned 3/91	1,067,343	516,875	480.5	N/A	250	N/A	Yes	Yes	Drilling Service Co.	Burns & McDonnell
7/85	17/4	1203	Abandoned 3/91	1,067,189	516,955	481.1	N/A	250	N/A	Yes	Yes	Drilling Service Co.	Burns & McDonnell
4/91	1204	1204		1,066,421	515,823	483.3	485.63	223.5	269.8-259.8	Yes	Yes	Mathes & Associates	Foth & Van Dyke
4/91	1205	1205		1,067,387	515,621	384.5	386.77	123	271.5-261.5	Yes	Yes	Mathes & Associates	Foth & Van Dyke
3/91	1206	1206		1,067,396	515,624	386.2	388.48	73	323.2-313.2	Yes	Yes	Mathes & Associates	Foth & Van Dyke

Continued...

1992

Installation Date	Original Designation	Current Designation	Current Status	Coordinates		Ground Surface	Top of Casing	Depth	Screen Interval	Boring Log	Well Construction Info	Drilling Company	Consultant
				North	East								
8/90	MW-F1S	MW-F1S		8,595	5,890	?	?	32.5	10	Yes	Yes	Brotcke Engineering	Foth & Van Dyke
8/90	MW-F1D	MW-F1D		8,600	5,805	?	?	79.1	5	Yes	Yes	Brotcke Engineering	Foth & Van Dyke
8/90	MW-F2	MW-F2		1,067,685	514,417	447.9	450.10	25.3	437.6-422.6	Yes	Yes	Brotcke Engineering	Foth & Van Dyke
8/90	MW-F3	MW-F3		70,380	5,880	?	?	42.8	10	Yes	Yes	Brotcke Engineering	Foth & Van Dyke

? denotes unknown
N/A denotes not applicable

RECEIVED
APR 3 1997

LEACHATE COLLECTION SUMPS

Aquaterra Drilling Log

HOLE NO. LCS-1A | SHEET 1 OF 4 SHEETS

PROJECT NAME: LCS-1A	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER:	NAME OF DRILLER(S): Craig
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: T685W Rotodrill
HOLE LOCATION: near LCS-1	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 14-inch augers; 12¼-inch drill bit
SURFACE ELEVATION:	
OVERBURDEN THICKNESS: –	DRILLING START DATE: 9/10/04 / DRILLING END DATE: 9/16/04
DEPTH DRILLED INTO ROCK: –	DEPTH GROUNDWATER ENCOUNTERED: Leachate approx. 160-feet
TOTAL DEPTH OF HOLE: 272.5 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: –

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
–	–	–	–

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
–	–	–	–	–	–	–

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
	–	–	–	Nathan Hagg

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Soil Cover				900	9/10/04
	Trash					
10					1100	
	Trash					
						End of drilling on 9/10/04 @ depth of 20-ft
20					1300	Resume drilling on 9/13/04
	Trash				1100	
30						
40						
	Trash					
50					1315	
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Bridgeton Landfill, LLC

HOLE NO.: LCS-1A

Aquaterra Drilling Log

HOLE NO. LCS-1A | SHEET 2 OF 4 SHEETS

PROJECT NAME: LCS-1A

INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	Trash					9/13/04
					1530	
70						
80	Trash				1630	Stopped drilling at approximate depth of 85 ft
					9/14	Resume drilling on 9/14/04
90	Trash					
100						
110						
	Trash				1200	
120						
130						
140	Trash				1330	
150						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Bridgeton Landfill, LLC

HOLE NO.: LCS-1A

Aquaterra Drilling Log

HOLE NO. LCS-1A | SHEET 4 OF 4 SHEETS

PROJECT NAME: LCS-1A

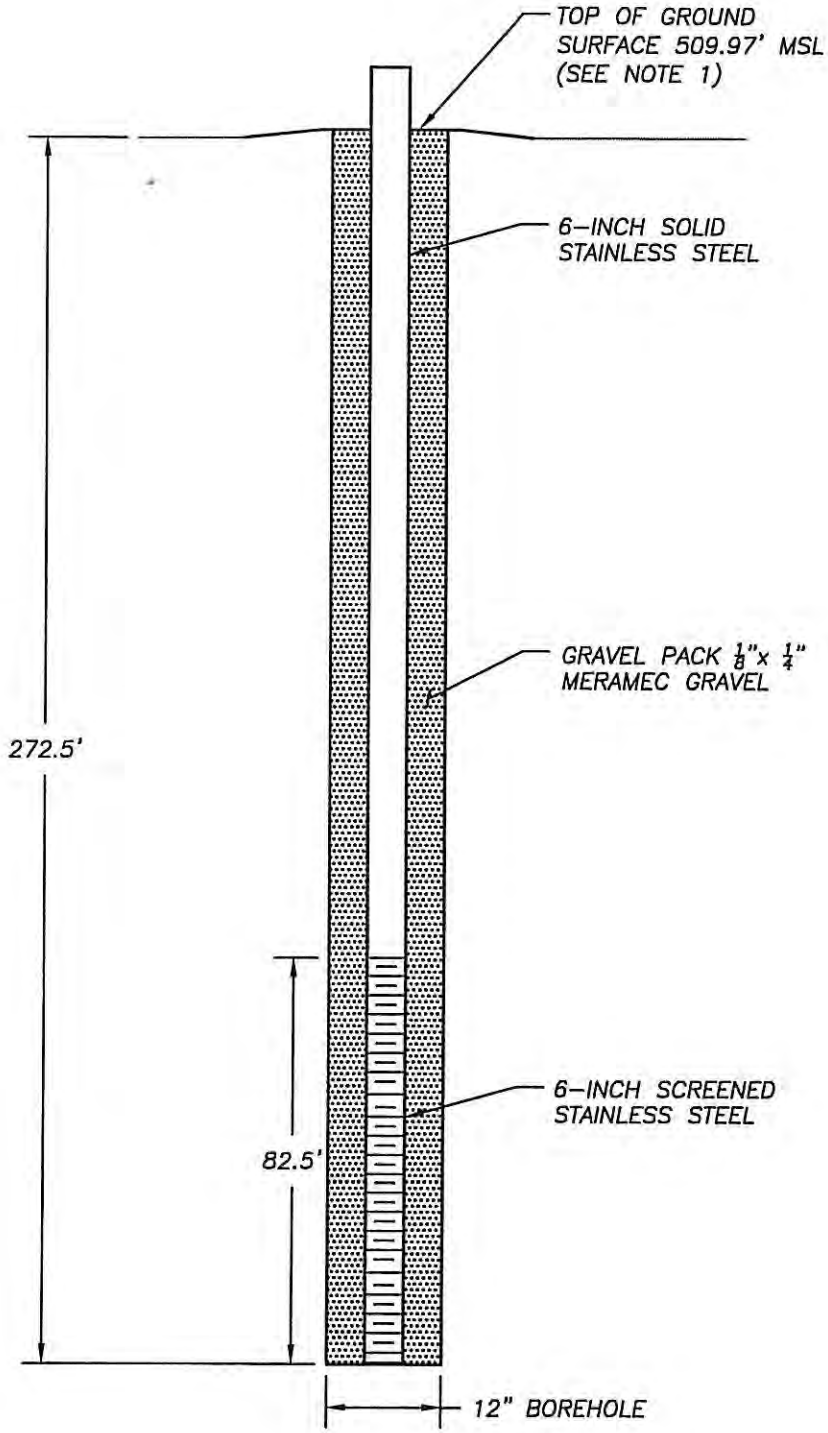
INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
250	Trash					
260						
270	Trash — — —	—	—	—	1300 1200	Drilling stopped on 9/15/04 at depth of 270 ft Resume drilling on 9/16/04
	End of boring at 272.5 ft				1300	Drilling stopped at a final depth of 272.5 ft Shale chips were found in the cuttings
280						
290						
300						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. LCS-1A



NOTES:

1. SURVEY DATA BASED ON SEPTEMBER 30, 2004 TOPOGRAPHICAL SURVEY DATA BY SHERBUT–CARSON & ASSOCIATES, P.C.
2. THE WELL PIPE IS SCREENED FROM THE BOTTOM TO ELEVATION 319.97.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

DETAIL
LEACHATE COLLECTION SUMP 1A
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By NLH	Designed By NLH	Project No. 1429.10
NOT TO SCALE	Date 11/15/04	File Name LCS–1A DETAIL.dwg	Figure No. 1

Aquaterra Drilling Log

HOLE NO. 1B | SHEET 1 OF SHEETS

PROJECT NAME: LCS 1B CQA	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1566.10	NAME OF DRILLER(S): Craig
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL:
HOLE LOCATION: 100' NE LCS 1A	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 20" Auger - 20 Feet; Air Rotary 20" to completion 279'
SURFACE ELEVATION:	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 3/25/05 — DRILLING END DATE: 3/31/05
DEPTH DRILLED INTO ROCK: —	DEPTH ~~GROUNDWATER~~ ENCOUNTERED: Leachate 107 ft
TOTAL DEPTH OF HOLE: 279 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
2'	Soil 2				3/24/05 900	Soil 1 to 1.5 feet
					3/25/05 1200	1st [illegible]
	Waste 31'					
	waste 50'				3/25 1520	
	82' waste				3/28 1145	
	107' waste ▽				3/29 1330	No Leachate encountered on Initial drilling - Hole Backfilled overnight to a Depth of 107' m

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS 1B CQA

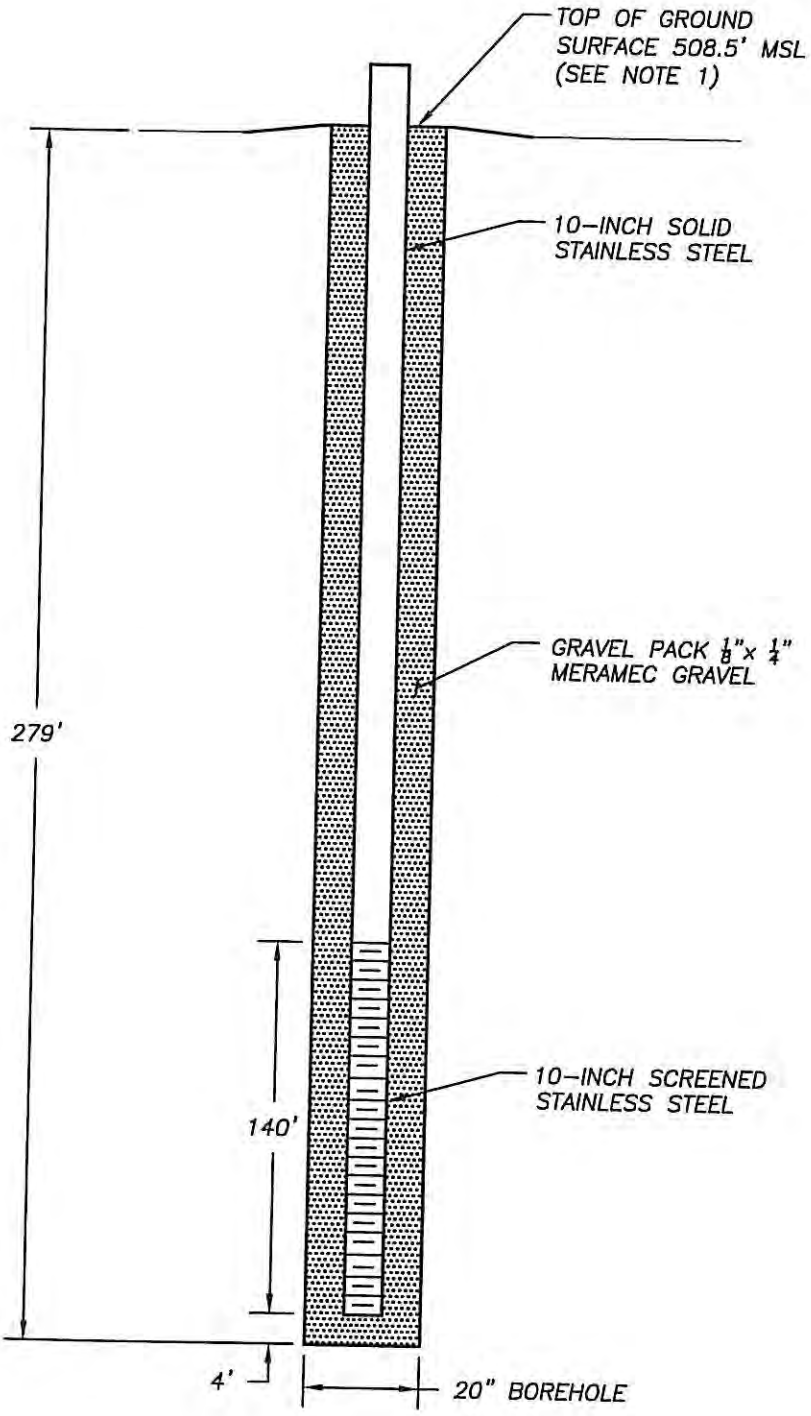
HOLE NO.: LCS 1B

Aquaterra Drilling Log

PROJECT NAME: LCS 1B CQA | INSPECTOR: Jerry Sordin | HOLE NO.: LCS 1B | SHEET OF SHEETS:

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	132' waste				1700 3/28	Final Depth for the day.
	157' waste				3/29 1010	
	182' waste				3/29 1220	
	207' waste				3/29 1430	
	232' waste				3/30 920	
	257' waste (Hard)				3/31 1155	Drilled Last 25 feet very slow Drilling through a Solid substance and only progressed a few inches an hour.
	279' Shale chips				3/31	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC. | PROJECT NAME: LCS 1B CQA | HOLE NO.: LCS 1B



NOTES:

1. SURVEY DATA BASED ON APRIL 19, 2005 TOPOGRAPHICAL SURVEY DATA BY SHERBUT–CARSON & ASSOCIATES, P.C.

2. THE WELL PIPE IS SCREENED FROM THE BOTTOM TO ELEVATION 373.5.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

DETAIL
LEACHATE COLLECTION SUMP 1B
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By AJF	Designed By NLH	Project No. 1566.10
NOT TO SCALE	Date 4/20/05	File Name LCS–1B DETAIL.dwg	Figure No. 1

Aquaterra Drilling Log

HOLE NO. LCS-1C | SHEET 1 OF 4 SHEETS

PROJECT NAME: LCS-1C DRILLING CQA	DRILLING SUBCONTRACTOR: LAYNE
PROJECT NUMBER: 2016.10	NAME OF DRILLER(S): RUSTY BOWLES
LOCATION: BRIDGETON, MISSOURI	MANUFACTURER'S DESIGNATION OF DRILL: SCHRAM T685W ROTADRILL
HOLE LOCATION: 25' NORTH OF LCS-1B	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 18¾" DRILL BIT W/STABILIZER; DRILLER/HELPER - CHARLES HALBERT; 1 RIG TENDER TRUCK - MODEL RTB-2100; 1 JOHN DEERE 3100 BACKHOE
SURFACE ELEVATION: 508 ±	
OVERBURDEN THICKNESS: 4'	DRILLING START DATE: 10-18-06 / DRILLING END DATE: 11/1/06
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: 175'
TOTAL DEPTH OF HOLE: 274'	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
SOLID	GRAVEL	—	LEACHATE	TERRY L. MUELLER MORGAN HUFF

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	0+00				1300	
	CL					
	0+04				1305 10-18-06	
10	WASTE					
	0+18				1500 10-18-06 1100 10-19-06	
20	WASTE		GRAVEL / 10" SOLID CASING (STAINLESS) / GRAVEL			
40	0+45				1530 10-19-06 0700 10-20-06	
50	WASTE					
60						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-1C DRILLING CQA | HOLE NO.: LCS-1C

Aquaterra Drilling Log

HOLE NO. LCS-1C | SHEET 2 OF SHEETS 4

PROJECT NAME: LCS-1C Drilling CQA

INSPECTOR: Terry L. Mueller

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60						
70	WASTE					
	0+75				1200 10-20-06 0700 10-23-06	
80						
90						
100	WASTE					
110				GRAVEL / 10" SOLID CASING (STAINLESS) / GRAVEL		
120						
	1+25				1530 10-23-06 0700 10-24-06	
130						
140	WASTE					
150						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-1C Drilling CQA

HOLE NO.: LCS-1C

Aquaterra Drilling Log

HOLE NO. LCS-1C | SHEET 3 OF SHEETS 4

PROJECT NAME: LCS-1C DRILLING CQA

INSPECTOR: TERRY L. MUELLER

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
150			10" SOLID CASING	1764		
160						
170	WASTE					
	WATER ▽					
180						
190						
200	2400		GRAVEL		1530 0700 10-24-06 10-25-06	
210			10" SLOTTED CASING (STAINLESS)			
220	WASTE					
230	2431		GRAVEL		1530 0700 10-25-06 10/30/06	
	ROCK BOULDER					
240						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-1C DRILLING CQA

HOLE NO. LCS-1C

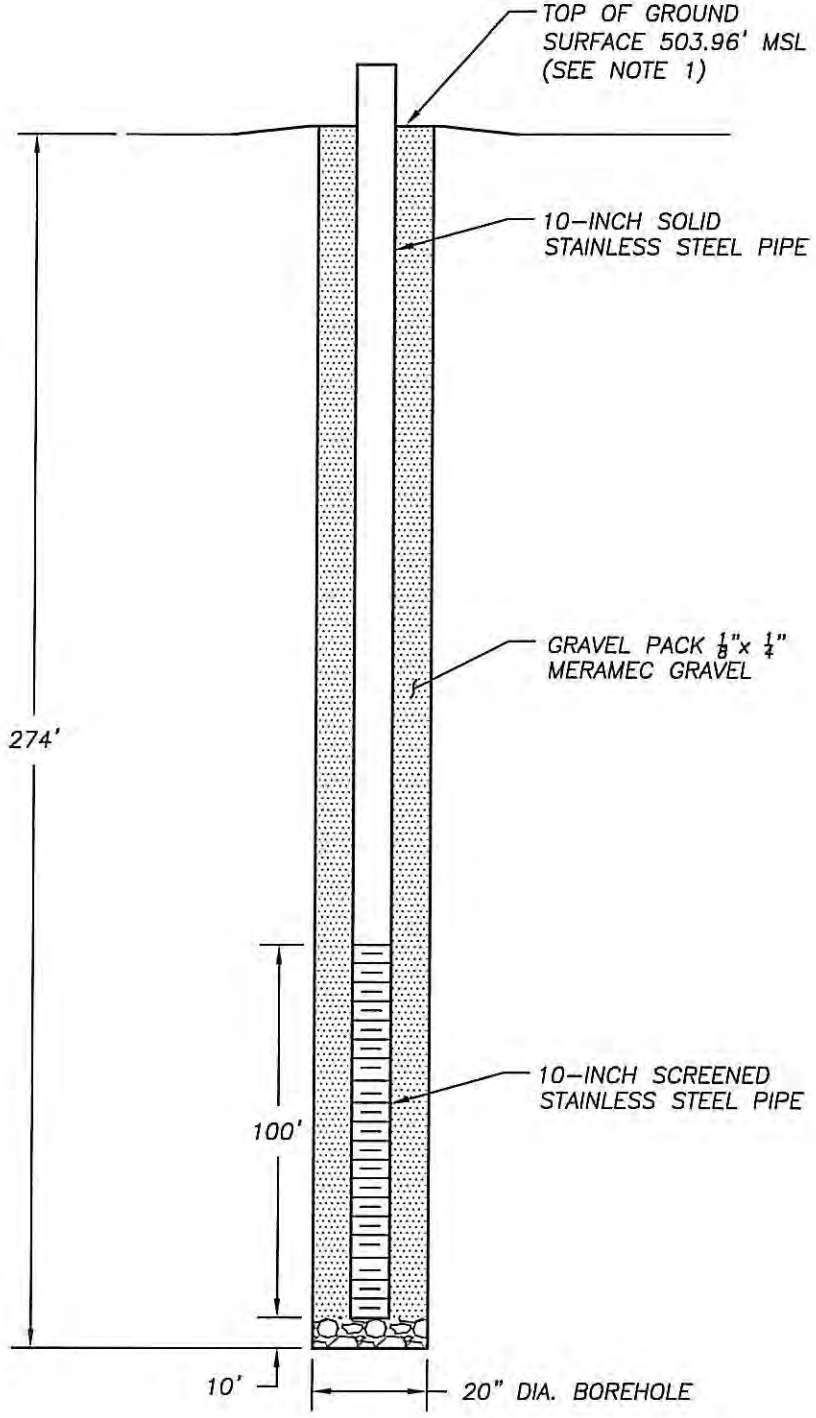
Aquaterra Drilling Log

HOLE NO. LCS-1C | SHEET 4 OF SHEETS 4

PROJECT NAME: LCS-1C DRILLING CQA

INSPECTOR: JERRY L. MUELLER

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
24	ROCK BOULDERS				930 10-30-06	SLOW DRILLING
	2+45				1530 10-30-06 0700 10-31-06	
25	ROCK DEBRIS		GRAVEL; 10" SLOTTED CASING (STAINLESS); GRAVEL			
				2+64		
26	2+68		ROCK DEBRIS		1530 10-31-06 0730 11-1-06	No Asbestos Containing Material Observed.
	ROCK DEBRIS 2+74				1100 11-1-06	
27						
28						
29						
30						



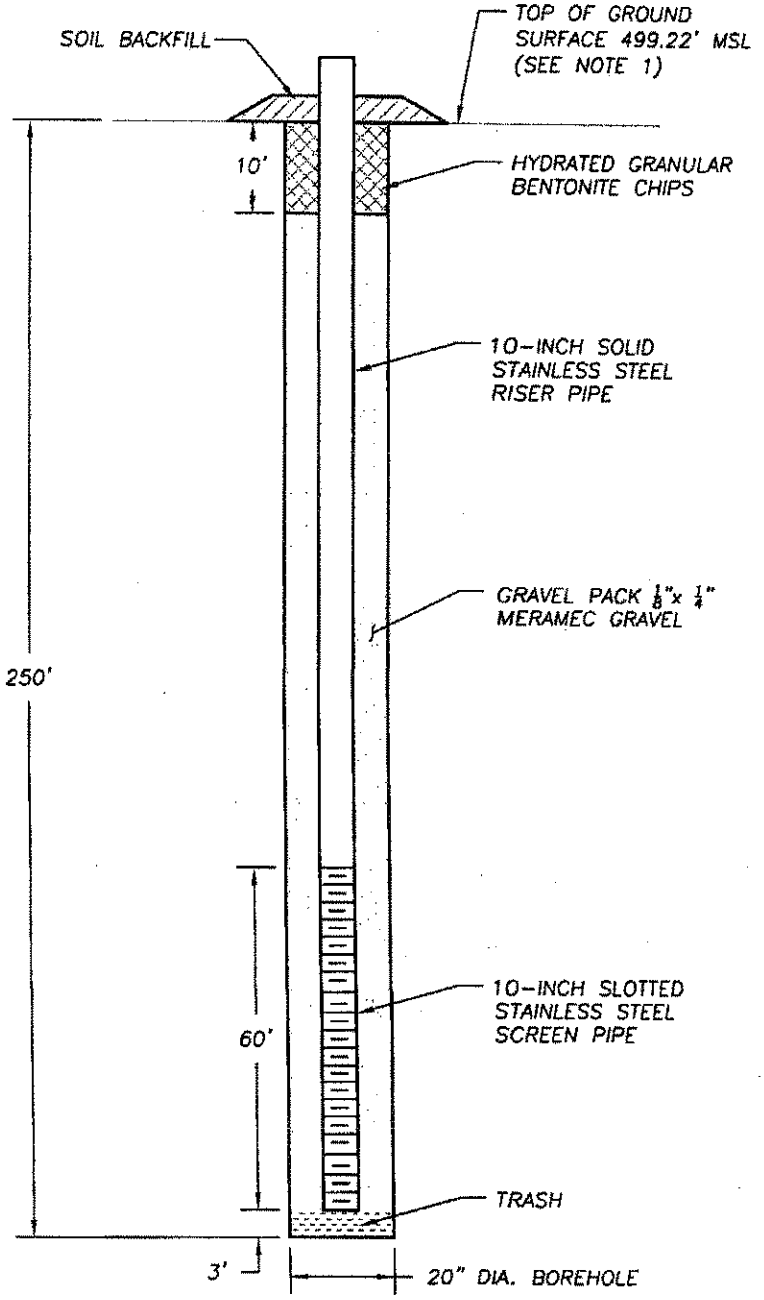
NOTES:

1. SURVEY DATA BASED ON OCTOBER 25, 2006 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON & ASSOCIATES, P.C.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LEACHATE COLLECTION SUMP 1C
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By NLH	Designed By NLH	Project No. 2016.10
NOT TO SCALE	Date 1/8/07	File Name LCS-1C DETAIL.dwg	Figure No. 1



NOTES:

1. SURVEY DATA BASED ON 9/30/09 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON & ASSOCIATES, P.C.
2. THE WELL PIPE IS SCREENED FROM THE BOTTOM TO ELEVATION 246.22' MSL.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
13 Executive Drive, Suite 1
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LEACHATE COLLECTION SUMP 1D INSTALLATION CQA
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. TKJ	Drawn By RLH	Designed By RHH	Project No. 3582.10
NOT TO SCALE	Date 10/07/09	File Name 3582.10 LCS-1D Detail.dwg	Figure No. 1

R:\Allied Waste\Bridgeton\3582.10 - LCS 1D Extraction Well Replacement CQA\3582.10 LCS-1D Detail.dwg October 8, 2009 8:36:17 am (rma)

Aquaterra Drilling Log

HOLE NO. LCS-2 | SHEET 1 OF 4 SHEETS

PROJECT NAME: Bridgeton Landfill LLC Leachate Wells CQA	DRILLING SUBCONTRACTOR: Layne - Western
PROJECT NUMBER: 02031010	NAME OF DRILLER(S): ~~Harold~~ Harold Waddell
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: INGERSOEL-RAND
HOLE LOCATION: LCS-2	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Air Rotary Drill Rig; 6 inch
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 10/1/03 — DRILLING END DATE: 10-3-03
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 301 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	[signature]

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	18" of cover soil				1300	9 inch drill bit used
	Trash					
0	Trash	CH_4 = 0.0 % O_2 = 20.9 %			1350	
	Trash				1430	
10						
		CH_4: 0.0% O_2: 20.4 %				
20	Trash				1545	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Bridgeton Landfill LLC Leachate Wells CQA

HOLE NO.: LCS-2

Aquaterra Drilling Log

HOLE NO. LCS-2 | SHEET 2 OF SHEETS 4

PROJECT NAME: Bridgeton Landfill LLC - Leachate Wells CQA

INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	Trash				1545	9-inch drill bit
70						
		$CH_4 = 0.0\%$			1640	
80	Trash	$O_2 = 20.5\%$				
90						
	Trash				1745	Layne Western is finished drilling for the day at 100 ft
100						
	Trash	$CH_4 = 0.0\%$			730	Resume drilling on 10/2/03 with a 7 7/8-inch drill bit
		$O_2 = 20.5$				
110						
120	Trash	$CH_4 = 0.0\%$			900	
		$O_2 = 20.7\%$				
130						
140						
		$CH_4 = 0.0\%$				
150	Trash	$O_2 = 20.4\%$			1130	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. LCS-2

Aquaterra Drilling Log

HOLE NO. LCS - 2 | SHEET 3 OF SHEETS 4

PROJECT NAME: Bridgeton Landfill LLC - Leachate Wells CQA

INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
150					1130	
160	Trash				1200	
170						
180	Trash				1245	
		CH_4 : 0.0%				
		O_2 : 20.6%				
190						
200						
210						
220	Trash	CH_4 = 0.0%			1415	
		O_2 = 20.5%				
230						
240	Trash				1500	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. LCS-2

Aquaterra Drilling Log

HOLE NO. LCS - 2 | SHEET 4 OF SHEETS 4

ECT NAME: depton Land fill LLC - Leachate Wells CQA

INSPECTOR: Nathan Higgerson

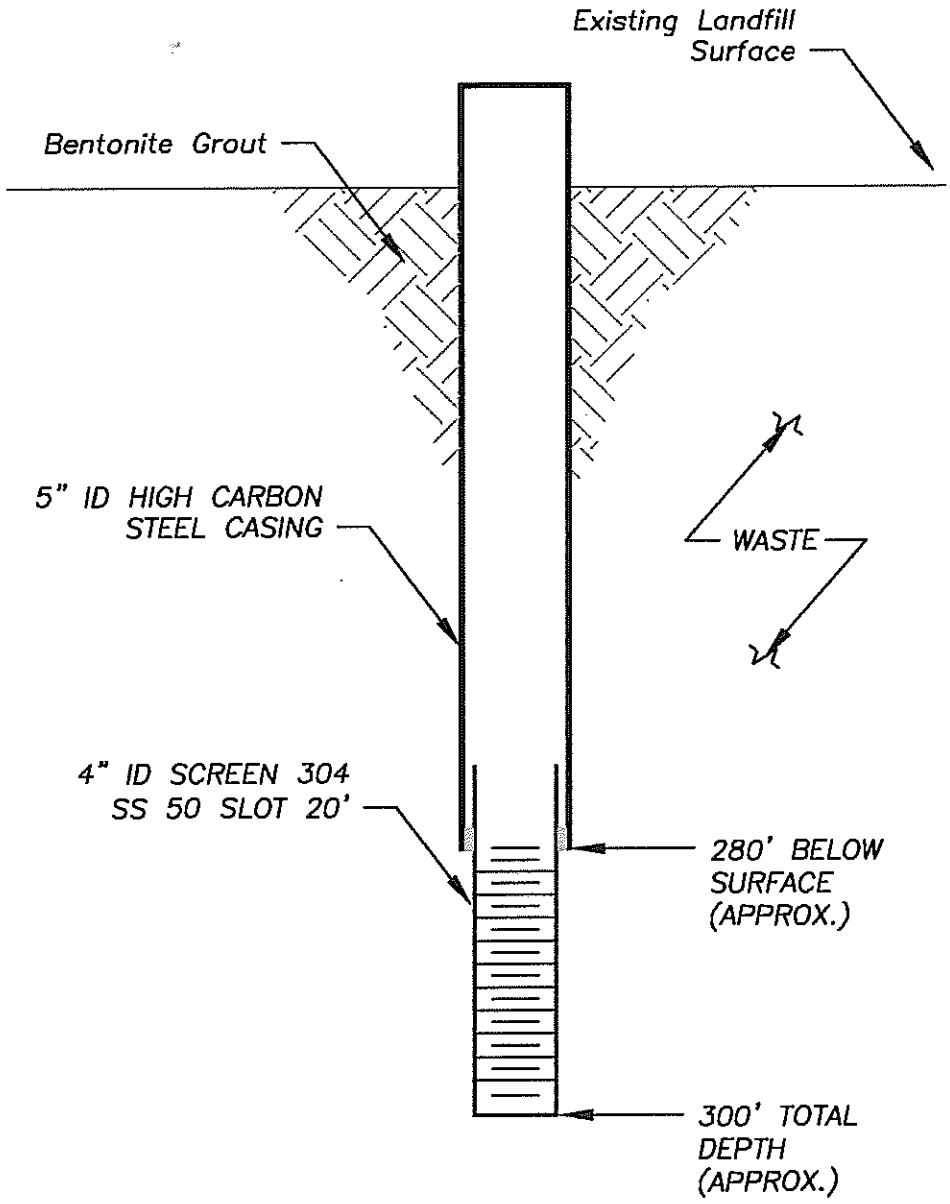
H	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	Trash	CH_4=0.0% O_2=20.5%			1500	End of drilling on 8/4/03 at approximate depth of 240 ft
					730	Resume drilling on 10/3/03 6½ Bit Size
		CH_4=0.0% O_2=20.6%			844	
	TRASH	CH_4=0.0% O_2=20.2%			949	
	TRASH				10:15	
	TRASH	CH_4=0.0%			10:40	
	End of boring at 301 ft	O_2=20.5%				No asbestos containing materials encountered

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. LCS - 2

Appendix C



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
1400 South Lincoln Ave.
O'Fallon, Illinois 62269

DETAIL 1 – LEACHATE WELL DETAIL
LCS 2 AND 3
BRIDGETON LANDFILL LLC
BRIDGETON MISSOURI

Project Mgr. MSB	Drawn By JHS	Designed By	Project No. 02031010
Scale No Scale	Date 10/9/03	File Name 02031010_WELL DETAIL.dwg	Drawing No. 1

Aquaterra Drilling Log

HOLE NO. LCS-2B | SHEET 1 OF 2 SHEETS

PROJECT NAME: LCS-2B & 3B CQA of Installation	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 1470-10	NAME OF DRILLER(S): Tim Elders
LOCATION: Bridgeton Landfill, LLC	MANUFACTURER'S DESIGNATION OF DRILL: Renegade
HOLE LOCATION: LCS-2B	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 14 3/4-inch borehole
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 12/1/04 — DRILLING END DATE: 12/14/04
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE: 305 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Hyer

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	2-foot of soil				900	
	Trash					End of drilling on 12/1/04
20						at approx. depth of 20 ft
						Resume drilling on 12/2/04
					1300	
	Trash				1400	
40						
					1630	End of drilling on 12/2/04
						at approx. depth of 45 ft
						Resume drilling on 12/3/04
	Trash				1130	
60						
					1500	
					1600	End of drilling on 12/3/04
						at approx. depth of 80 ft
					830	Resume drilling on 12/6/04
	Trash					
100						
					1430	
					1630	End of drilling on 12/6/04
120						at approx. depth of 120 ft

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-2B & 3B CQA

HOLE NO.: LCS-2B

Aquaterra Drilling Log

HOLE NO. LCS-2B | SHEET 2 OF SHEETS 2

PROJECT NAME: LCS - 2B & 3B CQA

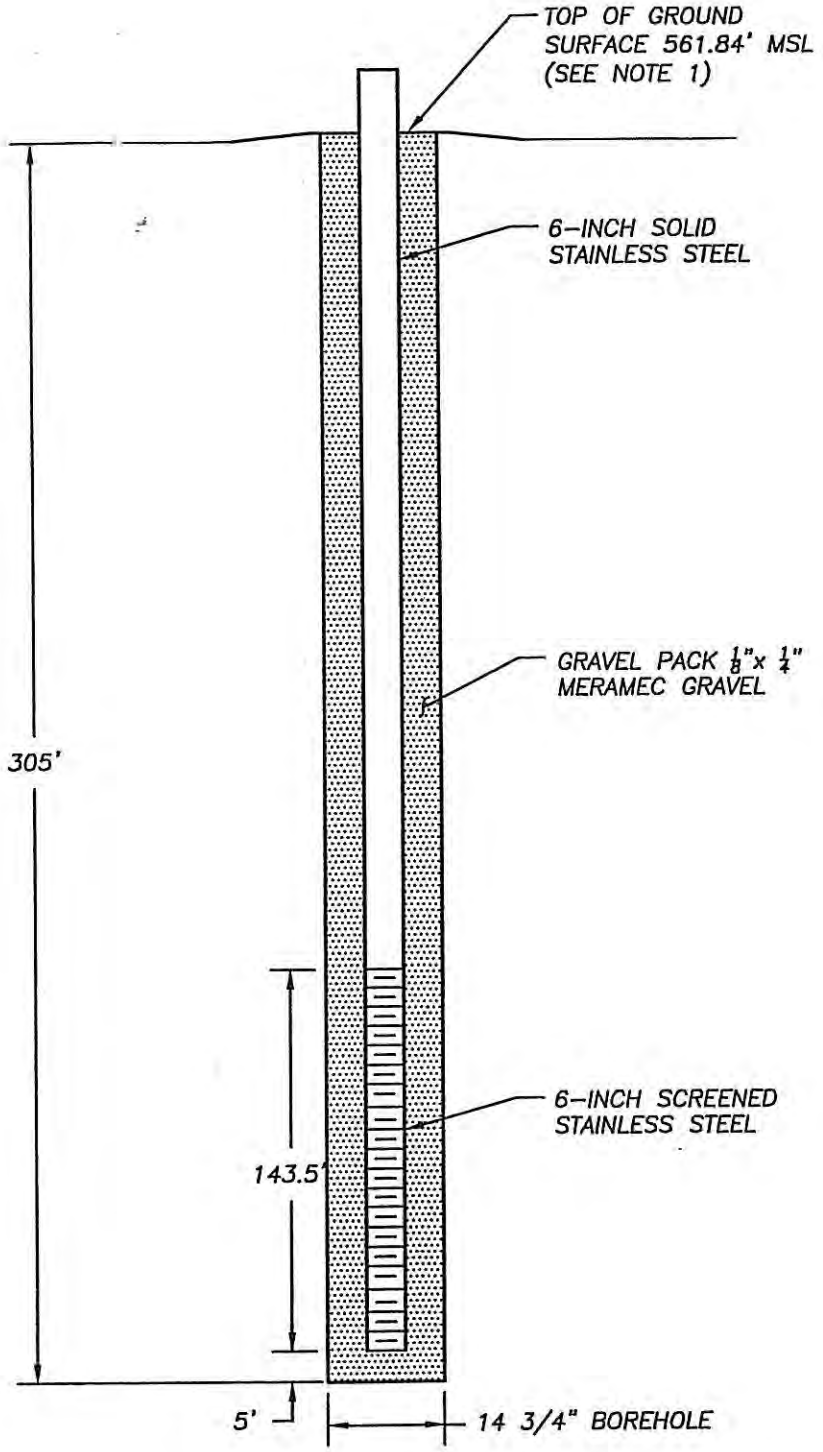
INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
120					830	Resume drilling on 12/7/04
	Trash					
132						
					1200	
140						
					1600	End of drilling on 12/7/04 at an approx. depth of 158 ft
160					800	Resume drilling on 12/8/04
	Trash					
180						
					1600	End of drilling on 12/8/04 at an approx. depth of 185 ft
					800	Resume drilling on 12/9/04
200	Trash					
220						
					1600	End of drilling on 12/9/04 @ approx 230'
					800	Resume drilling on 12/10/04
240	Trash					
260						
280						
					1600	End 12/10/04 @ 285'
						Resume drilling on 12/14/04
300	End of borehole at an approx. depth of 305 feet	shale chips				End of drilling on 12/14/04

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS - 2B & 3B CQA

HOLE NO.: LCS - 2B



NOTES:

1. SURVEY DATA BASED ON JANUARY 17, 2005 TOPOGRAPHICAL SURVEY DATA BY SHERBUT–CARSON & ASSOCIATES, P.C.
2. THE WELL PIPE IS SCREENED FROM THE BOTTOM TO ELEVATION 405.34.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

DETAIL
LEACHATE COLLECTION SUMP 2B
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By NLH	Designed By NLH	Project No. 1470.10
NOT TO SCALE	Date 1/27/05	File Name LCS–2BDETAIL.dwg	Figure No. 1

Aquaterra Drilling Log

HOLE NO. LCS-2C | SHEET 1 OF 2 SHEETS

PROJECT NAME: Leachate Collection Sump CQA	DRILLING SUBCONTRACTOR: Layne - Western
PROJECT NUMBER: 1653.10	NAME OF DRILLER(S): Craig Scooby
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: T685W Rotadrill
HOLE LOCATION: LCS-2C	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 24 inch auger; 20 inch rotary; 20 inch
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 11/7/05 — DRILLING END DATE: 11/18/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: →
TOTAL DEPTH OF HOLE: 260ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Hogg

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	Bottom (NLH)					Drilling begins 11/7/05
	Trash					
40						Drilling stopped on 11/7/05
					800	Drilling resumes on 11/8/05
50	Trash					
60						
70						
80						
90					1530	Drilling stopped 11/8/05
					800	Drilling resumes 11/9/05
100	Trash					
110						

Aquaterra Drilling Log

HOLE NO. LCS-2C | SHEET OF SHEETS 2

PROJECT NAME: LCS Drilling CQA

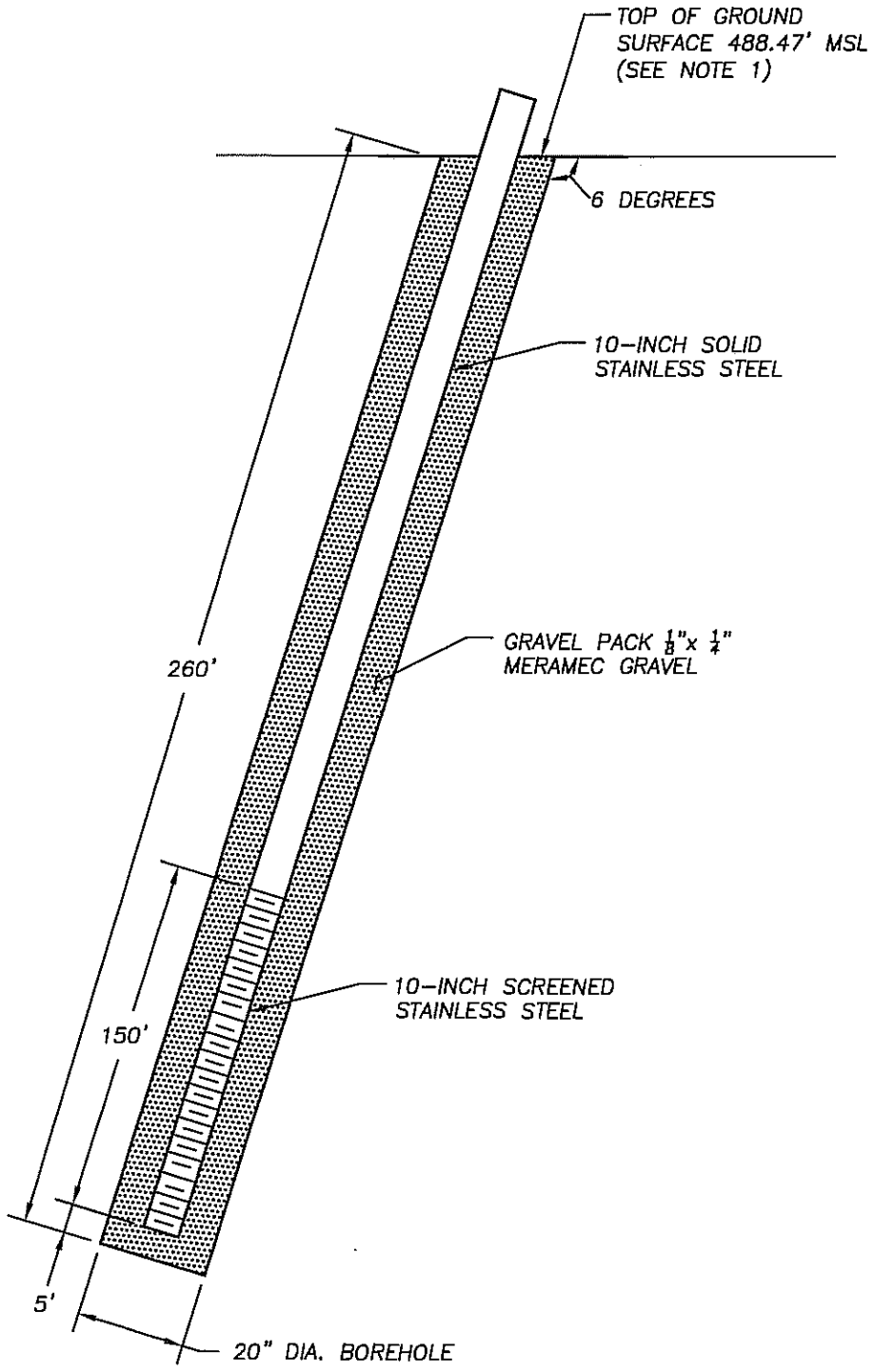
INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
120					1530	Drilling stopped 11/9/05
130	Trash / Rock Debris				1400	Drilling resumes 11/10/05
					1570	Drilling stopped 11/10/05
140	Trash				1200	Drilling resumes 11/16/05
150						
160					1600	Drilling stopped 11/16/05
	Trash				800	Drilling resumes 11/17/05
170						
180						
190						
200					1200	Drilling stopped 11/17/05
210	Trash				800	Drilling resumes 11/18/05
220						
230						
240						
250						
260	gravel/bedrock				1400	Drilling stopped 11/18/05
	End of boring at 260 ft					at approximate depth of 260 ft. No asbestos containing materials observed.
270						
280						
290						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS Drilling CQA

HOLE NO.: LCS-2C



NOTES:

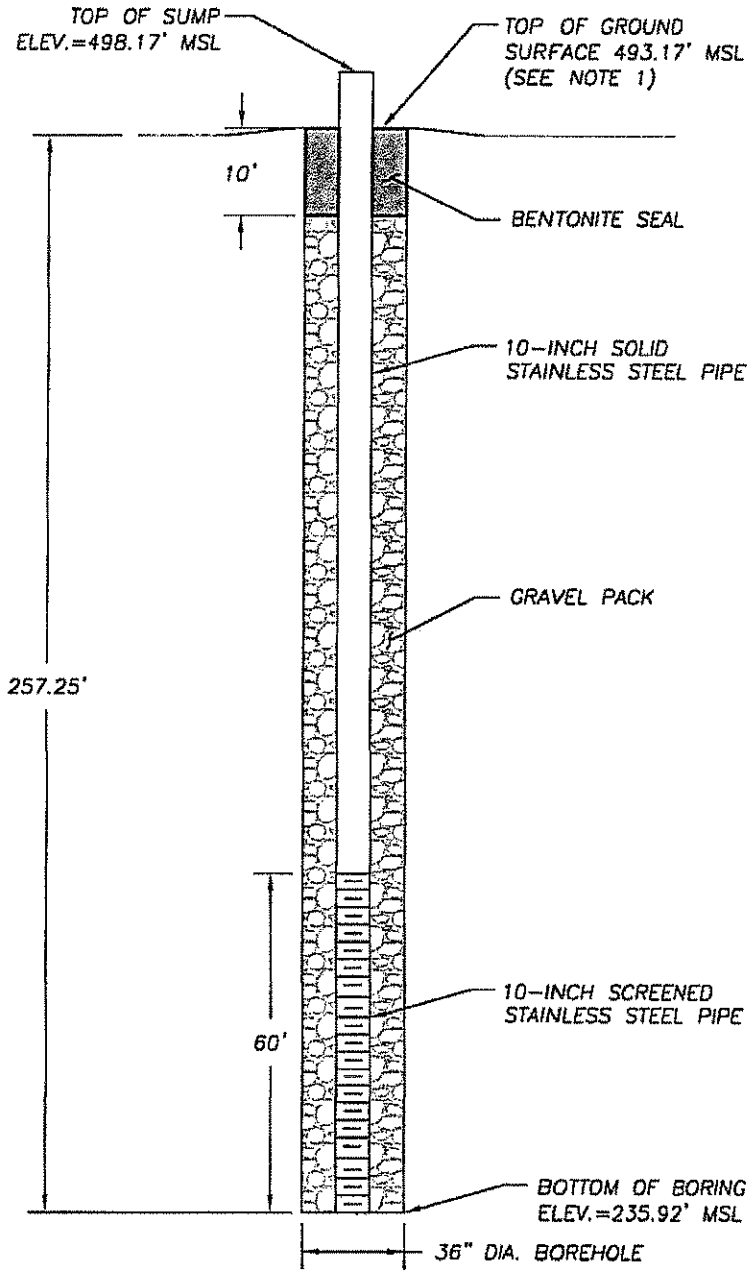
1. SURVEY DATA BASED ON NOVEMBER 24, 2005 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON & ASSOCIATES, P.C.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LEACHATE COLLECTION SUMP 2C
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By WS	Designed By NLH	Project No. 1653.10
NOT TO SCALE	Date 11/21/05	File Name LCS-2C DETAIL.dwg	Figure No. 1

K:\Allied Waste\Bridgeton\1653.10 - LCS-2C & LCS-3C CQA\LCS-2C DETAIL.dwg December 2, 2005 3:58:43 pm (Nat)



NOTES:

1. SURVEY DATA BASED ON BASED ON A SITE SURVEY PERFORMED ON DECEMBER 22, 2008 BY SHERBUT-CARSON & ASSOCIATES, P.C.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LCS-2D INSTALLATION CQA REPORT
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. TKJ	Drawn By RLH	Designed By RLH	Project No. 3131.10
NOT TO SCALE	Date 12/19/08	File Name LCS-1C DETAIL.dwg	Figure No. 1

Aquaterra Drilling Log

HOLE NO. LCS-3 | SHEET 1 OF 4 SHEETS

ST NAME: Bridgeton Landfill LLC - Leachate Wells CQA
ST NUMBER: 02031010
ION: Bridgeton, MO
OCATION: LCS-3
CE ELEVATION: —
URDEN THICKNESS: —
DRILLED INTO ROCK: —
L DEPTH OF HOLE: 300 feet

DRILLING SUBCONTRACTOR: Layne-Western
NAME OF DRILLER(S): Herold Waddell
MANUFACTURER'S DESIGNATION OF DRILL: Ingersoel-Rand
SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Air Rotary Drill Rig; 6 inch
DRILLING START DATE: 10-4-03
DRILLING END DATE: 10/6/03
DEPTH GROUNDWATER ENCOUNTERED: —
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —
TOTAL NUMBER OF CORE BOXES: —

ECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED
—	—	—

LES FOR CHEMICAL ANALYSIS AL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

OSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)
—	—	—	—

SIGNATURE OF INSPECTOR: William T. Rogers

TH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
					1130	
	Trash					
50	Trash				1200	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: Bridgeton Landfill LLC - Leachate Wells CQA

HOLE NO. LCS-3

Appendix E

Aquaterra Drilling Log

HOLE NO. LCS-3 | SHEET 2 OF SHEETS 4

PROJECT NAME: Bridgeton Landfill LLC - Leachate Wells CSDA

INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60						
70	Trash				1215	
80						
90						
100						
110						
120	TRASH				13:40	7⅞ drill Head
130						
140						
150						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. LCS-3

Aquaterra Drilling Log

HOLE NO. LCS-3 | SHEET 3 OF 4 SHEETS

PROJECT NAME: Bridgeton Landfill LLC - Leachate Wells CQIA

INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	TRASH				1600	
	TRASH				1623	Blockage in the WATER system inside the drill pipe — — Finished for the day
72						WORK Resumed on 10/5/03
82	TRASH				1100	
192						
202	TRASH				1215	
210						
220	TRASH				1243	
230						
240	TRASH				1320	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. LCS-3

Aquaterra Drilling Log

HOLE NO. LCS-3 | SHEET 4 OF 4 SHEETS

PROJECT NAME: idgeton Landfill LLC - Leachate Wells CQIA

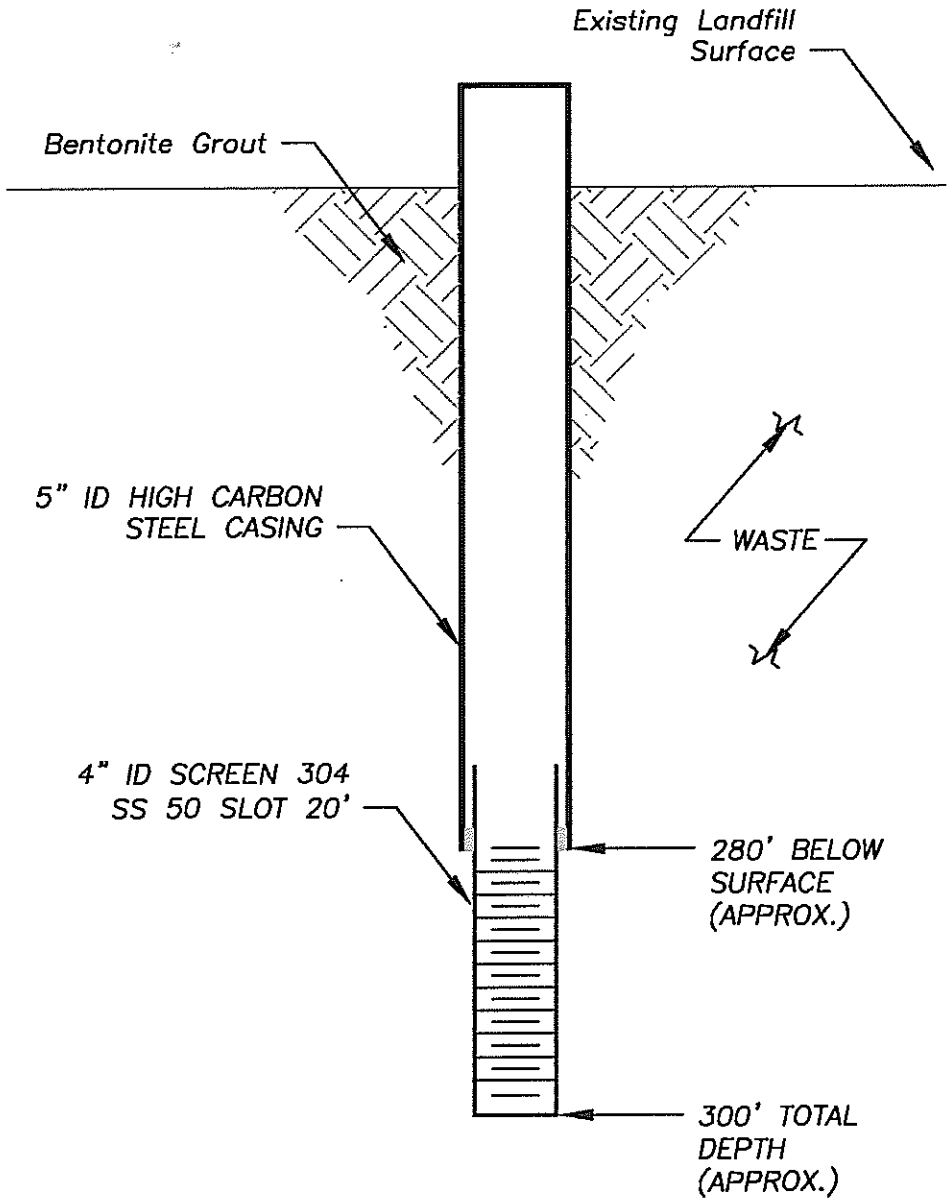
INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	—	—	—	—	1600	done for the day NLH per conversation with the drillers on 10/6/03
	Trash					
70					1600	done for the day
					730	resume drilling on 10/6/03
	Trash					
80						
90						
100	End of boring at 300'				945	No asbestos containing materials encountered
110						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME

HOLE NO. LCS-3



AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
1400 South Lincoln Ave.
O'Fallon, Illinois 62269

DETAIL 1 – LEACHATE WELL DETAIL
LCS 2 AND 3
BRIDGETON LANDFILL LLC
BRIDGETON MISSOURI

Project Mgr. MSB	Drawn By JHS	Designed By	Project No. 02031010
Scale No Scale	Date 10/9/03	File Name 02031010_WELL DETAIL.dwg	Drawing No. 1

Aquaterra Drilling Log

HOLE NO. LCS-3B | SHEET 1 OF 2 SHEETS

PROJECT NAME: LCS-2B & 3B CQA of Installation	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 1470.10	NAME OF DRILLER(S): Tim Elders
LOCATION: Bridgeton Landfill, LLC	MANUFACTURER'S DESIGNATION OF DRILL: Renegade
HOLE LOCATION: LCS-3B	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 14 3/4 ~~to~~ inch borehole
SURFACE ELEVATION: –	
OVERBURDEN THICKNESS: –	DRILLING START DATE: 12/17/04 — DRILLING END DATE: 12/30/04
DEPTH DRILLED INTO ROCK: –	DEPTH GROUNDWATER ENCOUNTERED: –
TOTAL DEPTH OF HOLE	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: –

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
–	–	–	–

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
–	–	–	–	–	–	–

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
–	–	–	–	Nathan Hyp

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	1 ft of clay				1200	Drilling begins 12/17/04
	Trash					
		Approx. 4 ft of clay				End of drilling 12/17/04 at approx. depth of 20 ft
20					1200	Resume drilling on 12/21/04
	Trash				1300	
40						End of drilling 12/21/04 at approx. depth of 45 ft
	Trash				0900	Resume drilling 12/27/04
60						
80						End of drilling 12/27/04 at approx. depth of 90 ft
					800	Resume drilling on 12/28/04
	Trash					
100					1130	
120						

Aquaterra Drilling Log

HOLE NO. LCS-3B | SHEET 2 OF SHEETS 2

PROJECT NAME: LCS-2B & 3B CQA of Installation

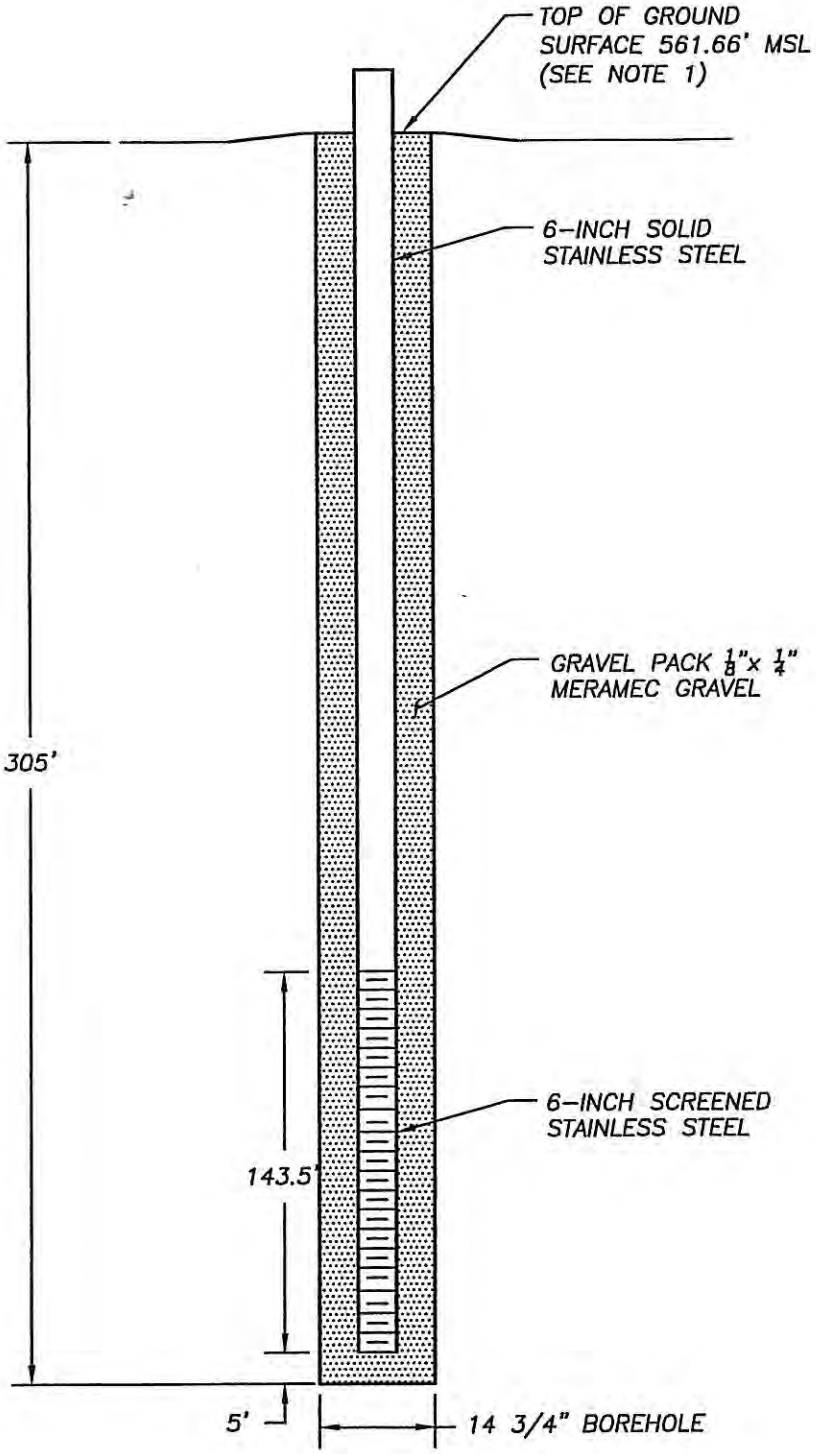
INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
120	Trash				1600	- hit something hard drilling slowed
130						
140	Trash				2330	- Drilling far around the clock to complete LCS-3B
					- - -	12/29/04 - NLH
					0300	
150	Trash				0600	
160	trash				1230	
					1630	
170	TRASH					
180						
					- - - - - - - -	12/29/04 NLH
					1900	
190						
					2000	
200	End of boring at an approx. depth of 305 feet				- - - - - - - -	12/30/04 NLH
					0300	End of drilling at 305 ft

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-2B & 3B CQA of Installation

HOLE NO.: LCS-3B



NOTES:

1. SURVEY DATA BASED ON JANUARY 17, 2005 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON & ASSOCIATES, P.C.

2. THE WELL PIPE IS SCREENED FROM THE BOTTOM TO ELEVATION 405.16.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive, Suite 204
Fairview Heights, Illinois 62208

DETAIL
LEACHATE COLLECTION SUMP 3B
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By NLH	Designed By NLH	Project No. 1470.10
NOT TO SCALE	Date 1/27/05	File Name: LCS-3BDETAIL.dwg	Figure No. 1

Aquaterra Drilling Log

HOLE NO. LCS-3C | SHEET 1 OF 2 SHEETS

PROJECT NAME: LCS Drilling CQA	DRILLING SUBCONTRACTOR: Layne-Western
PROJECT NUMBER: 1653.10	NAME OF DRILLER(S): Craig Scooby
LOCATION: Bridgeton Landfill	MANUFACTURER'S DESIGNATION OF DRILL: T685W Rotadrill
HOLE LOCATION: LCS-3C	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 24 inch auger; 20 inch rotary; 20 inch
SURFACE ELEVATION: —	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 10/21/05 — DRILLING END DATE: 11/3/05
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 252 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Hegg

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	Trash				800	Drilling begins 10/21/05
					1400	Drilling stopped 10/21/05
					1030	Drilling resumes 10/24/05
20	Trash					
					1430	Drilling stopped 10/24/05
					700	Drilling resumes 10/25/05
50	Trash				800	
60						
90					1100	
100						
110					1700	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS Drilling CQA | HOLE NO.: LCS-3C

Aquaterra Drilling Log

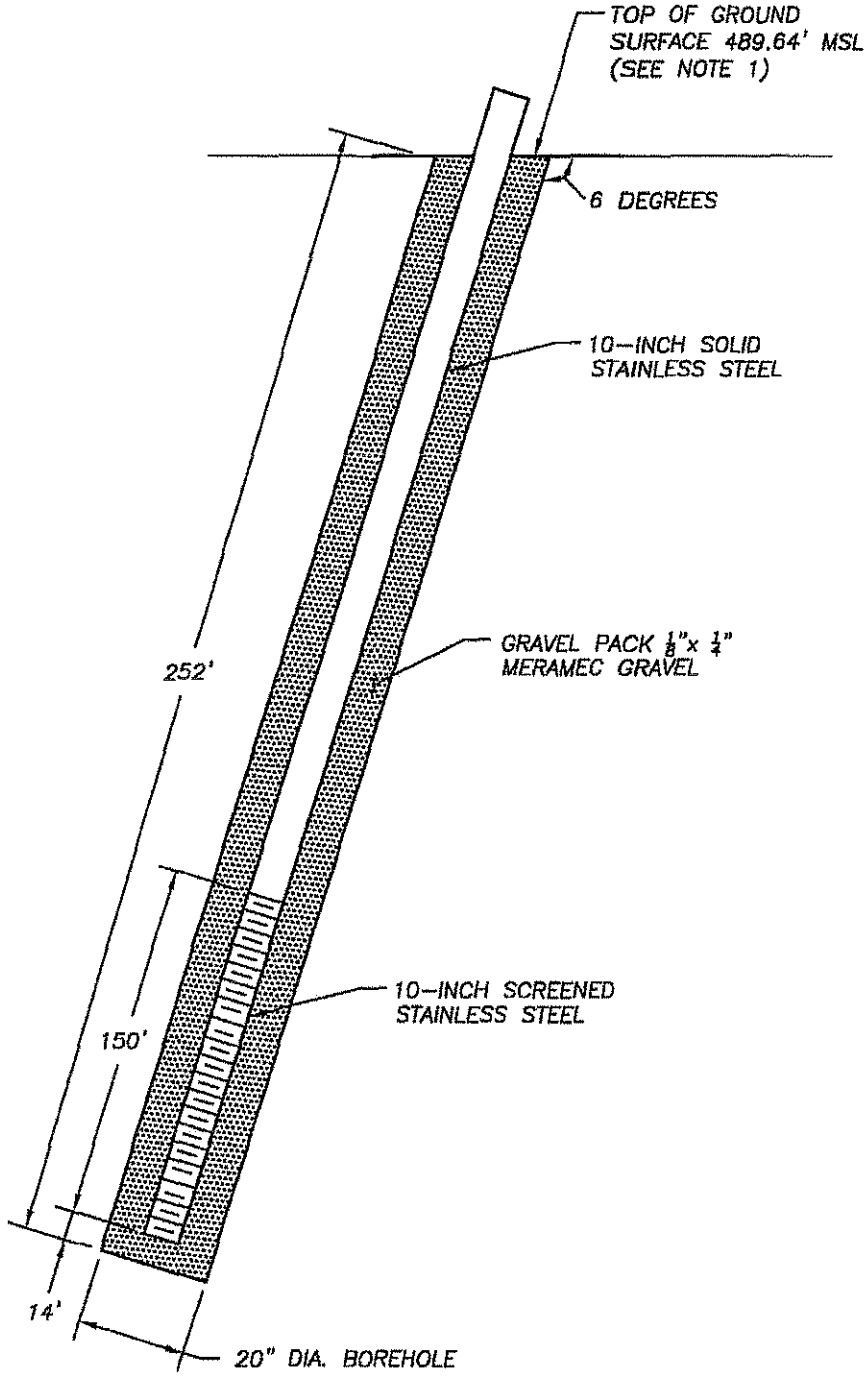
HOLE NO. LCS-3C | SHEET 2 OF 2 SHEETS

PROJECT NAME: LCS Drilling CQA | INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
120						
130	Trash					
140						
150					1730	Drilling stopped 10/25/05
					1010	Drilling resumes 10/26/05
160	Trash					
170					1300	
180						
					1730	Drilling stopped 10/26/05
190					800	Drilling resumes 10/27/05
	Trash / gravel					
200					1400	Drilling stopped 10/27/05
					800	Drilling resumes 10/28/05
200	Trash (plastic)					
200					1400	Drilling stopped 10/28/05
					930	Drilling resumes 10/31/05
30					1070	
	Trash					
10						
12					1500	Drilling stopped 11/1/05
	Rock				830	Drilling resumes 11/2/05
	End of boring at 252 ft				1130	Drilling stopped on 11/2/05 at approximate depth of 252 ft with No asbestos containing materials observed.
220						
230						
240						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS Drilling CQA | HOLE NO.: LCS-3C



NOTES:

1. SURVEY DATA BASED ON NOVEMBER 24, 2005 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON & ASSOCIATES, P.C.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LEACHATE COLLECTION SUMP 3C
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By WS	Designed By NLH	Project No. 1653.10
NOT TO SCALE	Date 11/21/05	File Name LCS-3C DETAIL.dwg	Figure No. 1

Aquaterra Drilling Log

HOLE NO. LCS-4A | SHEET 1 OF 4 SHEETS

PROJECT NAME: LCS-4A Installation	DRILLING SUBCONTRACTOR: Boart Longyear
PROJECT NUMBER: 1292.10	NAME OF DRILLER(S): Mark Biermaier
LOCATION: Bridgeton, MO	MANUFACTURER'S DESIGNATION OF DRILL: Foremost DR24
HOLE LOCATION: West edge of south hill crown	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 20 inches
SURFACE ELEVATION: 547.77	
OVERBURDEN THICKNESS: —	DRILLING START DATE: 3/16/04 — DRILLING END DATE: 3/27/04
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 302 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
—	-	-	—	Nathan Higgason

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Soil Cover (2ft approx.)				1045	Stop for problems with hole shifting (2 hrs)
10	Trash					
					1615	
20	Trash	CH_4 0 ppm H_2S 0 ppm % LEL 0	—	—	1830 1600	Drilling stopped for the day at 21ft Resume drilling 3/17/04
30						
					1900	Drilling stopped for 3/17/04 at depth of 35'
40					1000	Resume drilling 3/24/04
50	Trash					
60					1430	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-4A Installation | HOLE NO.: LCS-4A

Aquaterra Drilling Log — LCS-4

PROJECT NAME: LCS-4 Installation
INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	Trash	CH_4 0.0% H_2S 0.0% %LEL 0.0%			1430	Drilling on 3/24/04 (continued)
					1800	stopped for the day at approximately 60 ft
70					730	Resume drilling on 3/25/04
					1700	stopped for the day at approx 80 ft
80	TRASH	CH_4 350 ppm H_2S 0% LEL 0%			1830	3/27 NO DRILLING ON 3/26
						STOPPED @ 90'
90	TRASH	CH_4 0% H_2S 0% LEL 0%			0730	3/28 RAIN ODAY
					1500	STOPPED @ 100'
100	TRASH	CH_4 0% H_2S 0% LEL 0%			0700	3/29 - [illegible] - UNKNOWN OBJECT SLOWED PROGRESS FOR 3 HOURS
110						
					1400	STOPPED @ 120'
120	TRASH	CH_4 0% H_2S 0% LEL 0%			0700	[illegible] 3/30
130						
					1900	STOPPED @ 138'
140	TRASH				700	3/31 HAD REFUSAL FOR MOST OF DAY NO GAIN
	SEE NEXT PAGE				1940	
150	TRASH				0700	

PROJECT NAME: LCS-4A Installation
HOLE NO.: LCS-4A

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

Aquaterra Drilling Log

HOLE NO. LCS-4A | SHEET 3 OF 4 SHEETS

PROJECT NAME: LCS-4 INSTALLATION

INSPECTOR: DAVID PETERSON

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
40	TRASH	CH_4 - 0% H_2S - 0% LEL - 0%			0720	BIT NEEDED REPAIR 4/01
148					1400	STOPPED @ 148'
	TRASH	CH_4 - 0% H_2S - 0% LEL - 0%			700	4/06
60					1450	STOPPED @ 160'
	TRASH	CH_4 - 0% H_2S - 0% LEL - 0%			0700	4/07
80					2000	STOPPED @ 180'
	TRASH	CH_4 - 0% H_2S - 0% LEL - 0%			0700	4/08
					1930	205' TOTAL DEPTH
	Trash				800	Resume drilling 4/9/04
223					1430	RESUME DRILLING 4/13
						Stopped @ 230'

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-4A Installation

HOLE NO.: LCS-4A

Aquaterra Drilling Log

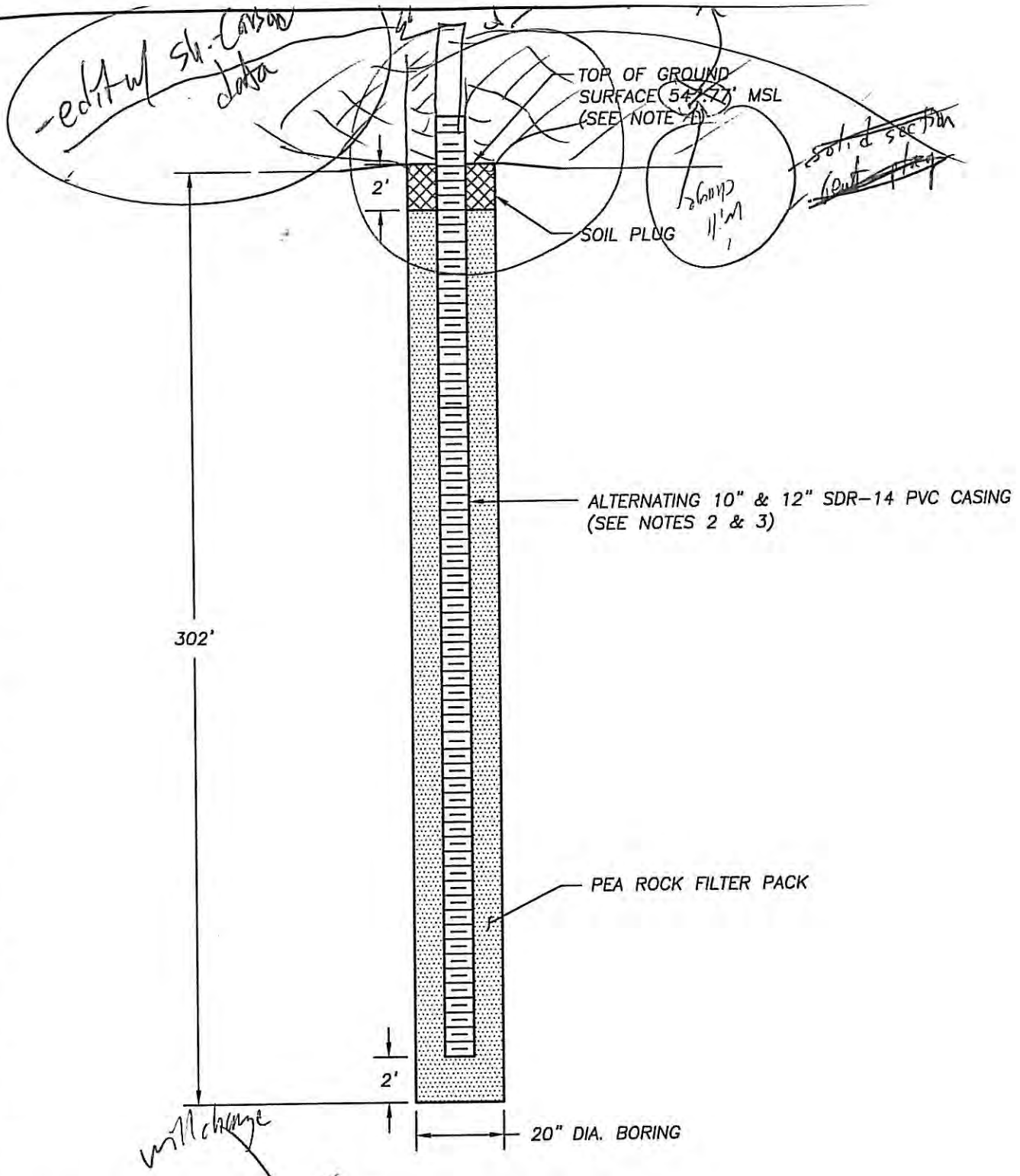
HOLE NO. LCS-4A | SHEET 4 OF SHEETS 4

PROJECT NAME: LCS-4 INSTALLATION | INSPECTOR: NATHAN HIGGERSON

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
230	Trash	CH_4 - 0% H_2S - 0% LEL - 0%				Resume drilling on 4/16
240						drilling stopped at approximately 245'
	Trash					Resume drilling on 4/17
250						
260		CH_4 - 0% H_2S - 0% LEL - 0%			1330 1200	Drilling stopped at approximate depth of 265' Resume drilling on 4/18
270	Trash					
280		CH_4 - 0% H_2S - 0% LEL - 0%			1445	Resume drilling on 4/19
						drilling stopped @ 285' Resume drilling on 4/27
290	Trash					
300						Drilling stopped at approximate final depth of 302 ft
	EOB @ approximately 302 ft					

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-4A INSTALLATION | HOLE NO.: LCS-4A



NOTES:

1. SURVEY DATA BASED ON APRIL 27, 2004 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON & ASSOCIATES, P.C.
2. PVC CASING IS SCREENED ALONG ITS ENTIRE LENGTH WITH 0.125" x 2" SLOTS SPACED 1" APART.
3. CENTRALIZERS ARE INSTALLED APPROXIMATELY EVERY 40'.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
6980 West 153rd Street
Overland Park, Kansas 66223

DETAIL
LEACHATE COLLECTION SUMP 4A
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By NLH	Designed By NLH	Project No. 1292.10
NOT TO SCALE	Date 6/2/04	File Name LCS-4A DETAIL N.dwg	Figure No. 1

Aquaterra Drilling Log

HOLE NO. LCS-4B | SHEET 1 OF 1 SHEETS

PROJECT NAME: LCS-4B CQA Installation	DRILLING SUBCONTRACTOR: Layne Western Company, Inc.
PROJECT NUMBER: 3737.10	NAME OF DRILLER(S): Rusty Bowls, Dave Jones
LOCATION: Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL: Air Rotary Drill Rig (Rota Drill-T6R5W)
HOLE LOCATION: Western Edge-South Hill	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 20" bit; Backhoe-Case 580 Super L, Tender Trailer-Layne Western, Support Vehicle-
SURFACE ELEVATION:	
OVERBURDEN THICKNESS:	DRILLING START DATE: December 10, 2009 / DRILLING END DATE:
DEPTH DRILLED INTO ROCK: N/A	DEPTH GROUNDWATER ENCOUNTERED:
TOTAL DEPTH OF HOLE:	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
N/A	N/A	N/A	N/A	N/A	N/A	N/A

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	SIGNATURE OF INSPECTOR
Leachate Collection Sump	N/A	N/A	N/A	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	Soil Cover				7:30 AM	Layne Western installed 18 ft. Casing.
	Trash	N/A	N/A	N/A		No Asbestos Observed
10					12-10-09	
20	Trash	N/A	N/A	N/A	7:30 AM	Stopped at 9:30 a.m. installed 20' steel stabilizer, resumed drilling.
30					3:30 pm 12-11-09	
40	Trash				7:30 AM	No Asbestos Observed
50					3:30PM 12-14-09	
					12-15-09	NO Asbestos Observed
60						

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
Kansas City-Jefferson City-Omaha-St. Louis

PROJECT NAME: LCS-4B CQA Installation

HOLE NO.: LCS-4B

Aquaterra Drilling Log

HOLE NO. LCS4B | SHEET OF SHEETS

PROJECT NAME: LCS-4B CQA

INSPECTOR: Randy Hamburg

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
60	Trash				0730	NO Asbestos Observed
					0830	
					12/16/09	
					0730	
70	Trash					NO Asbestos Observed
80						
					1500	
					12/17/09	
90					0730	
100	Trash					No Asbestos Observed
110						
120					1500	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-4B CQA Installation

HOLE NO.: LCS-4B

Aquaterra Drilling Log

HOLE NO. LCS-4B | SHEET OF SHEETS

PROJECT NAME: LCS-4B CQA Installation | INSPECTOR: RANDY Homburg / Robert H Hill II

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
120					12/21/09 (0760 AM)	No Asbestos Observed
130	Trash					Lost 10 feet due to trash collasping into hole over the weekend).
140					(1600 PM) 12/22/09 (0700 AM)	No Asbestos Observed
150	Trash					No work done on 12/23/09 due to rain Mob on 12/28/09.
160					(1500 PM) 12/30/09 (0730 AM)	12/28/09 Water and soap added to hole to get drill bit out to replace. No vertical depth gained.
170	Trash					12/29/09 Layne fished out detached drill bit assembly. Trash collasped back into hole. Back to 157' bgs.
180						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-4B CQA Installation | HOLE NO. LCS-4B

Aquaterra Drilling Log

HOLE NO. LCS-4B | SHEET OF SHEETS

PROJECT NAME: LCS-4B CQA Installation | INSPECTOR: Robert Hill II

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
180					12/30/09	
						No Asbestos Observed
190	Trash					
200						
					(1530 pm)	(207' TD)
					12/31/09	
210					(0730 am)	
						No Asbestos Observed
220	Trash					
230					(11:50 am)	(232' TD)
					(01/04/09	
	Trash				9:30 AM	
240					0	

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-4B CQA Installation | HOLE NO.: LCS-4B

Aquaterra Drilling Log

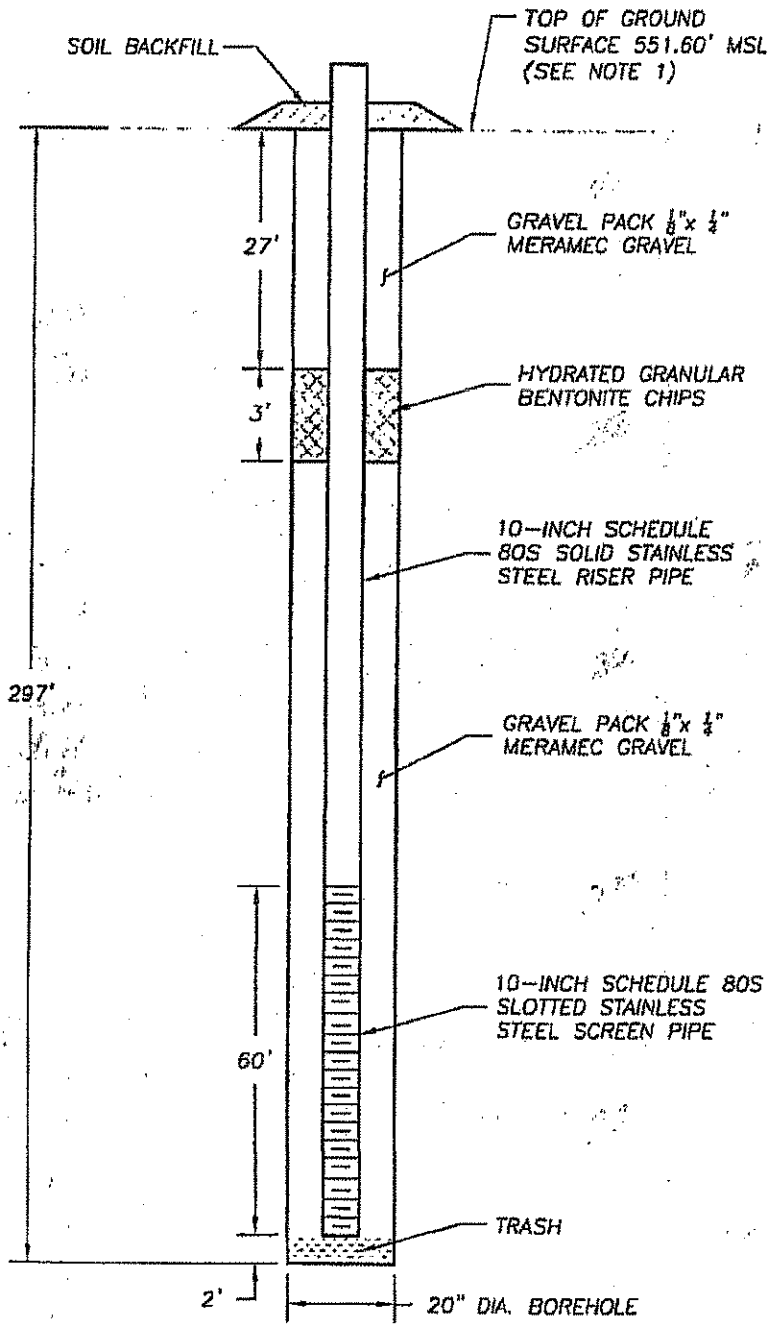
HOLE NO. LCS-4B | SHEET OF SHEETS

PROJECT NAME: LCS-4B CQA Installation | INSPECTOR: Robert M. Hill II

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
240						
						No Asbestos Observed
250						
	Trash					Drill Rig Delay due to frigid temperatures. Started drilling shortly after 9:00 am.
260						
270					(3:30 pm) (01/05/10) (01/11/10)	
						No progress. Compressor/ battery problems. Rig started then stopped again due to bad starter. (No depth gained)
280	Trash					
290						
	Trash				(01/12/10)	
						TD = 297'
300						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS-4B CQA Installation | HOLE NO.: LCS-4B



NOTES:

1. SURVEY DATA BASED ON 2/10/10 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON-CLAXTON, LLC.
2. THE WELL PIPE IS SCREENED FROM THE BOTTOM OF WELL TO ELEVATION 316.60' MSL.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
13 Executive Drive, Suite 1
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LEACHATE COLLECTION SUMP 4B INSTALLATION CQA
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. RHH	Drawn By RLH	Designed By TKJ	Project No. 3737.10
NOT TO SCALE	Date 01/22/10	File Name 3737.10 LCS-4B Detail.dwg	Figure No. 1

K:\Aqua Work\Bridgeton\3737.10 LCS 4B Sump\3737.10 LCS-4B Detail_revised.dwg, February 17, 2010 2:36:37 pm, (tkj)

Aquaterra Drilling Log

HOLE NO. LCS-5A | SHEET 1 OF 2 SHEETS

PROJECT NAME: Leachate Collection Sump Drilling CQA	DRILLING SUBCONTRACTOR: Layne Western
PROJECT NUMBER: 1688.10	NAME OF DRILLER(S): Craig Scoby
LOCATION: Bridgeton Landfill, LLC	MANUFACTURER'S DESIGNATION OF DRILL: T685W Rotadrill
HOLE LOCATION: GEW-5A	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 24 inch auger; 20 inch rotary
SURFACE ELEVATION: -	20 inch
OVERBURDEN THICKNESS: —	DRILLING START DATE: 9/28/05
DRILLING END DATE: 10/7/05	
DEPTH DRILLED INTO ROCK: —	DEPTH GROUNDWATER ENCOUNTERED: —
TOTAL DEPTH OF HOLE: 295 ft	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	Nathan Hyzer

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
0	± 3.5 ft of soil				800	Drilling began on 9/28/05
10	trash					
20	Pipe installed				1000	
30					1400	Drilling stopped 9/28/05
40						Drilling started 9/29/05
50	trash				1400	
60						
70						Drilling stopped 9/29/05
80	Trash				1000	Layne resume drilling 9/30/05
90						
100					1300	Drilling stopped in study at 100ft
110	Trash					Resum drilling on 10/3/05
120						

Aquaterra Drilling Log

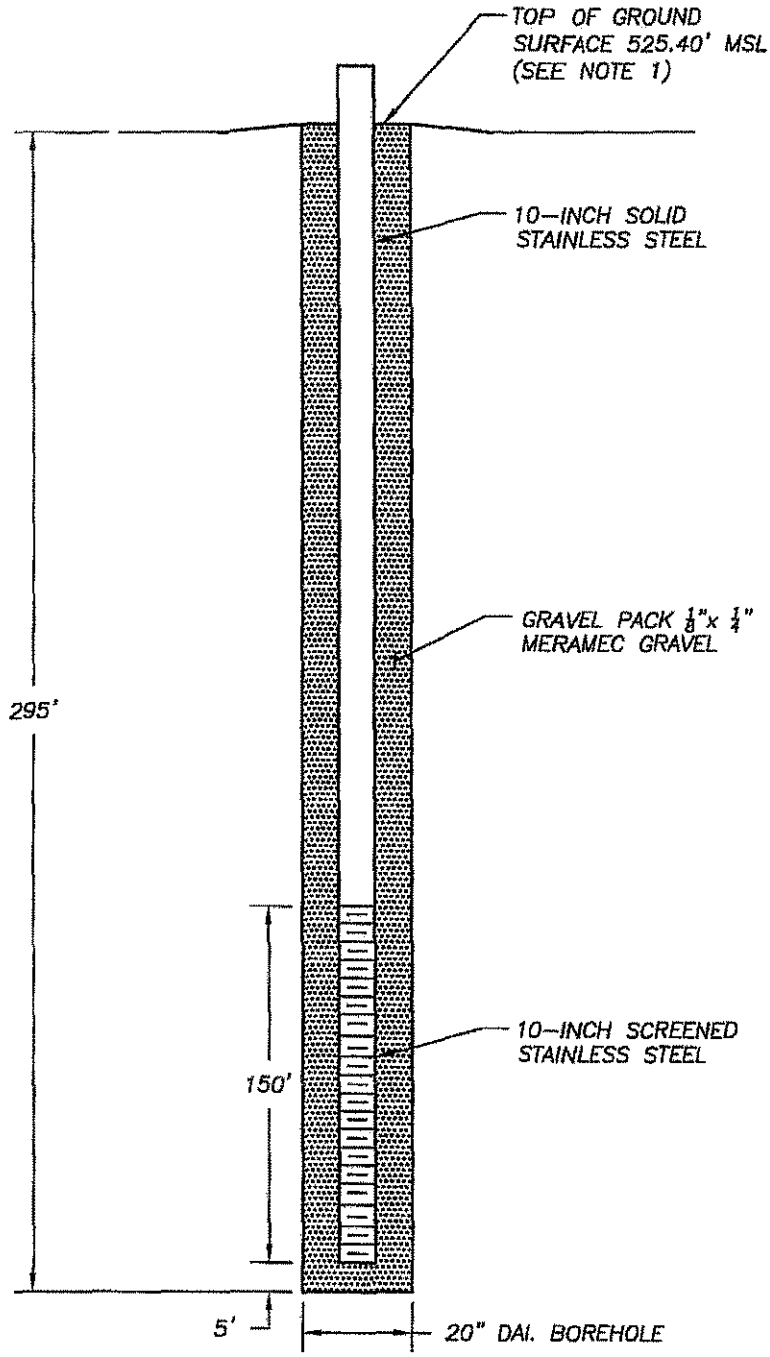
HOLE NO. LCS-5A | SHEET 2 OF 2 SHEETS

PROJECT NAME: LCS Drilling CQA | INSPECTOR: Nathan Higgerson

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
120						
130	Trash				930	
140						
150					1230	
160						
170	Trash				1430	
180						
190						
200					1715	Drilling stopped for 10/7 at approximately 200 ft
210						Drilling resumed on 10/4/05
220	Trash					
230						
240	Trash					
250						Drilling stopped for 10/5 @ 250 ft
260						Drilling resumes 10/5/05
270	Trash/sludge					
280					800	Drilling stopped for 10/5/05 @ 277 ft
290						Drilling resumed 10/7/05
300	Trash					
						Drilling stopped on 10/7/05 at approximately 295 ft.
	End of boring at 295 ft					No markers containing material observed

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS Drilling CQA | HOLE NO.: LCS-5A



NOTES:

1. SURVEY DATA BASED ON NOVEMBER 24, 2005 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON & ASSOCIATES, P.C.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LEACHATE COLLECTION SUMP 5A
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By WS	Designed By NLH	Project No. 1688.10
NOT TO SCALE	Date 11/21/05	File Name LCS-5A DETAIL.dwg	Figure No. 1

Aquaterra Drilling Log

HOLE NO. LCS-6A | SHEET 1 OF 1 SHEETS

PROJECT NAME: Leachate Collection Sump Drilling CQA
PROJECT NUMBER: 1688.10
LOCATION: Bridgeton Landfill, LLC
HOLE LOCATION: GEW-6A
SURFACE ELEVATION:
OVERBURDEN THICKNESS: —
DEPTH DRILLED INTO ROCK: —
TOTAL DEPTH OF HOLE: 85 ft

DRILLING SUBCONTRACTOR: Layne Western
NAME OF DRILLER(S): Craig Scooby
MANUFACTURER'S DESIGNATION OF DRILL: T685W Rotadrill
SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 28 inch auger; 20 inch rotary; 28 inch
DRILLING START DATE: 9/21/05
DRILLING END DATE: 9/23/05
DEPTH GROUNDWATER ENCOUNTERED: —
DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
—	—	—	—

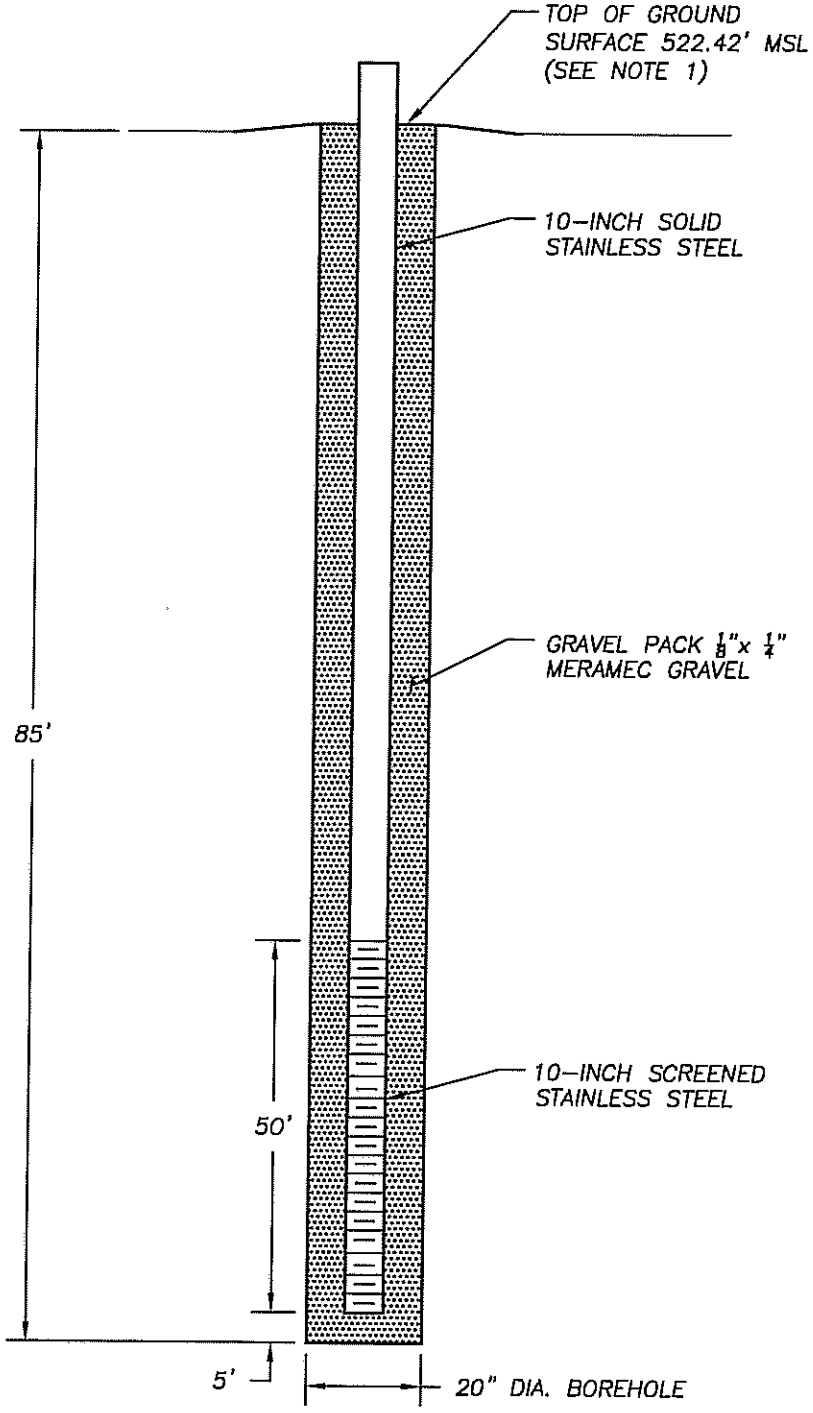
SAMPLES FOR CHEMICAL ANALYSIS (TOTAL)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
—	—	—	—	—	—	—

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
—	—	—	—	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
10	3.5 ft of soil Trash					Drilling begins on 9/21/05 and stopped at 9.5 ft. Drilling resumes on 9/22/05
20	Trash				1130 810	Drilling stopped at 20ft to set the BOP stack Drilling resumes on 9/23/05
30					930	
50	Trash				1230	
70	Trash some rock cuttings (limestone/shale)				1430	Drilling stopped on 9/23/05 at bedrock at 85 ft approximately
90	End of boring at 85 ft					No asbestos containing materials were observed
100						
110						
120						

AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME: LCS Drilling CQA
HOLE NO.: LCS-6A



NOTES:

1. SURVEY DATA BASED ON NOVEMBER 24, 2005 TOPOGRAPHICAL SURVEY DATA BY SHERBUT-CARSON & ASSOCIATES, P.C.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LEACHATE COLLECTION SUMP 6A
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. MSB	Drawn By WS	Designed By NLH	Project No. 1688.10
NOT TO SCALE	Date 11/21/05	File Name LCS-6A DETAIL.dwg	Figure No. 1

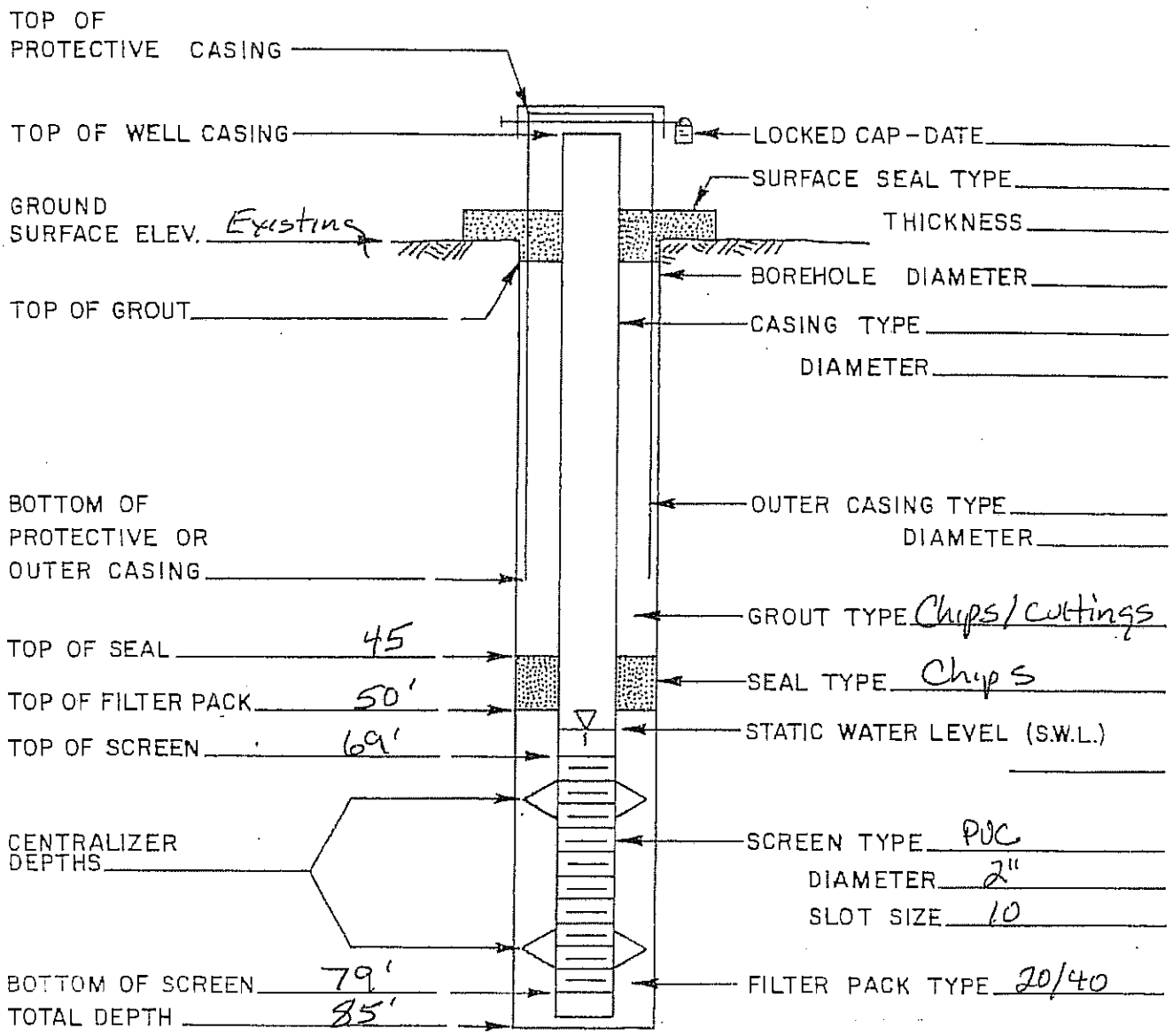
K:\Allied Waste\Bridgeton\1688.10 - LCS-5A and 6A CQA\LCS-6A DETAIL.dwg December 7, 2005 3:59:33 pm (Hal)

WELL COMPLETION RECORD

PROJECT Bridgeton Landfill LOCATION Bridgeton MO

WELL NUMBER LCS 6 Piezometer DATE INSTALLED 12-9-09

REPRESENTATIVE _____ DRILLER Rusty



COMMENTS 2" Piezometer for water levels @ LCS-6a location

REPRESENTATIVE SIGNATURE _____ DATE _____

Layne

Bridgeton LF Location of LCS 6A Completed on December 18, 2009

Points 1000-1001 Are the existing ground and top of casing of old LCS 6A for check
Points 2000-2001 Are the new LCS 6A (There was a newly drilled hole and a 2" PVC that was tagged fo

	NORTH	EAST	EX. ELEV	DECRIPTION
1000	1068722	516493.4	517.461	LCS 6A at Ground
1001	1068723	516493.3	522.254	LCS 6A at Top of Casing
2000	1068698	516506.5	518.629	LCS 6A at Top of Casing
2001	1068698	516506.6	515.985	LCS 6A at Top of Ground

from Sherbut - Carson Surveyors

Aquaterra Drilling Log

HOLE NO. | SHEET 1 OF SHEETS

PROJECT NAME LCS-6B	DRILLING SUBCONTRACTOR Layne Western Company, Inc.
PROJECT NUMBER 4352.10	NAME OF DRILLER(S) Rusty Bowls, Dave Jones, Terry Jones
LOCATION Bridgeton, Missouri	MANUFACTURER'S DESIGNATION OF DRILL Atlas-Copco T3W Rotary Drill
HOLE LOCATION 30 feet north of LCS-6A on east side of landfill	SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 20" bit; John Deere 310D Rubber tired backhoe; Layne Western Peterbuilt Tender Truck
SURFACE ELEVATION 515.022	
OVERBURDEN THICKNESS N/A	DRILLING START DATE 10/25/10 — DRILLING END DATE 11/3/10
DEPTH DRILLED INTO ROCK N/A	DEPTH GROUNDWATER ENCOUNTERED N/A
TOTAL DEPTH OF HOLE 87 feet	DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED

GEOTECHNICAL SAMPLES (TOTAL)	DISTURBED	UNDISTURBED	TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

SAMPLES FOR CHEMICAL ANALYSIS (TOTAL) N/A	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	(SPECIFY)	TOTAL CORE RECOVERY
	N/A	N/A	N/A	N/A	N/A	N/A

DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPEICFY)	SIGNATURE OF INSPECTOR
Leachate Collection Sump	N/A	N/A	N/A	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	Soil Cover 3 ft				10/25/2010 7:00 AM	No asbestos observed
	Waste					
20 ft					3:30 PM 10/25/2010	
	Waste				7:00 AM	Off site at 1:50 pm due to wind No asbestos observed
29 ft					1:50 PM 10/26/2010	
	Waste				7:30 AM	
45 ft					3:30 PM 10/27/2010	
	Waste				7:00 AM	Stopped drilling due to leaking rubber gasket. No asbestos observed
52 ft					10:10am 10/28/2010	
	Saturated Waste				7:00 AM	Resumed drilling on 11/1/2010

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME LCS-6B CQA Installation | HOLE NO. LCS-6B

Aquaterra Drilling Log

HOLE NO. LCS-6B | SHEET OF SHEETS

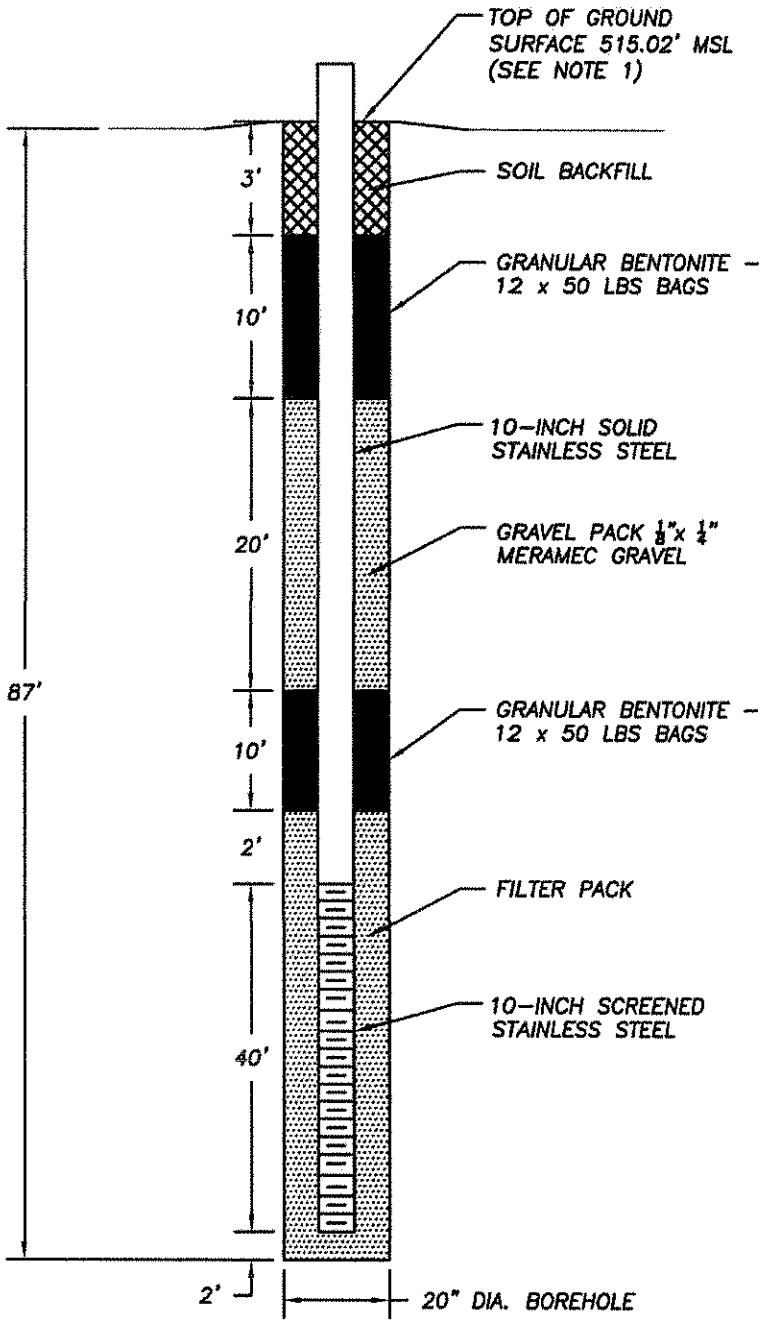
IECT NAME LCS-6B CQA | INSPECTOR

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE RESULTS	ANALYTICAL SAMPLE NO.	TIME	REMARKS
	Waste				1:10pm 11/1/2010	No asbestos observed
	87 ft					

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.

PROJECT NAME LCS-6B CQA Installation

HOLE NO. LCS6-B



NOTES:

1. SURVEY DATA BASED ON JANUARY 5, 2011 SURVEY DATA PROVIDED BY SHERBUT-CARSON & ASSOCIATES, P.C.

AQUATERRA
ENVIRONMENTAL SOLUTIONS, INC.
141 Market Place Drive
Fairview Heights, Illinois 62208

AS-BUILT DETAIL
LEACHATE COLLECTION SUMP 6B
BRIDGETON LANDFILL, LLC
BRIDGETON, MISSOURI

Project Mgr. CR	Drawn By RLH	Designed By RHH	Project No. 1688.10
NOT TO SCALE	Date 01/04/10	File Name LCS-6B DETAIL.dwg	Figure No. 1

TEMPERATURE MONITORING PROBES

AQUATERRA

Environmental Solutions, Inc.
7311 W. 130th St, Overland Park, KS 66213

CLIENT:	Bridgeton Landfill, LLC
PROJECT NAME:	Temperature Monitoring Probe
PROJECT NUMBER:	5582.1
PROJECT LOCATION:	Bridgeton, Missouri
BORING LOCATION:	North Slope
AES PROJECT NO:	5582.1
AES GEOLOGIST:	ROBERT H. HILL II
START DATE:	11/07/12
FINISH DATE:	11/07/12
START TIME:	06:50 a.m.
FINISH TIME:	10:00 a.m.

LOG OF BORING NO.: **TMP-1**

SHEET NUMBER 1 of 6

138 Feet

DRILLING CONTRACTOR:	Frontz Drilling
DRILLER:	Kris Lauer
DRILLING RIG:	Versa-Sonic Drill Rig
DRILLING METHOD:	Sonic Rotary
SAMPLING METHOD:	N/A
BORING DIAMETER:	4 in.
WELL DIAMETER:	3 7/8 inch
WELL COMPLETION:	N/A
SURFACE ELEVATION:	469.00
TOC ELEVATION:	N/A
WATER LEVEL:	N/A
WATER ELEVATION:	N/A
DATE:	11/07/2012

WELL CONSTRUCTION DETAILS

MATERIAL:	Steel
DIAMETER:	4 in.
WELL TOTAL DEPTH:	138 ft. BGS
SCREEN LENGTH:	N/A
RISER LENGTH:	N/A
TOP OF SCREEN:	N/A
BOTTOM OF SCREEN:	N/A
SCREEN SLOT:	N/A
TOP OF FILTER PACK:	N/A
TOP OF SEAL:	N/A
TYPE OF SEAL:	Cement Bentonite Grout
TYPE OF FILTER PACK:	N/A

SAMPLE TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES AND WELL CONSTRUCTION
					1			Soil Cover	(40 Sch. CPVC Conduit)
					2				
					3				
					4				
					5				
					6				
					7				
					8				
					9				
					10				
		N/A			11				Cement Bentonite Grout
		N/A			12				
		N/A			13				
		N/A			14				
		N/A			15			Municipal Solid Waste	
		N/A			16				
		N/A			17				
		N/A			18				
		N/A			19				
		N/A			20				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-1**	SHEET NUMBER 2 of 6
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/07/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			21				Thermocouple Probe
		N/A			22				
		N/A			23				
		N/A			24				
		N/A			25				
		N/A			26				
		N/A			27				
		N/A			28				
		N/A			29				
		N/A			30				
		N/A			31				
		N/A			32				
		N/A			33			Municipal Solid Waste	
		N/A			34				Cement Bentonite Grout
		N/A			35				
		N/A			36				(Abrasive Sheath)
		N/A			37				
		N/A			38				Thermocouple Probe
		N/A			39				
		N/A			40				
		N/A			41				
		N/A			42				
		N/A			43				
		N/A			44				
		N/A			45				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-1**	SHEET NUMBER 3 of 6
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/07/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			46			Municipal Solid Waste	(Abrasive Sheath) Thermocouple Probe
		N/A			47				
		N/A			48				
		N/A			49				
		N/A			50				
		N/A			51				
		N/A			52				
		N/A			53				
		N/A			54				
		N/A			55				
		N/A			56				
		N/A			57				
		N/A			58				
		N/A			59				
		N/A			60				
		N/A			61				
		N/A			62				
		N/A			63				
		N/A			64				
		N/A			65				
		N/A			66				
		N/A			67				
		N/A			68				
		N/A			69				
		N/A			70				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-1**	SHEET NUMBER 4 of 6
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/07/2012	
	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			71				
		N/A			72				
		N/A			73				
		N/A			74				
		N/A			75				
		N/A			76				
		N/A			77				
		N/A			78				Thermocouple Probe
		N/A			79				
		N/A			80				
		N/A			81				
		N/A			82				
		N/A			83			Municipal Solid Waste	(Abrasive Sheath)
		N/A			84				
		N/A			85				
		N/A			86				
		N/A			87				
		N/A			88				
		N/A			89				
		N/A			90				
		N/A			91				
		N/A			92				
		N/A			93				
		N/A			94				
		N/A			95				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES; ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-1**	SHEET NUMBER 5 of 6
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/07/2012	
	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			96				
		N/A			97				
		N/A			98				Thermocouple Probe
		N/A			99				
		N/A			100				
		N/A			101				
		N/A			102				
		N/A			103				
		N/A			104				
		N/A			105				
		N/A			106				
		N/A			107				
		N/A			108			Municipal Solid Waste	(Abrasive Sheath)
		N/A			109				
		N/A			110				
		N/A			111				
		N/A			112				
		N/A			113				
		N/A			114				
		N/A			115				
		N/A			116				
		N/A			117				
		N/A			118				Thermocouple Probe
		N/A			119				
		N/A			120				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-1**

SHEET NUMBER 6 of 6

CLIENT: Bridgeton Landfill, LLC

GEOLOGIST: Robert H. Hill II

PROJECT NAME: Temperature Monitoring Probe

DATE: 11/07/2012

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			121				
		N/A			122				
		N/A			123				
		N/A			124				
		N/A			125				
		N/A			126				
		N/A			127				
		N/A			128				
		N/A			129			Municipal Solid Waste	(Abrasive Sheath)
		N/A			130				
		N/A			131				
		N/A			132				
		N/A			133				
		N/A			134				
		N/A			135				
		N/A			136				
		N/A			137				
		N/A			138				Thermocouple Probe
					139				(Quarry Bottom)
					140				
					141				
					142				
					143				
					144				
					145				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.
7311 W. 130th St, Overland Park, KS 66213

CLIENT:	Bridgeton Landfill, LLC
PROJECT NAME:	Temperature Monitoring Probe
PROJECT NUMBER:	5582.1
PROJECT LOCATION:	Bridgeton, Missouri
BORING LOCATION:	North Slope
AES PROJECT NO:	5582.1
AES GEOLOGIST:	ROBERT H. HILL II
START DATE:	11/07/12
FINISH DATE:	11/09/12
START TIME:	13:40 a.m.
FINISH TIME:	15:00 p.m.

LOG OF BORING NO.: **TMP-2**

SHEET NUMBER 1 of 9

200 Feet

DRILLING CONTRACTOR:	Frontz Drilling
DRILLER:	Kris Lauer
DRILLING RIG:	Versa-Sonic Drill Rig
DRILLING METHOD:	Sonic Rotary
SAMPLING METHOD:	N/A
BORING DIAMETER:	4 in.
WELL DIAMETER:	3 7/8 inch
WELL COMPLETION:	N/A
SURFACE ELEVATION:	491.50
TOC ELEVATION:	N/A
WATER LEVEL:	N/A
WATER ELEVATION:	N/A
DATE:	11/07/2012

WELL CONSTRUCTION DETAILS

MATERIAL:	Steel
DIAMETER:	4 in.
WELL TOTAL DEPTH:	200 ft. BGS
SCREEN LENGTH:	N/A
RISER LENGTH:	N/A
TOP OF SCREEN:	N/A
BOTTOM OF SCREEN:	N/A
SCREEN SLOT:	N/A
TOP OF FILTER PACK:	N/A
TOP OF SEAL:	N/A
TYPE OF SEAL:	Cement Bentonite Grout
TYPE OF FILTER PACK:	N/A

SAMPLE TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES AND WELL CONSTRUCTION
					1			Soil Cover	(40 Sch. CPVC Conduit)
					2				
					3				
					4				
					5				
					6				
					7				
					8				
		N/A			9			Municipal Solid Waste	Cement Bentonite Grout
		N/A			10				
		N/A			11				
		N/A			12				
		N/A			13				
		N/A			14				
		N/A			15				
		N/A			16				
		N/A			17				
		N/A			18				
		N/A			19				
		N/A			20				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-2**	SHEET NUMBER 2 of 9
	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 11/07/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			21				Thermocouple Probe
		N/A			22				
		N/A			23				
		N/A			24				
		N/A			25				
		N/A			26				
		N/A			27				
		N/A			28				
		N/A			29				
		N/A			30				
		N/A			31				
		N/A			32				
		N/A			33			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			34				
		N/A			35				
		N/A			36				
		N/A			37				
		N/A			38				
		N/A			39				
		N/A			40				Thermocouple Probe
		N/A			41				
		N/A			42				
		N/A			43				
		N/A			44				
		N/A			45				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-2**	SHEET NUMBER 3 of 9
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/09/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			46				
		N/A			47				
		N/A			48				
		N/A			49				
		N/A			50				
		N/A			51				
		N/A			52				
		N/A			53				
		N/A			54				
		N/A			55				
		N/A			56				
		N/A			57				
		N/A			58			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			59				
		N/A			60				Thermocouple Probe
		N/A			61				
		N/A			62				
		N/A			63				
		N/A			64				
		N/A			65				
		N/A			66				
		N/A			67				
		N/A			68				
		N/A			69				
		N/A			70				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-2**	SHEET NUMBER 4 of 9
	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 11/09/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			71			Municipal Solid Waste	Thermocouple Probe (Abrasive Sheath) Cement Bentonite Grout
		N/A			72				
		N/A			73				
		N/A			74				
		N/A			75				
		N/A			76				
		N/A			77				
		N/A			78				
		N/A			79				
		N/A			80				
		N/A			81				
		N/A			82				
		N/A			83				
		N/A			84				
		N/A			85				
		N/A			86				
		N/A			87				
		N/A			88				
		N/A			89				
		N/A			90				
		N/A			91				
		N/A			92				
		N/A			93				
		N/A			94				
		N/A			95				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-2**

SHEET NUMBER 5 of 9

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 11/09/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			96				
		N/A			97				
		N/A			98				
		N/A			99				
		N/A			100				Thermocouple Probe
		N/A			101				
		N/A			102				
		N/A			103				
		N/A			104				
		N/A			105				
		N/A			106				
		N/A			107				
		N/A			108			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			109				
		N/A			110				
		N/A			111				
		N/A			112				
		N/A			113				
		N/A			114				
		N/A			115				
		N/A			116				
		N/A			117				
		N/A			118				
		N/A			119				
		N/A			120				Thermocouple Probe

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-2**	SHEET NUMBER 6 of 9
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/09/2012	
	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			121			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			122				
		N/A			123				
		N/A			124				
		N/A			125				
		N/A			126				
		N/A			127				
		N/A			128				
		N/A			129				
		N/A			130				
		N/A			131				
		N/A			132				
		N/A			133				
		N/A			134				
		N/A			135				
		N/A			136				
		N/A			137				
		N/A			138				
		N/A			139				
		N/A			140				Thermocouple Probe
		N/A			141				
		N/A			142				
		N/A			143				
		N/A			144				
		N/A			145				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-2**	SHEET NUMBER 7 of 9
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/09/2012	
	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			146				
		N/A			147				
		N/A			148				
		N/A			149				
		N/A			150				
		N/A			151				
		N/A			152				
		N/A			153				
		N/A			154				
		N/A			155				
		N/A			156				
		N/A			157				
		N/A			158			**Municipal Solid Waste**	**(Abrasive Sheath) Cement Bentonite Grout**
		N/A			159				
		N/A			160				**Thermocouple Probe**
		N/A			161				
		N/A			162				
		N/A			163				
		N/A			164				
		N/A			165				
		N/A			166				
		N/A			167				
		N/A			168				
		N/A			169				
		N/A			170				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA
Environmental Solutions, Inc.
7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-2**

SHEET NUMBER 8 of 9

GEOLOGIST: Robert H. Hill II
CLIENT: Bridgeton Landfill, LLC
DATE: 11/09/2012
PROJECT NAME: Temperature Monitoring Probe
PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			171			Municipal Solid Waste	Thermocouple Probe
		N/A			172				
		N/A			173				
		N/A			174				
		N/A			175				
		N/A			176				
		N/A			177				
		N/A			178				
		N/A			179				
		N/A			180				
		N/A			181				(Abrasive Sheath) Cement Bentonite Grout
		N/A			182				
		N/A			183				
		N/A			184				
		N/A			185				
		N/A			186				
		N/A			187				
		N/A			188				
		N/A			189				
		N/A			190				
		N/A			191				
		N/A			192				
		N/A			193				
		N/A			194				
		N/A			195				

LEGEND:
SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-2**

SHEET NUMBER 9 of 9

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 11/09/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			196			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			197				
		N/A			198				
		N/A			199				
		N/A			200				Thermocouple Probe (Quarry Bottom)

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.
7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-3**

SHEET NUMBER 1 of 11

250 Feet

CLIENT:	Bridgeton Landfill, LLC
PROJECT NAME:	Temperature Monitoring Probe
PROJECT NUMBER:	5582.1
PROJECT LOCATION:	Bridgeton, Missouri
BORING LOCATION:	North Slope
AES PROJECT NO:	5582.1
AES GEOLOGIST:	ROBERT H. HILL II
START DATE:	11/15/12
FINISH DATE:	11/15/12
START TIME:	07:00 a.m.
FINISH TIME:	17:00 p.m.

DRILLING CONTRACTOR:	Frontz Drilling
DRILLER:	Kris Lauer
DRILLING RIG:	Versa-Sonic Drill Rig
DRILLING METHOD:	Sonic Rotary
SAMPLING METHOD:	N/A
BORING DIAMETER:	4 in.
WELL DIAMETER:	3 7/8 inch
WELL COMPLETION:	N/A
SURFACE ELEVATION:	499.11
TOC ELEVATION:	N/A
WATER LEVEL:	N/A
WATER ELEVATION:	N/A
DATE:	11/15/2012

WELL CONSTRUCTION DETAILS

MATERIAL:	Steel
DIAMETER:	4 In.
WELL TOTAL DEPTH:	250 ft. BGS
SCREEN LENGTH:	N/A
RISER LENGTH:	N/A
TOP OF SCREEN:	N/A
BOTTOM OF SCREEN:	N/A
SCREEN SLOT:	N/A
TOP OF FILTER PACK:	N/A
TOP OF SEAL:	N/A
TYPE OF SEAL:	Cement Bentonite Grout
TYPE OF FILTER PACK:	N/A

SAMPLE TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES AND WELL CONSTRUCTION
					1			Soil Cover	
		N/A			6			Municipal Solid Waste	(40 Sch. CPVC Conduit)
		N/A			7				
		N/A			8				Cement Bentonite Grout
		N/A			9				
		N/A			10				
		N/A			11				
		N/A			12				
		N/A			13				
		N/A			14				
		N/A			15				
		N/A			16				
		N/A			17				
		N/A			18				
		N/A			19				
		N/A			20				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-3**	SHEET NUMBER 2 of 11
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/15/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			21				
		N/A			22				
		N/A			23				
		N/A			24				
		N/A			25				
		N/A			26				
		N/A			27				
		N/A			28				
		N/A			29				
		N/A			30				Thermocouple Probe
		N/A			31				
		N/A			32				
		N/A			33			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			34				
		N/A			35				
		N/A			36				
		N/A			37				
		N/A			38				
		N/A			39				
		N/A			40				
		N/A			41				
		N/A			42				
		N/A			43				
		N/A			44				
		N/A			45				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-3**	SHEET NUMBER 3 of 11
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/15/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			46			Municipal Solid Waste	Thermocouple Probe
		N/A			47				
		N/A			48				
		N/A			49				
		N/A			50				
		N/A			51				
		N/A			52				
		N/A			53				
		N/A			54				
		N/A			55				
		N/A			56				(Abrasive Sheath) Cement Bentonite Grout
		N/A			57				
		N/A			58				
		N/A			59				
		N/A			60				
		N/A			61				
		N/A			62				
		N/A			63				
		N/A			64				
		N/A			65				
		N/A			66				
		N/A			67				
		N/A			68				
		N/A			69				
		N/A			70				Thermocouple Probe

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-3**	SHEET NUMBER 4 of 11
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/15/2012	
	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			71			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			72				
		N/A			73				
		N/A			74				
		N/A			75				
		N/A			76				
		N/A			77				
		N/A			78				
		N/A			79				
		N/A			80				
		N/A			81				
		N/A			82				
		N/A			83				
		N/A			84				
		N/A			85				
		N/A			86				
		N/A			87				
		N/A			88				
		N/A			89				
		N/A			90				Thermocouple Probe
		N/A			91				
		N/A			92				
		N/A			93				
		N/A			94				
		N/A			95				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-3**	SHEET NUMBER 5 of 11
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/15/2012	
	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			96			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout Thermocouple Probe
		N/A			97				
		N/A			98				
		N/A			99				
		N/A			100				
		N/A			101				
		N/A			102				
		N/A			103				
		N/A			104				
		N/A			105				
		N/A			106				
		N/A			107				
		N/A			108				
		N/A			109				
		N/A			110				
		N/A			111				
		N/A			112				
		N/A			113				
		N/A			114				
		N/A			115				
		N/A			116				
		N/A			117				
		N/A			118				
		N/A			119				
		N/A			120				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-3**	SHEET NUMBER 6 of 11
	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 11/15/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			121			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout Thermocouple Probe
		N/A			122				
		N/A			123				
		N/A			124				
		N/A			125				
		N/A			126				
		N/A			127				
		N/A			128				
		N/A			129				
		N/A			130				
		N/A			131				
		N/A			132				
		N/A			133				
		N/A			134				
		N/A			135				
		N/A			136				
		N/A			137				
		N/A			138				
		N/A			139				
		N/A			140				
		N/A			141				
		N/A			142				
		N/A			143				
		N/A			144				
		N/A			145				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-3** SHEET NUMBER 7 of 11

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 11/15/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			146			Municipal Solid Waste	Thermocouple Probe
		N/A			147				
		N/A			148				
		N/A			149				
		N/A			150				
		N/A			151				
		N/A			152				
		N/A			153				
		N/A			154				
		N/A			155				
		N/A			156				
		N/A			157				
		N/A			158				(Abrasive Sheath) Cement Bentonite Grout
		N/A			159				
		N/A			160				
		N/A			161				
		N/A			162				
		N/A			163				
		N/A			164				
		N/A			165				
		N/A			166				
		N/A			167				
		N/A			168				
		N/A			169				
		N/A			170				Thermocouple Probe

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-3** SHEET NUMBER 8 of 11

GEOLOGIST: Robert H. Hill II

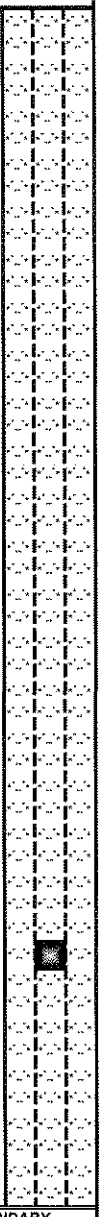
CLIENT: Bridgeton Landfill, LLC

DATE: 11/15/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			171			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			172				
		N/A			173				
		N/A			174				
		N/A			175				
		N/A			176				
		N/A			177				
		N/A			178				
		N/A			179				
		N/A			180				
		N/A			181				
		N/A			182				
		N/A			183				
		N/A			184				
		N/A			185				
		N/A			186				
		N/A			187				
		N/A			188				
		N/A			189				
		N/A			190				Thermocouple Probe
		N/A			191				
		N/A			192				
		N/A			193				
		N/A			194				
		N/A			195				



LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-3**	SHEET NUMBER 9 of 11
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/15/2012	
	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			196				
		N/A			197				
		N/A			198				
		N/A			199				
		N/A			200				
		N/A			201				
		N/A			202				
		N/A			203				
		N/A			204				
		N/A			205				
		N/A			206				
		N/A			207				
		N/A			208			**Municipal Solid Waste**	**(Abrasive Sheath) Cement Bentonite Grout**
		N/A			209				
		N/A			210				**Thermocouple Probe**
		N/A			211				
		N/A			212				
		N/A			213				
		N/A			214				
		N/A			215				
		N/A			216				
		N/A			217				
		N/A			218				
		N/A			219				
		N/A			220				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-3**

SHEET NUMBER 10 of 11

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 11/15/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			221				
		N/A			222				
		N/A			223				
		N/A			224				
		N/A			225				
		N/A			226				
		N/A			227				
		N/A			228				
		N/A			229				
		N/A			230				Thermocouple Probe
		N/A			231				
		N/A			232				
		N/A			233			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			234				
		N/A			235				
		N/A			236				
		N/A			237				
		N/A			238				
		N/A			239				
		N/A			240				
		N/A			241				
		N/A			242				
		N/A			243				
		N/A			244				
		N/A			245				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-3**

SHEET NUMBER 11 of 11

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 11/15/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			246			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			247				
		N/A			248				
		N/A			249				
		N/A			250				Thermocouple Probe (Quarry Bottom)

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.
7311 W. 130th St, Overland Park, KS 66213

CLIENT:	Bridgeton Landfill, LLC
PROJECT NAME:	Temperature Monitoring Probe
PROJECT NUMBER:	5582.1
PROJECT LOCATION:	Bridgeton, Missouri
BORING LOCATION:	Center of Landfill between north and south cells.
AES PROJECT NO:	5582.1
AES GEOLOGIST:	ROBERT H. HILL II
START DATE:	10/31/12
FINISH DATE:	10/31/12
START TIME:	0700 a.m.
FINISH TIME:	17:00 p.m.

LOG OF BORING NO.: **TMP-4**

SHEET NUMBER 1 of 3

49 Feet

DRILLING CONTRACTOR:	Frontz Drilling
DRILLER:	Kris Lauer
DRILLING RIG:	Versa-Sonic Drill Rig
DRILLING METHOD:	Sonic Rotary
SAMPLING METHOD:	N/A
BORING DIAMETER:	6 in.
WELL DIAMETER:	51/2 In.
WELL COMPLETION:	N/A
SURFACE ELEVATION:	501.50
TOC ELEVATION:	N/A
WATER LEVEL:	N/A
WATER ELEVATION:	N/A
DATE:	10/31/2012

WELL CONSTRUCTION DETAILS

MATERIAL:	Steel
DIAMETER:	6 In.
WELL TOTAL DEPTH:	49 ft. BGS
SCREEN LENGTH:	N/A
RISER LENGTH:	N/A
TOP OF SCREEN:	N/A
BOTTOM OF SCREEN:	N/A
SCREEN SLOT:	N/A
TOP OF FILTER PACK:	N/A
TOP OF SEAL:	N/A
TYPE OF SEAL:	Mixed Grout
TYPE OF FILTER PACK:	N/A

SAMPLE TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES AND WELL CONSTRUCTION
					1			**Soil Cover**	
					2				
					3				
					4				
					5				
					6				
					7				**(40 Sch. CPVC Conduit)**
					8				
		78			9				
		78			10				
		79			11				**Cement Bentonite Grout**
		79			12				
		80			13				
		81			14			**Dry Waste** Pliable Plastic, Wood, Metal,and Paper Materials No Visual Asbestos	
		82			15				
		82			16				
		83			17				
		84			18				
		84			19				
		84			20				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-4**	SHEET NUMBER 2 of 3
	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 10/31/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		85			21				
		85			22				
		85			23				
		86			24				
		86			25				
		86			26				
		86			27				
		87			28				
		86			29				Thermocouple Probe
		87			30				
		87			31				
		87			32			**Dry Waste**	
		87			33			Pliable Plastic, Wood, Metal, and Paper Materials	(Abrasive Sheath)
		88			34			No Visual asbestos	Cement Bentonite Grout
		88			35				
		89			36				
		89			37				
		89			38				
		87			39				
		88			40				
		87			41				
		88			42				
		88			43				
		89			44				
		89			45				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-4** SHEET NUMBER 3 of 3

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 10/27/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: 5582.10

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		89			46			**Dry Waste** Pliable Plastic, Wood, Metal, and Paper Materials No Visual Asbestos	(Abrasive Sheath) Cement Bentonite Grout
		90			47				
		90			48				
		90			49				Thermocouple Probe
								Total Boring Depth	

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.
7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-6**

215 Feet

CLIENT:	Bridgeton Landfill, LLC
PROJECT NAME:	Temperature Monitoring Probe
PROJECT NUMBER:	5582.1
PROJECT LOCATION:	Bridgeton, Missouri
BORING LOCATION:	North Slope
AES PROJECT NO:	5582.1
AES GEOLOGIST:	ROBERT H. HILL II
START DATE:	10/16/12
FINISH DATE:	10/18/12
START TIME:	09:30 a.m.
FINISH TIME:	10:00 a.m.

DRILLING CONTRACTOR:	Frontz Drilling
DRILLER:	Kris Lauer
DRILLING RIG:	Versa-Sonic Drill Rig
DRILLING METHOD:	Sonic Rotary
SAMPLING METHOD:	N/A
BORING DIAMETER:	6 in.
WELL DIAMETER:	5 3/4 inch
WELL COMPLETION:	N/A
SURFACE ELEVATION:	487.40
TOC ELEVATION:	N/A
WATER LEVEL:	N/A
WATER ELEVATION:	N/A
DATE:	10/16/2012

WELL CONSTRUCTION DETAILS

MATERIAL:	Steel
DIAMETER:	6 in.
WELL TOTAL DEPTH:	215 ft. BGS
SCREEN LENGTH:	N/A
RISER LENGTH:	N/A
TOP OF SCREEN:	N/A
BOTTOM OF SCREEN:	N/A
SCREEN SLOT:	N/A
TOP OF FILTER PACK:	N/A
TOP OF SEAL:	N/A
TYPE OF SEAL:	Cement Bentonite Grout
TYPE OF FILTER PACK:	N/A

SAMPLE TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES AND WELL CONSTRUCTION
		N/A			1–10			**Soil Cover**	**(40 Sch. CPVC Conduit)**
		83			10–20			**Municipal Solid Waste** Slightly Moist - No Visible Asbestos	**Cement Bentonite Grout** **(Drilling Mud Added)**

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-6**	SHEET NUMBER 2 of 9
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 10/16/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		108			21 22 23 24 25 26 27 28 29 30			**Municipal Solid Waste** Slightly Moist - No Visible Asbestos	**(Abrasive Sheath)** **Cement Bentonite Grout** **Thermocouple Probe**
		102			31 32 33 34 35 36 37 38 39 40				
		100			41 42 43 44 45				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-6**	SHEET NUMBER 3 of 9
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 10/16/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		100			46 47 48 49 50				Brown Silty Clay @ 47' to 48' bgs.
		120			51 52 53 54 55 56 57 58 59 60			**Municipal Solid Waste** Slightly Moist - No Visible Asbestos	**Thermocouple Probe** **(Abrasive Sheath)** **Cement Bentonite Grout**
		130			61 62 63 64 65 66 67 68 69 70				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-6**	SHEET NUMBER 4 of 9
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 10/17/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		100			71 72 73 74 75 76 77 78 79 80				Thermocouple Probe
		112			81 82 83 84 85 86 87 88 89 90			**Municipal Solid Waste** Slightly Moist - No Visible Asbestos	**(Abrasive Sheath)** **Cement Bentonite Grout**
		131			91 92 93 94 95				**Thermocouple Probe**

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-6**

SHEET NUMBER 5 of 9

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 10/17/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: 5582.10

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		131			96 97 98 99 100				
		120			101 102 103 104 105 106 107 108 109 110			**Municipal Solid Waste** Slightly Moist - No Visible Asbestos	**(Abrasive Sheath)** **Cement Bentonite Grout** Red Silty Clay @ 110' to 112' bgs.
		148			111 112 113 114 115 116 117 118 119 120				**Thermocouple Probe**

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-6** SHEET NUMBER 6 of 9

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 10/16/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: 5582.10

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		129			121–129				
		128			130–140			**Municipal Solid Waste** **Slightly Moist - No Visible Asbestos**	**(Abrasive Sheath)** **Cement Bentonite Grout** Brown Silty Clay @ 130' to 134' bgs **Thermocouple Probe**
					141–145			**Municipal Solid Waste** Moist - No Visible Asbestos	

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-6**

SHEET NUMBER 7 of 9

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 10/18/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: 5582.10

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		129			146				
					147				
					148				
					149				
					150				
		119			151				
					152				
					153				
					154				
					155				Thermocouple Probe
					156				
					157			**Municipal Solid Waste**	
					158			Moist - No Visible Asbestos	(Abrasive Sheath) Cement Bentonite Grout
					159				
					160				
		109			161				
					162				
					163				
					164				
					165				
					166				
					167				
					168				
					169				
					170				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-6**

SHEET NUMBER 8 of 9

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 10/18/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: 5582.10

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		100			171				Thermocouple Probe
					172				
					173				
					174				
					175				
					176				
					177				
					178				
					179				
					180				
					181				
					182			**Municipal Solid Waste**	(Abrasive Sheath)
					183			Moist - No Visible Asbestos	**Cement Bentonite Grout**
					184				
		95			185				
					186				
					187				
					188				
					189				
					190				
					191				
					192				
		89			193				
					194				
					195				Thermocouple Probe

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-6**

SHEET NUMBER 9 of 9

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 10/18/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: 5582.10

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		89			196 197 198 199 200				
		99			201 202 203 204 205 206 207 208 209 210			**Municipal Solid Waste** Moist - No Visible Asbestos	**(Abrasive Sheath)** **Cement Bentonite Grout**
		89			211 212 213 214 215				**Thermocouple Probe** **(Quarry Bottom)**

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.
7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-7R**

SHEET NUMBER 1 of 10
225 Feet

CLIENT:	Bridgeton Landfill, LLC
PROJECT NAME:	Temperature Monitoring Probe
PROJECT NUMBER:	5582.1
PROJECT LOCATION:	Bridgeton, Missouri
BORING LOCATION:	Ten Feet NE of TMP-7
AES PROJECT NO:	5582.1
AES GEOLOGIST:	ROBERT H. HILL II
START DATE:	11/16/12
FINISH DATE:	11/16/12
START TIME:	07:00 a.m.
FINISH TIME:	17:00 p.m.

DRILLING CONTRACTOR:	Frontz Drilling
DRILLER:	Kris Lauer
DRILLING RIG:	Versa-Sonic Drill Rig
DRILLING METHOD:	Sonic Rotary
SAMPLING METHOD:	N/A
BORING DIAMETER:	4 in.
WELL DIAMETER:	3 7/8 inch
WELL COMPLETION:	N/A
SURFACE ELEVATION:	503.00
TOC ELEVATION:	N/A
WATER LEVEL:	N/A
WATER ELEVATION:	N/A
DATE:	11/16/2012

WELL CONSTRUCTION DETAILS

MATERIAL:	Steel
DIAMETER:	4 In.
WELL TOTAL DEPTH:	225 ft. BGS
SCREEN LENGTH:	N/A
RISER LENGTH:	N/A
TOP OF SCREEN:	N/A
BOTTOM OF SCREEN:	N/A
SCREEN SLOT:	N/A
TOP OF FILTER PACK:	N/A
TOP OF SEAL:	N/A
TYPE OF SEAL:	Cement Bentonite Grout
TYPE OF FILTER PACK:	N/A

SAMPLE TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES AND WELL CONSTRUCTION
					1			Soil Cover	(40 Sch. CPVC Conduit)
					2				
					3				
					4				
					5				
					6				
					7				
					8				
		N/A			9			Municipal Solid Waste	
		N/A			10				Cement Bentonite Grout
		N/A			11				
		N/A			12				
		N/A			13				
		N/A			14				
		N/A			15				
		N/A			16				
		N/A			17				
		N/A			18				
		N/A			19				
		N/A			20				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-7R**	SHEET NUMBER 2 of 10
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 11/16/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			21				
		N/A			22				
		N/A			23				
		N/A			24				
		N/A			25				Thermocouple Probe
		N/A			26				
		N/A			27				
		N/A			28				
		N/A			29				
		N/A			30				
		N/A			31				
		N/A			32				
		N/A			33			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			34				
		N/A			35				
		N/A			36				
		N/A			37				
		N/A			38				
		N/A			39				
		N/A			40				
		N/A			41				
		N/A			42				
		N/A			43				
		N/A			44				
		N/A			45				Thermocouple Probe

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA Environmental Solutions, Inc.	LOG OF BORING NO.: **TMP-7R**	SHEET NUMBER 3 of 10
7311 W. 130th St, Overland Park, KS 66213	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 11/16/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			46			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			47				
		N/A			48				
		N/A			49				
		N/A			50				
		N/A			51				
		N/A			52				
		N/A			53				
		N/A			54				
		N/A			55				
		N/A			56				
		N/A			57				
		N/A			58				
		N/A			59				
		N/A			60				
		N/A			61				
		N/A			62				
		N/A			63				
		N/A			64				
		N/A			65				Thermocouple Probe
		N/A			66				
		N/A			67				
		N/A			68				
		N/A			69				
		N/A			70				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-7R**	SHEET NUMBER 4 of 10
	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 11/16/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			71				
		N/A			72				
		N/A			73				
		N/A			74				
		N/A			75				
		N/A			76				
		N/A			77				
		N/A			78				
		N/A			79				
		N/A			80				
		N/A			81				
		N/A			82				
		N/A			83			**Municipal Solid Waste**	**(Abrasive Sheath) Cement Bentonite Grout**
		N/A			84				
		N/A			85				**Thermocouple Probe**
		N/A			86				
		N/A			87				
		N/A			88				
		N/A			89				
		N/A			90				
		N/A			91				
		N/A			92				
		N/A			93				
		N/A			94				
		N/A			95				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-7R**	SHEET NUMBER 5 of 10
	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 11/16/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			96			Municipal Solid Waste	Thermocouple Probe (Abrasive Sheath) Cement Bentonite Grout
		N/A			97				
		N/A			98				
		N/A			99				
		N/A			100				
		N/A			101				
		N/A			102				
		N/A			103				
		N/A			104				
		N/A			105				
		N/A			106				
		N/A			107				
		N/A			108				
		N/A			109				
		N/A			110				
		N/A			111				
		N/A			112				
		N/A			113				
		N/A			114				
		N/A			115				
		N/A			116				
		N/A			117				
		N/A			118				
		N/A			119				
		N/A			120				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-7R**	SHEET NUMBER 6 of 10
	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 11/16/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			121			Municipal Solid Waste	Thermocouple Probe (Abrasive Sheath) Cement Bentonite Grout Thermocouple Probe
		N/A			122				
		N/A			123				
		N/A			124				
		N/A			125				
		N/A			126				
		N/A			127				
		N/A			128				
		N/A			129				
		N/A			130				
		N/A			131				
		N/A			132				
		N/A			133				
		N/A			134				
		N/A			135				
		N/A			136				
		N/A			137				
		N/A			138				
		N/A			139				
		N/A			140				
		N/A			141				
		N/A			142				
		N/A			143				
		N/A			144				
		N/A			145				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-7R**	SHEET NUMBER 7 of 10
	GEOLOGIST: Robert H. Hill II	
CLIENT: Bridgeton Landfill, LLC	DATE: 11/16/2012	
PROJECT NAME: Temperature Monitoring Probe	PROJECT NUMBER: N/A	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			146				
		N/A			147				
		N/A			148				
		N/A			149				
		N/A			150				
		N/A			151				
		N/A			152				
		N/A			153				
		N/A			154				
		N/A			155				
		N/A			156				
		N/A			157				
		N/A			158			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			159				
		N/A			160				
		N/A			161				
		N/A			162				
		N/A			163				
		N/A			164				
		N/A			165				Thermocouple Probe
		N/A			166				
		N/A			167				
		N/A			168				
		N/A			169				
		N/A			170				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-7R** SHEET NUMBER 8 of 10

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 11/16/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			171			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			172				
		N/A			173				
		N/A			174				
		N/A			175				
		N/A			176				
		N/A			177				
		N/A			178				
		N/A			179				
		N/A			180				
		N/A			181				
		N/A			182				
		N/A			183				Thermocouple Probe
		N/A			184				
		N/A			185				
		N/A			186				
		N/A			187				
		N/A			188				
		N/A			189				
		N/A			190				
		N/A			191				
		N/A			192				
		N/A			193				
		N/A			194				
		N/A			195				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-7R**

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 11/16/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			196			Municipal Solid Waste	Thermocouple Probe
		N/A			197				
		N/A			198				
		N/A			199				
		N/A			200				
		N/A			201				
		N/A			202				
		N/A			203				
		N/A			204				
		N/A			205				
		N/A			206				
		N/A			207				
		N/A			208				(Abrasive Sheath) Cement Bentonite Grout
		N/A			209				
		N/A			210				
		N/A			211				
		N/A			212				
		N/A			213				
		N/A			214				
		N/A			215				
		N/A			216				
		N/A			217				
		N/A			218				
		N/A			219				
		N/A			220				

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-7R**

SHEET NUMBER 10 of 10

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 11/16/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: N/A

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		N/A			221			Municipal Solid Waste	(Abrasive Sheath) Cement Bentonite Grout
		N/A			222				
		N/A			223				
		N/A			224				
		N/A			225				Thermocouple Probe
		N/A			226				(Refusal Near Quarry Bottom) Total Depth of Boring @ 225 Feet
		N/A			226				
		N/A			228				
		N/A			229				
		N/A			230				
		N/A			231				
		N/A			232				(Approximate Quarry Bottom)

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube

PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers

HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.
7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-9**

SHEET NUMBER 1 of 5
100 Feet

CLIENT:	Bridgeton Landfill, LLC
PROJECT NAME:	Temperature Monitoring Probe
PROJECT NUMBER:	5582.1
PROJECT LOCATION:	Bridgeton, Missouri
BORING LOCATION:	North Slope
AES PROJECT NO:	5582.1
AES GEOLOGIST:	ROBERT H. HILL II
START DATE:	10/18/12
FINISH DATE:	10/19/12
START TIME:	12:13 p.m.
FINISH TIME:	15:22 p.m.

DRILLING CONTRACTOR:	Frontz Drilling
DRILLER:	Kris Lauer
DRILLING RIG:	Versa-Sonic Drill Rig
DRILLING METHOD:	Sonic Rotary
SAMPLING METHOD:	N/A
BORING DIAMETER:	6 in.
WELL DIAMETER:	5 3/4 inch
WELL COMPLETION:	N/A
SURFACE ELEVATION:	486.00
TOC ELEVATION:	N/A
WATER LEVEL:	N/A
WATER ELEVATION:	N/A
DATE:	10/18/2012

WELL CONSTRUCTION DETAILS

MATERIAL:	Steel
DIAMETER:	6 In.
WELL TOTAL DEPTH:	100 ft. BGS
SCREEN LENGTH:	N/A
RISER LENGTH:	N/A
TOP OF SCREEN:	N/A
BOTTOM OF SCREEN:	N/A
SCREEN SLOT:	N/A
TOP OF FILTER PACK:	N/A
TOP OF SEAL:	N/A
TYPE OF SEAL:	Cement Bentonite Grout
TYPE OF FILTER PACK:	N/A

SAMPLE TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES AND WELL CONSTRUCTION
					1			**Soil Cover**	
					2				
					3				
					4				
					5				
					6				**(40 Sch. CPVC Conduit)**
					7				
					8				
					9				
					10				
					11				**Cement Bentonite Grout**
					12				
					13			**Municipal Solid Waste** Dry - No Visible Asbestos	
					14				
		129			15				
					16				
					17				
					18				
					19				
					20				**Thermocouple Probe**

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-9**	SHEET NUMBER 2 of 5
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 10/19/2012	
	PROJECT NUMBER: 5582.10	

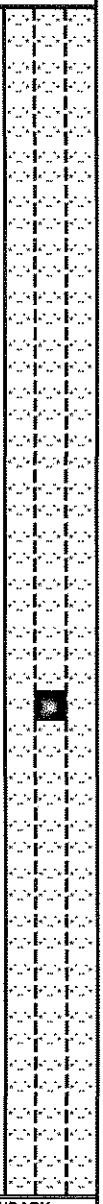
SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		131			21 22 23 24 25 26 27 28 29 30				
		138			31 32 33 34 35 36 37 38 39 40			**Municipal Solid Waste** Slightly Moist - No Visible Asbestos	**(Abrasive Sheath)** **Cement Bentonite Grout** **Thermocouple Probe**
		147			41 42 43 44 45				

LEGEND:
SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA **Environmental Solutions, Inc.** 7311 W. 130th St, Overland Park, KS 66213	LOG OF BORING NO.: **TMP-9**	SHEET NUMBER 3 of 5
CLIENT: Bridgeton Landfill, LLC	GEOLOGIST: Robert H. Hill II	
PROJECT NAME: Temperature Monitoring Probe	DATE: 10/19/2012	
	PROJECT NUMBER: 5582.10	

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		147			46 47 48 49 50				
		148			51 52 53 54 55 56 57 58 59 60			**Municipal Solid Waste** Slightly Moist - No Visible Asbestos	**(Abrasive Sheath)** **Cement Bentonite Grout** **Thermocouple Probe**
		141			61 62 63 64 65 66 67 68 69 70				



LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-9**

SHEET NUMBER 4 of 5

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 10/19/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: 5582.10

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		142			71 72 73 74 75 76 77 78 79 80			**Municipal Solid Waste** Slightly Moist - No Visible Asbestos	**Thermocouple Probe** **(Abrasive Sheath)** **Cement Bentonite Grout**
		149			81 82 83 84 85 86 87 88 89 90				
		160			91 92 93 94 95			**Municipal Solid Waste** Moist - No Visible Asbestos	

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

AQUATERRA

Environmental Solutions, Inc.

7311 W. 130th St, Overland Park, KS 66213

LOG OF BORING NO.: **TMP-9** SHEET NUMBER 5 of 5

GEOLOGIST: Robert H. Hill II

CLIENT: Bridgeton Landfill, LLC

DATE: 10/19/2012

PROJECT NAME: Temperature Monitoring Probe

PROJECT NUMBER: 5582.10

SAMPLER TYPE	SAMPLE DEPTH	Temp °F	PID (PPM)	RECOVERY (FT)	DEPTH IN FEET	USCS CLASS	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
		160			96 97 98 99 100			**Municipal Solid Waste** Moist - No Visible Asbestos	**(Abrasive Sheath)** **Cement Bentonite Grout**

LEGEND:

SS - Split Spoon
CS - 5 foot CME Sampler
ST - Shelby Tube
PID - Photoionization Detector
PP - Pocket Penetrometer
HSA - Hollow Stem Augers
HA - Hand Auger
WB - Wash Bore
RB - Rock Bit
NX - Rock Core

THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: ACTUAL TRANSITIONS MAY BE GRADUAL.

APPENDIX E

HISTORIC LOCAL CROSS-SECTIONS

Elevation In Feet
Above Mean Sea Level

WATER LEVELS
May 23 & 24, 1984
February 3, 1984

500
480
460
440
420
400
380
360
340
320

NORTH
A

BORING NO.D-83
BORING NO.I-62
BORING NO.S-61
BORING NO.S-60
BORING NO.S-82
BORING NO.I-59
BORING NO.I-58
BORING NO.I-56
BORING NO.I-55
BORING NO.S-54
BORING NO.S-76
BORING NO.S-75
BORING NO.D-89
BORING NO.D-81

ROAD
Ditch
Silty Clay
Fine Sand
Silty Sand
Sand
Sand & Clay Seams
Silty Clay
Sand
Sand & Gravel
Silty Clay
Fine to Coarse Sand
Sand
Sand & Gravel
Sand
Sand & Gravel
Silty Sand
Coarse Sand
BASE OF AQUITARD
Sandy Clay (Fill)
Sandy Silt
Sand
Silty Clay
Silty Sand
Sand
AQUIFER
Sandy Clay, Trash, Limestone Boulders
Sandy Clay
Fine Sand
Clay
Fine Sand Trace Gravel
Sandy Clay, Trash
Sandy Clay, Trash, Boulders
Fine Sand
Sandy Clay
Gray Clay
Fine Sand, Trace Gravel
Fine Sand
Sandy Clay, Boulders
Clay, Chat
Sandy Clay
Clay
Fine Sand Trace Gravel
Sandy Clay, Trash
Sandy Clay
Limestone Boulders (?)
Sandy Clay
Fine Sand & Clay Layers
Clay
Fine Sand With Gravel
Sandy Silt
Gravel
Clayey Silt
Sand
Silt
Silty Sand
Sand
Silty Clay
Silt & Sand Interbeds
Sand
Sand & Gravel
Sand
Sand & Gravel Interbeds
Sand
Sand & Gravel
Silty Clay & Clayey Silt
Silty Sand
Silty Clay
Silty Sand
Sand
APPROXIMATE TOP OF BEDROCK
LIMESTONE

Approximate Ground Surface
QUARRY
LOESS
LIMESTONE
BOTTOM OF QUARRY AT ELEV. 250'

SOUTH
A

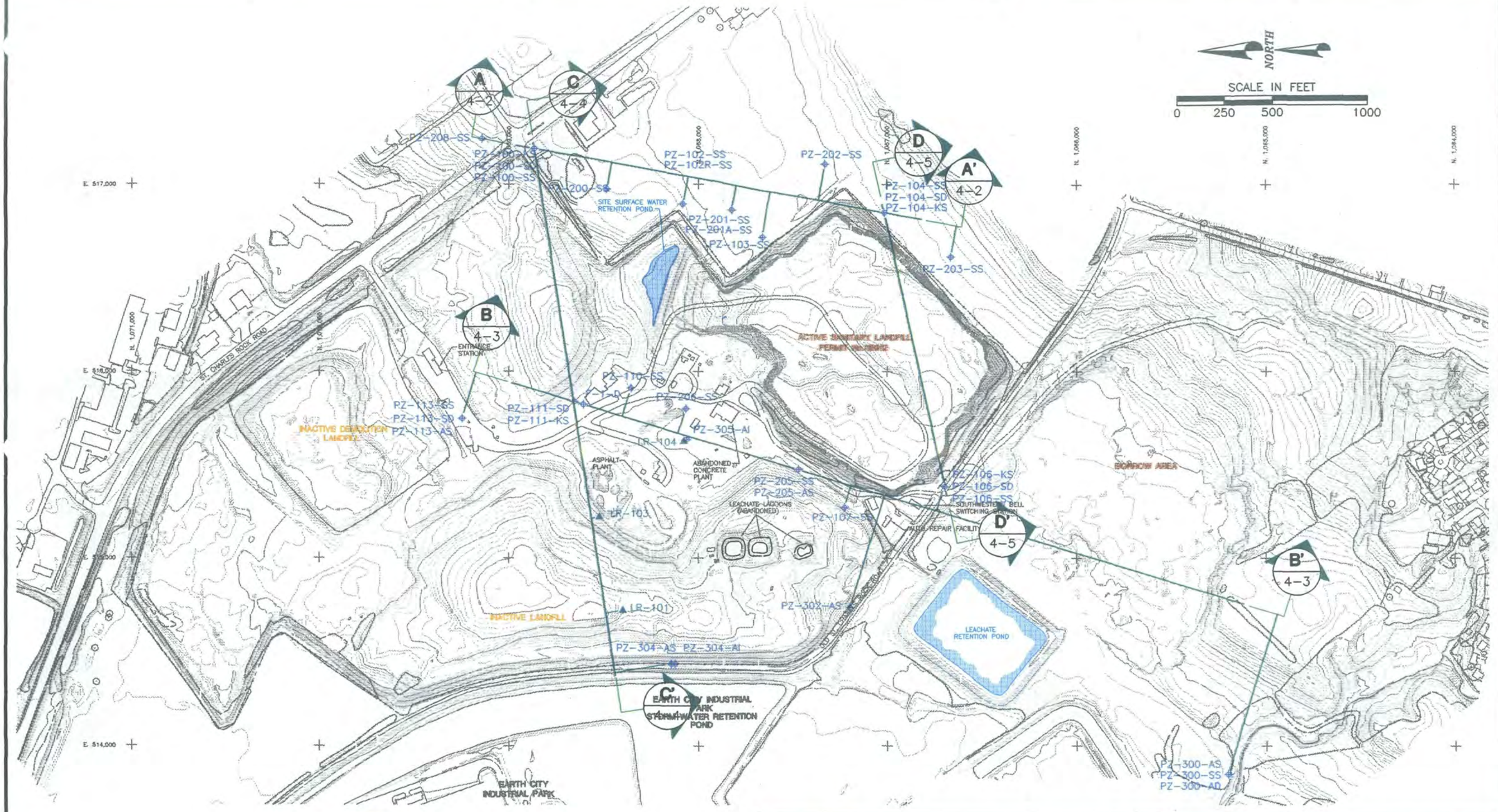
Elevation In Feet
Above Mean Sea Level

Notes:
1. Slopes Appear Steepened Because of High Vertical Exaggeration.
2. See Figure I-2 For Location of Profile.

Horizontal Scale: 1" = 600'
Vertical Scale: 1" = 20'
Vertical Exaggeration 30: 1

Burns & McDonnell
ENGINEERS · ARCHITECTS · CONSULTANTS

Figure I-3
GEOLOGIC PROFILE
NORTH AND SOUTH



NOTE:
TOPOGRAPHY PROVIDED BY SURDEX. JANUARY 1995

LEGEND

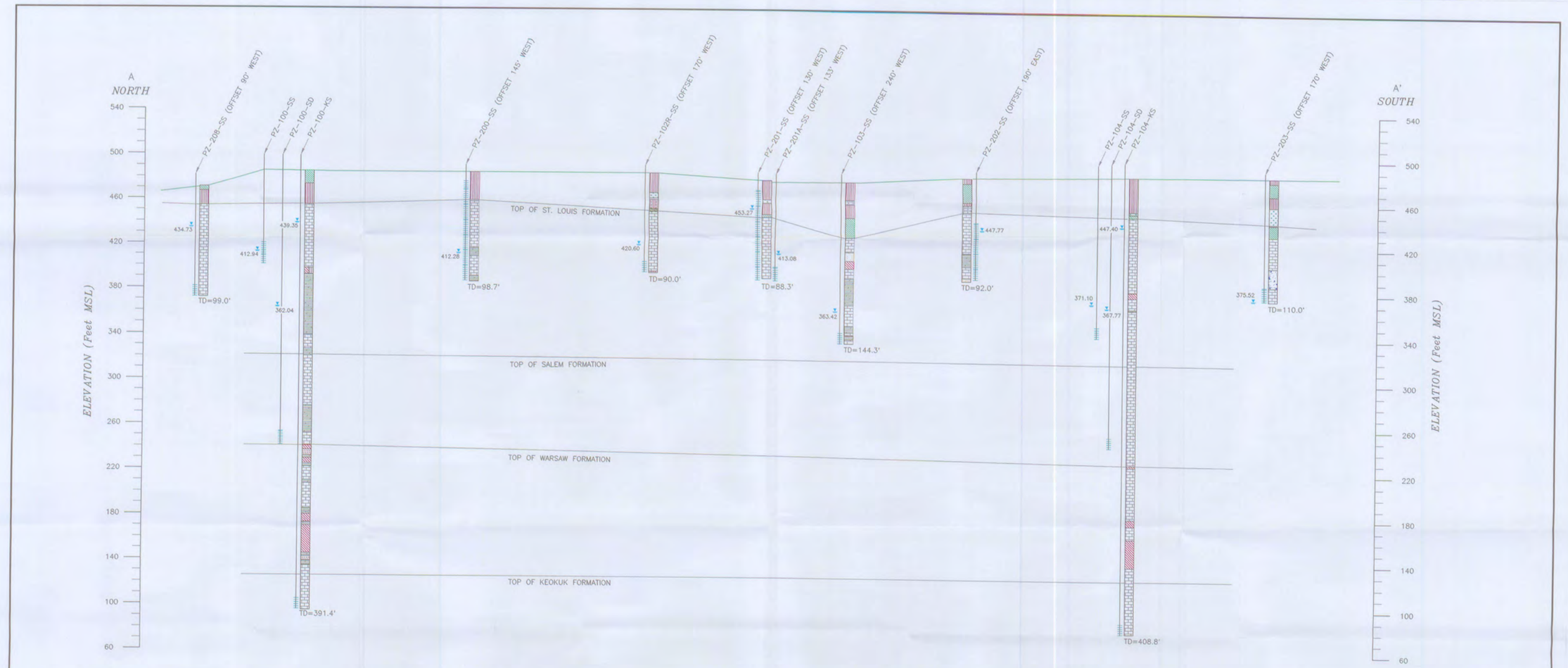
B / 4-3 — SECTION DESIGNATOR; GEOLOGIC CROSS SECTION FIGURE NUMBER

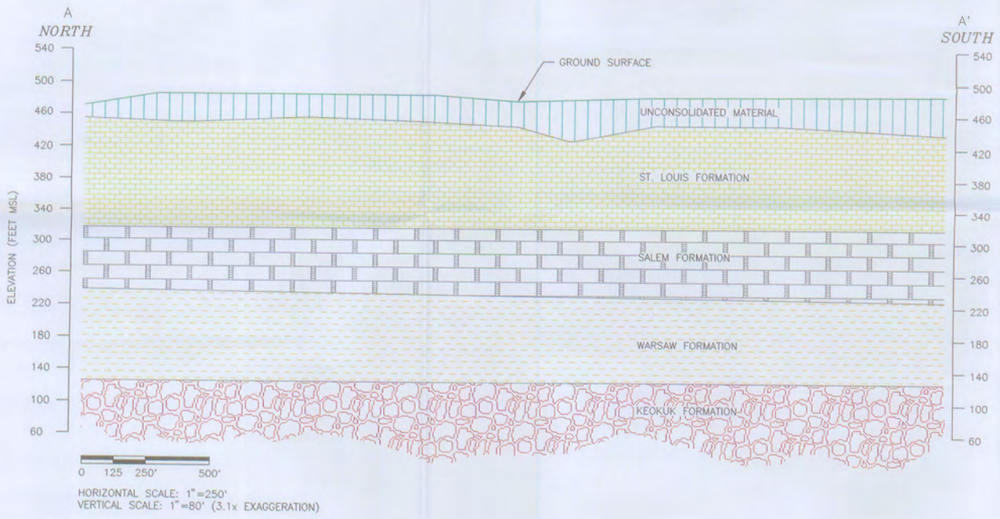
Golder Associates — Denver, Colorado

CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL

TITLE
GEOLOGIC CROSS SECTION LOCATION MAP

DRAWN	TMC	DATE	AUGUST 1996	JOB NO.	943-2848
CHECKED	BGT	SCALE	AS SHOWN	DWG. NO./REV. NO.	B089
REVIEWED	WEH	FILE NO.	2848B089	FIGURE NO.	4-1





EXPLANATION

PIEZOMETER DESIGNATION — PZ-100-KS

439.35 — WATER LEVEL (ELEV. FEET MSL) DATA COLLECTED ON JULY 12, 1996 EXCEPT WHERE OTHERWISE NOTED

PVC RISER PIPE

TOTAL DEPTH OF BOREHOLE (FEET BELOW GROUND SURFACE) TD=391.4' — WELL SCREEN INTERVAL

BEDROCK
- NOT SAMPLED
- LIMESTONE
- DOLOMITE
- SANDSTONE
- SILTSTONE
- CLAYSTONE
- COLLAPSE ZONE (INFILL CONSISTING OF LIMESTONE BOULDERS IN SILTSTONE AND/OR SANDSTONE MATRIX)

SOIL
- LOW PLASTICITY CLAY (CL)
- HIGH PLASTICITY CLAY (CH)
- SILT (ML)
- CLAYEY SAND (SC)
- SILTY SAND (SM)
- WELL GRADED SAND (SW)
- POORLY GRADED SAND (SP)
- POORLY GRADED GRAVEL (GP)
- SOLID WASTE

0 50' 100' 200'
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=40' (2.5 x EXAGGERATION)

NOTES:
1. GEOLOGIC CROSS SECTIONS PRESENT GENERALIZED SOIL AND BEDROCK STRATIGRAPHY BETWEEN BOREHOLE LOCATIONS. THE STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGIC EVIDENCE AND SO MAY VARY FROM THAT SHOWN. REFER TO THE BOREHOLE LOGS FOR DETAILED STRATIGRAPHY AT EACH BOREHOLE LOCATION.
2. TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

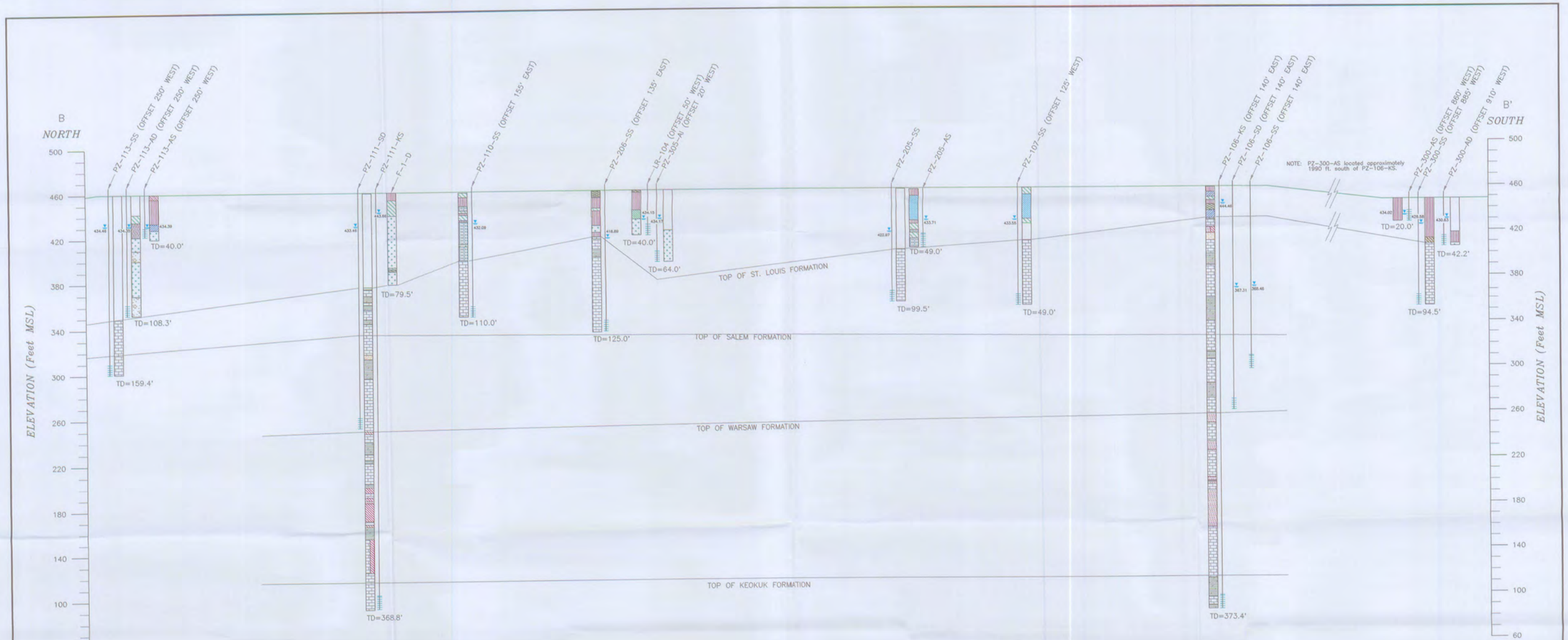
REV.	DATE	DESCRIPTION	DR. BY	APP. BY
0	9/14/95	ISSUED TO MONR	JMJ	CER

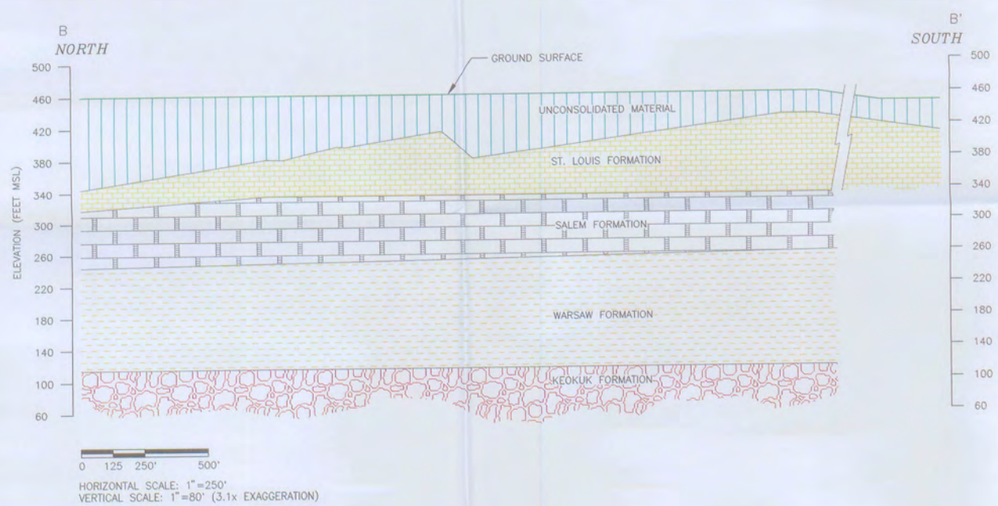
CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

TITLE: GEOLOGIC CROSS SECTION A-A'

Denver, Colorado — Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D098
FILE NO.	28480098	FIGURE	4-2





EXPLANATION

PIEZOMETER DESIGNATION — PZ-111-KS

443.66 — WATER LEVEL (ELEV. FEET MSL) DATA COLLECTED ON JULY 12, 1996 EXCEPT WHERE OTHERWISE NOTED

PVC RISER PIPE

TOTAL DEPTH OF BOREHOLE (FEET BELOW GROUND SURFACE) TD=368.8'

WELL SCREEN INTERVAL

BEDROCK
- NOT SAMPLED
- LIMESTONE
- DOLOMITE
- SANDSTONE
- SILTSTONE
- CLAYSTONE
- COLLAPSE ZONE (INFILL CONSISTING OF LIMESTONE BOULDERS IN SILTSTONE AND/OR SANDSTONE MATRIX)

SOIL
- LOW PLASTICITY CLAY (CL)
- HIGH PLASTICITY CLAY (CH)
- SILT (ML)
- CLAYEY SAND (SC)
- SILTY SAND (SM)
- WELL GRADED SAND (SW)
- POORLY GRADED SAND (SP)
- CLAYEY GRAVEL (GC)
- POORLY GRADED GRAVEL (GP)
- SOLID WASTE

0 50' 100' 200'
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=40' (2.5x EXAGGERATION)

NOTES:

1. GEOLOGIC CROSS SECTIONS PRESENT GENERALIZED SOIL AND BEDROCK STRATIGRAPHY BETWEEN BOREHOLE LOCATIONS. THE STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGIC EVIDENCE AND SO MAY VARY FROM THAT SHOWN. REFER TO THE BOREHOLE LOGS FOR DETAILED STRATIGRAPHY AT EACH BOREHOLE LOCATION.
2. TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995
3. WATER LEVELS FOR PZ-300-AS, PZ-300-SS, AND PZ-300-AD WERE COLLECTED ON APRIL 3, 1996. THIS WELL CLUSTER WAS DECOMISSIONED IN APRIL 1996.

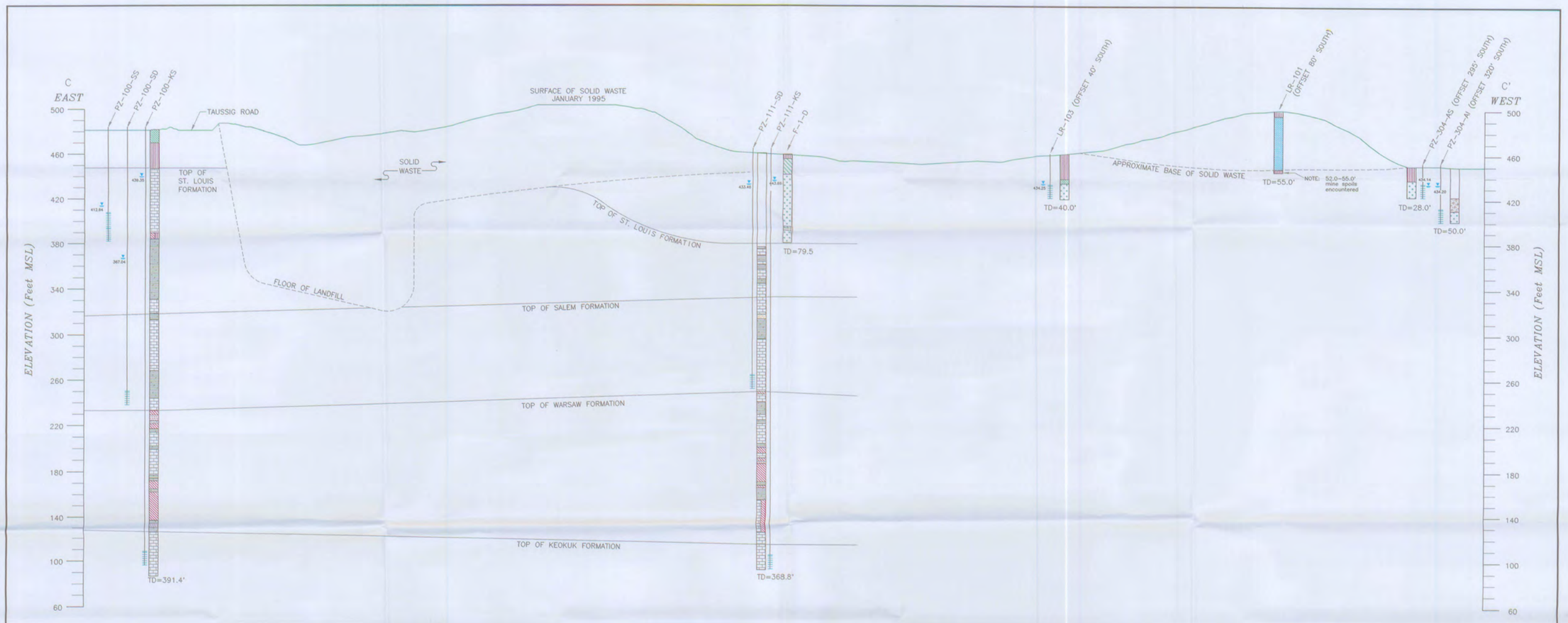
REV.	DATE	DESCRIPTION	DR. BY	APP. BY
0	9/14/95	ISSUED TO MDNR	JMJ	CER

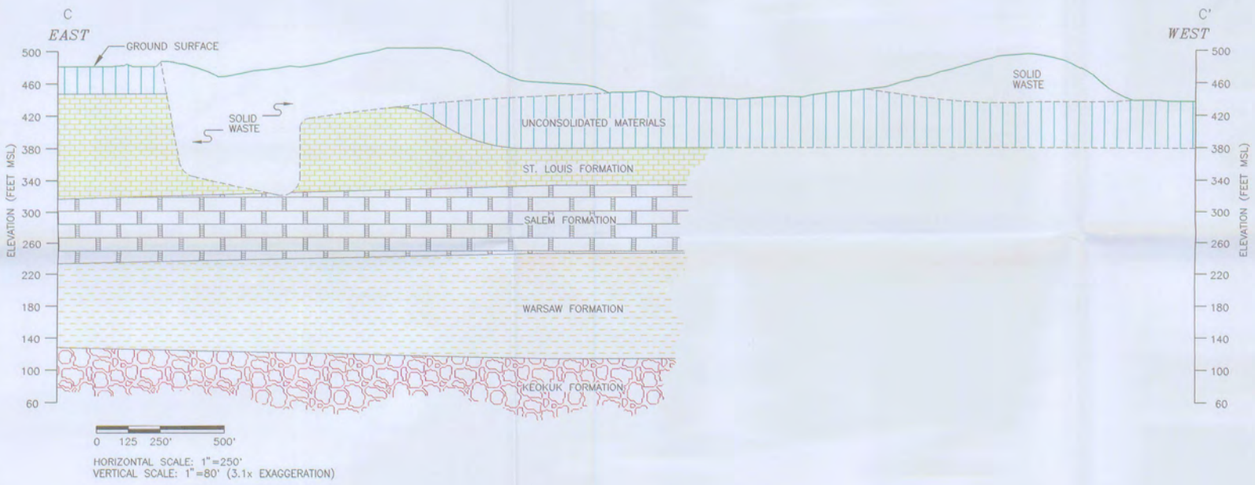
CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

TITLE: GEOLOGIC CROSS SECTION B-B'

Denver, Colorado — Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D095
FILE NO.	2848D095	FIGURE	4-3





EXPLANATION

PIEZOMETER DESIGNATION — PZ-100-KS

489.35 — WATER LEVEL (ELEV. FEET MSL) DATA COLLECTED ON JULY 12, 1996 EXCEPT WHERE OTHERWISE NOTED

PVC RISER PIPE

TOTAL DEPTH OF BOREHOLE (FEET BELOW GROUND SURFACE) TD=391.4' — WELL SCREEN INTERVAL

BEDROCK
- NOT SAMPLED
- LIMESTONE
- DOLOMITE
- SANDSTONE
- SILTSTONE
- CLAYSTONE
- COLLAPSE ZONE (INFILL CONSISTING OF LIMESTONE BOULDERS IN SILTSTONE AND/OR SANDSTONE MATRIX)

SOIL
- LOW PLASTICITY CLAY (CL)
- HIGH PLASTICITY CLAY (CH)
- SILT (ML)
- CLAYEY SAND (SC)
- SILTY SAND (SM)
- WELL GRADED SAND (SW)
- POORLY GRADED SAND (SP)
- POORLY GRADED GRAVEL (GP)
- SOLID WASTE

NOTES:

1. GEOLOGIC CROSS SECTIONS PRESENT GENERALIZED SOIL AND BEDROCK STRATIGRAPHY BETWEEN BOREHOLE LOCATIONS. THE STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGIC EVIDENCE AND SO MAY VARY FROM THAT SHOWN. REFER TO THE BOREHOLE LOGS FOR DETAILED STRATIGRAPHY AT EACH BOREHOLE LOCATION.
2. ESTIMATED BASE OF LANDFILL OBTAINED FROM MIDWEST ENVIRONMENTAL CONSULTANTS, SEPTEMBER 1994 PERMIT CONSOLIDATION DRAWINGS.
3. TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

0 50' 100' 200'
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=40' (2.5 x EXAGGERATION)

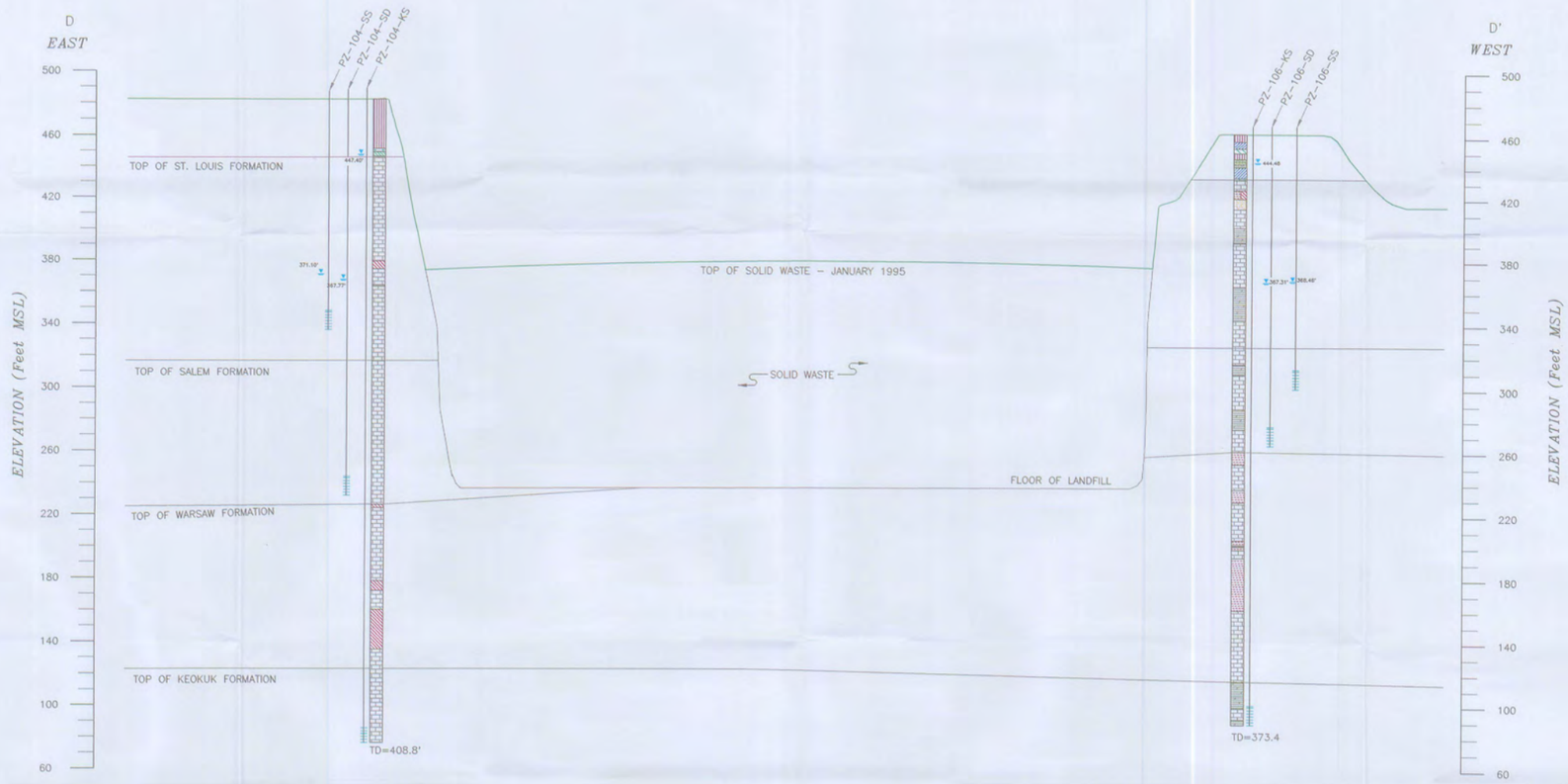
REV.	DATE	DESCRIPTION	DR. BY	APP. BY
0	9/14/95	ISSUED TO MDNR	JMJ	CER

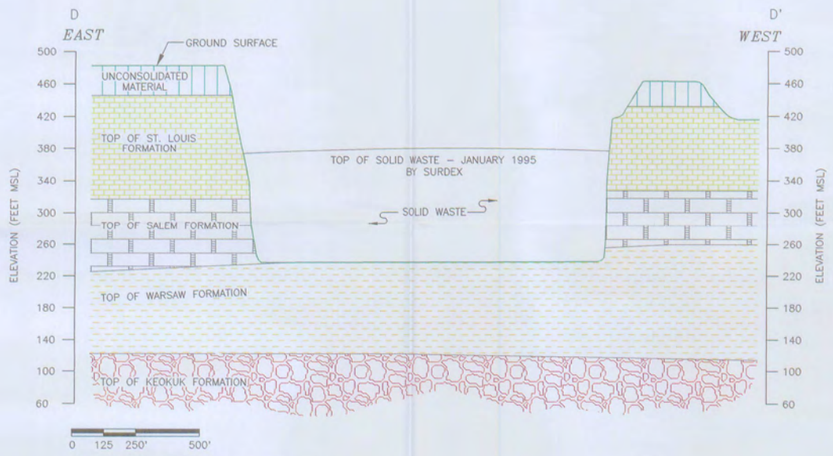
CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

TITLE: GEOLOGIC CROSS SECTION C-C'

Golder Associates — Denver, Colorado

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D096
FILE NO.	28480096	FIGURE	4-4





EXPLANATION

PIEZOMETER DESIGNATION — PZ-104-KS

447.40 — WATER LEVEL (ELEV. FEET MSL) DATA COLLECTED ON JULY 12, 1996 EXCEPT WHERE OTHERWISE NOTED

PVC RISER PIPE

WELL SCREEN INTERVAL

TOTAL DEPTH OF BOREHOLE (FEET BELOW GROUND SURFACE) — TD=408.8'

BEDROCK
- NOT SAMPLED
- LIMESTONE
- DOLOMITE
- SANDSTONE
- SILTSTONE
- CLAYSTONE
- COLLAPSE ZONE (INFILL CONSISTING OF LIMESTONE BOULDERS IN SILTSTONE AND/OR SANDSTONE MATRIX)

SOIL
- LOW PLASTICITY CLAY (CL)
- HIGH PLASTICITY CLAY (CH)
- SILT (ML)
- CLAYEY SAND (SC)
- SILTY SAND (SM)
- WELL GRADED SAND (SW)
- POORLY GRADED SAND (SP)
- POORLY GRADED GRAVEL (GP)
- SOLID WASTE

NOTES:

1. GEOLOGIC CROSS SECTIONS PRESENT GENERALIZED SOIL AND BEDROCK STRATIGRAPHY BETWEEN BOREHOLE LOCATIONS. THE STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGIC EVIDENCE AND SO MAY VARY FROM THAT SHOWN. REFER TO THE BOREHOLE LOGS FOR DETAILED STRATIGRAPHY AT EACH BOREHOLE LOCATION.
2. ESTIMATED BASE OF LANDFILL OBTAINED FROM MIDWEST ENVIRONMENTAL CONSULTANTS, SEPTEMBER 1994 PERMIT CONSOLIDATION DRAWINGS.
3. TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

0 50' 100' 200'
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=40' (2.5 x EXAGGERATION)

REV.	DATE	DESCRIPTION	DR. BY	APP. BY
0	9/14/95	ISSUED TO MDNR	JMJ	CER

CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

TITLE: GEOLOGIC CROSS SECTION D-D'

Golder Associates — Denver, Colorado

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D097
FILE NO.	2848D097	FIGURE	4-5

NORTH

0 100 200 425 850

Scale in Feet
Graphic Scale: 1 inch = 425 feet

EXPLANATION

- Section Designator
- PZ-202-SS — Piezometer Location
- LR-104 — Leachate Riser

A
PZ-208-SS
PZ-100-KS
PZ-100-SD
PZ-100-SS
C
B
PZ-200-SS
PZ-102-SS
PZ-102R-SS
PZ-201-SS
PZ-201A-SS
PZ-202-SS
D
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
PZ-104-SS
PZ-104-SD
PZ-104-KS
PZ-103-SS
PZ-203-SS
A'
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
ACTIVE SANITARY LANDFILL PERMIT No.118912
ENTRANCE STATION
ST. CHARLES ROCK ROAD
F-1-D
PZ-110-SS
PZ-111-SD
PZ-111-KS
B
C
PZ-206-SS
PZ-305-AI
LR-104
CONCRETE PLANT
PZ-113-SS
PZ-113-SD
PZ-113-AS
CLOSED DEMOLITION LANDFILL
ASPHALT PLANT
PZ-205-SS
PZ-205-AS
LEACHATE LAGOONS (ABANDONED)
PZ-107-SS
PZ-106-KS
PZ-106-SD
PZ-106-SS
BORROW AREA
AUTO REPAIR FACILITY
APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY
INACTIVE LANDFILL
OLD ST. CHARLES ROCK ROAD
CLOSED LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
PZ-300-AS
PZ-300-SS
PZ-300-AD
B'

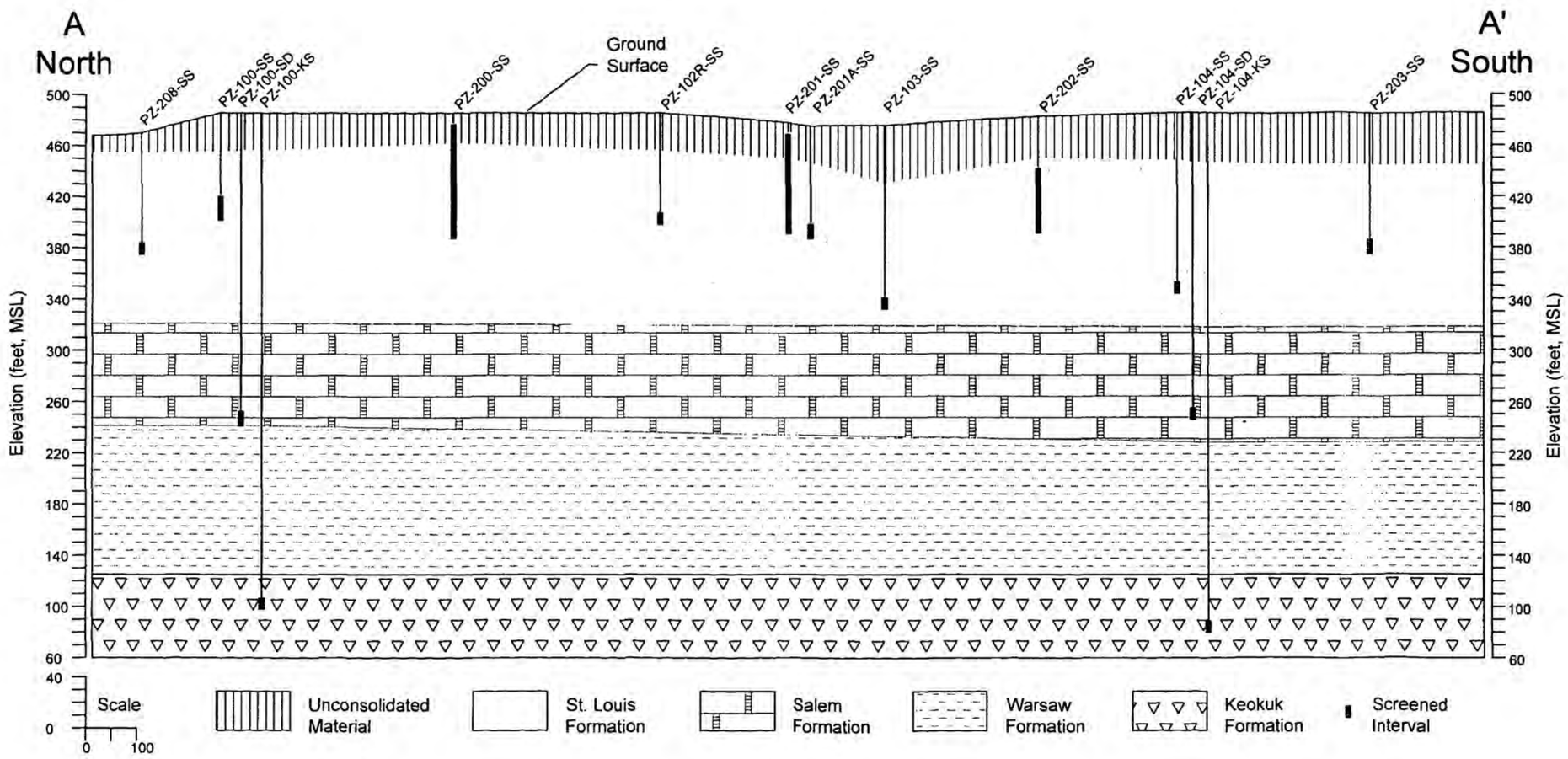
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-3
Geologic Cross Section Location Map

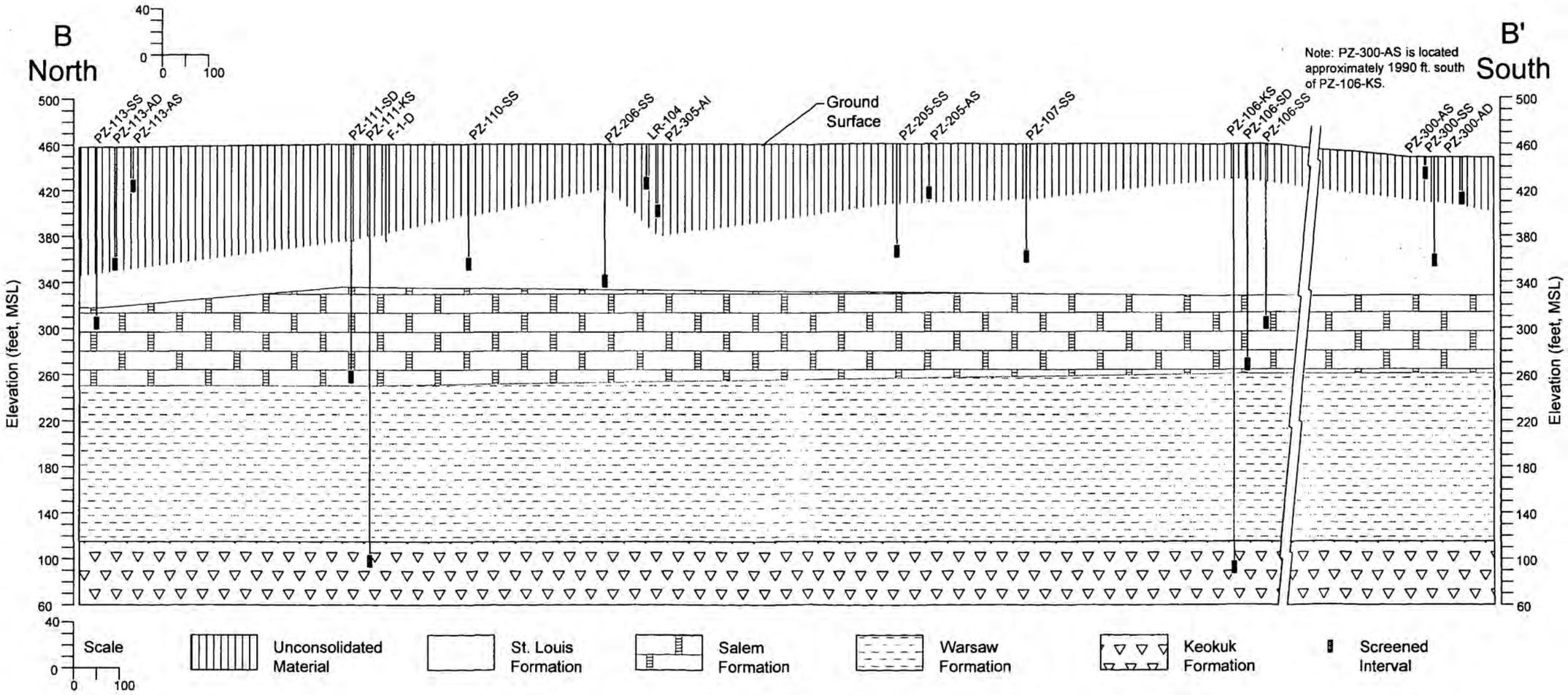


© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-4
Geologic Cross Section A-A'

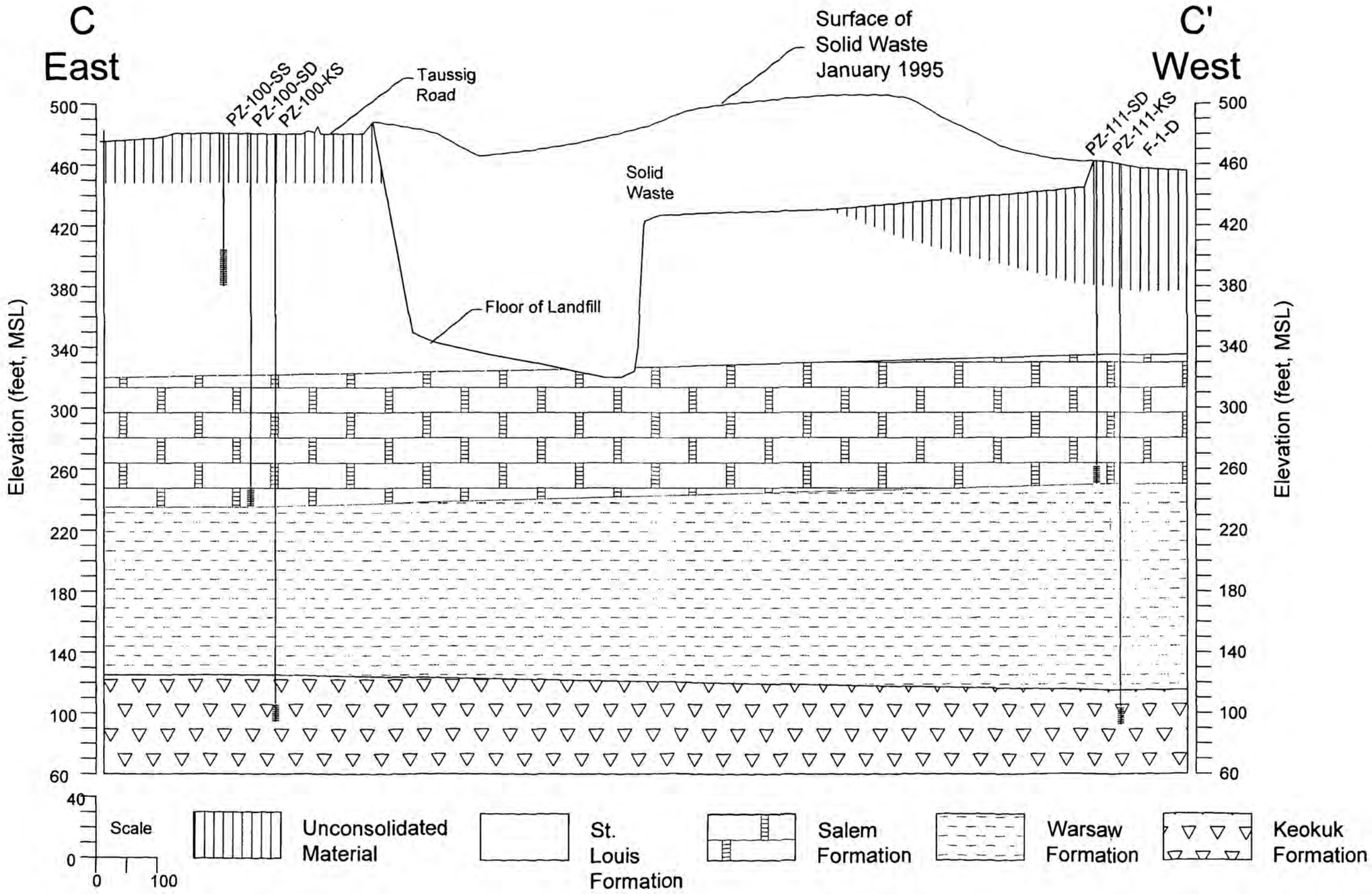


© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-5
Geologic Cross Section B-B'



© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-6
Geologic Cross Section C-C'

D

East

D'

West

PZ-104-SS
PZ-104-SD
PZ-104-KS

PZ-106-KS
PZ-106-SD
PZ-106-SS

Top of Solid Waste
January 1995

Solid
Waste

Floor of Landfill

Elevation (feet, MSL)

500
460
420
380
340
300
260
220
180
140
100
60

40
Scale
0
0 100

Unconsolidated Material

St. Louis Formation

Salem Formation

Warsaw Formation

Keokuk Formation

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-7
Geologic Cross Section D-D'

NORTHWEST

A

Area 2

Area 1

North Quarry Portion of the Bridgeton Landfill

SOUTHEAST

A'

BEND IN SECTION

Note: Projected Distance to the Cross Section (Typical)

D-83 (55 ft from Northeast) Property Boundary

I-62 (70 ft from Northeast)

WL-222 (58 ft from Southwest)

PVC-34 (78 ft from Southwest)

WL-223 (14 ft from Southwest)

PVC-20 (41 ft from Northeast)

PVC-6 (80 ft from Southwest)

WL-238 (77 ft from Northeast)

PVC-19 (27 ft from Northeast)

WL-226

PVC-12 (115 ft from Northeast)

PVC-9 (20 ft from Southwest)

WL-241 (87 ft from Southwest)

WL-240 (56 ft from Northeast)

WL-214 (78 ft from Southwest)

Closed Demolition Landfill

Solid Waste

PZ-207-AS (76 ft from Northeast)

Clay

Fill

Loess ?

Site Access Road

WL-106A (103 ft from Southwest)

WL-117 24' Depth (7 ft from Southwest)

PVC-36 21' Depth (40 ft from Southwest)

PVC-24 (60 ft from Northeast)

WL-108 (69 ft from Northeast)

PVC-37 (104 ft from Northeast)

WL-119 (70 ft from Southwest)

(58 ft from Northeast) WL-109D

D-14 (75 ft from Northeast)

LCS-6B (83 ft from Southwest)

Solid Waste

PZ-101-SS (118 ft from Southwest)

PZ-200-SS (181 ft from Northeast)

PZ-102R-SS (121 ft from Southwest)

PZ-102-SS (122 ft from Southwest)

Loess

Alluvium

ELEVATION ABOVE MEAN SEA LEVEL (feet)

450

400

350

300

430.37

430.18

430.40

452.92 Not Used

459.30

460.14

459.13

436.77

Alluvium

St. Louis Fm

St. Louis Fm

460

455

450

445

440

435

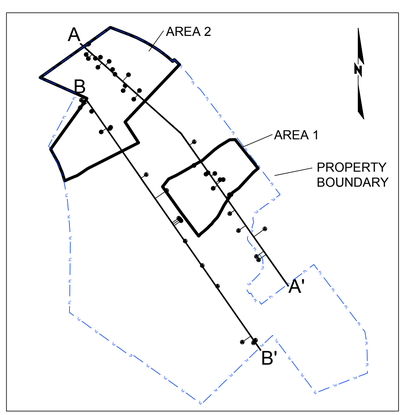
GEOLOGIC LEGEND

- Solid Waste
- Clay
- Loess
- Alluvium
- St Louis Fm Limestone
- Salem Fm Limestone
- Warsaw Fm
- Keokuk Fm Limestone

Well Screen Interval

LEGEND

- September 2013 Alluvial Groundwater Elevation Taken at Well
- September 2013 St Louis Fm Groundwater Elevation Taken at Well
- September 2013 Leachate Groundwater Elevation Taken at Well
- September 2013 Alluvial Groundwater Elevation at Cross Section Intersection
- September 2013 St Louis Fm Groundwater Elevation at Cross Section Intersection
- September 2013 Potentiometric Contours
- Inferred Hydraulic Gradient within the Bedrock Unit
- Max/Min Alluvial Groundwater Elevation at Cross Section Intersection (July 2012 Through September 2013)
- Max/Min St Louis FM Groundwater Elevation at Cross Section Intersection (July 2012 Through September 2013)



Cross Section Index

Notes: These cross-sections were developed to display groundwater conditions beneath the site.
Please see the cross-sections in Appendix M for detailed portrayals of the RIM occurrences in Areas 1 and 2.
Ground surface from Aerial Topography provided by Cooper Aerial Surveys Co. and is dated December 2, 2016

0 75 150

HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION 5X

Figure 5-13

Cross Section A-A'

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-5\Fig-5-13_5-14-Xsections.dwg 1/22/18

NORTHWEST B

SOUTHEAST B'

Area 2 Limits

Inactive Sanitary Landfill

Transfer Station

Asphalt Plant

South Quarry Portion of the Bridgeton Landfill

Note: Projected Distance to the Cross Section (Typical)

BUFFER ZONE

D6 (52 ft from Southwest)
WL-202 (161 ft from Southwest)
S-61 (54 ft from Southwest)
MW-102 (129 ft from Southwest)
WL-211 (32 ft from Southwest)
WL-210 (82 ft from Southwest)
D-12 (64 ft from Northeast)
S-10 (45 ft from Northeast)
I-11 (35 ft from Northeast)
D-87 (82 ft from Northeast)
PZ-112-AS (184 ft from Northeast)
PZ-111-SD (106 ft from Northeast)
PZ-111-KS (110 ft from Northeast)
MW-F1D (112 ft from Northeast)
PZ-110-SS
PZ-109-SS
LCS-1D (14 ft from Northeast)
LCS-3C (138 ft from Southwest)
PZ-104-SS (19 ft from Northeast)
PZ-104-KS PZ-104-SD (22 ft from Southwest)
PL PL PL Property Boundary

Solid Waste
Fill
Loess
Alluvium
St. Louis Fm
Salem Fm
Warsaw Fm
Keokuk Fm

430.12
429.99
429.97
430.12
430.42
430.18
429.73
430.06
430.50
430.75
463.89
431.35
461.52
456.45
463.90

ELEVATION ABOVE MEAN SEA LEVEL (feet)

450
400
350
300
250
200
150
100

NM

A
B
AREA 2
AREA 1
PROPERTY BOUNDARY
A'
B'
N

Cross Section Index

GEOLOGIC LEGEND

- Solid Waste
- Fill
- Loess
- Alluvium
- St Louis Fm Limestone
- Salem Fm Limestone
- Warsaw Fm
- Keokuk Fm Limestone

LEGEND

- Well Screen Interval
- September 2013 Alluvial Groundwater Elevation Taken at Well
- September 2013 St Louis Fm Groundwater Elevation Taken at Well
- September 2013 Alluvial Groundwater Elevation at Cross Section Intersection
- September 2013 St Louis Fm Groundwater Elevation at Cross Section Intersection
- September 2013 Potentiometric Contours
- Inferred Hydraulic Gradient within the Bedrock Unit
- Inferred Groundwater Flow Direction within the Alluvium
- Max/Min Alluvial Groundwater Elevation at Cross Section Intersection (July 2012 Through September 2013)
- Max/Min St Louis FM Groundwater Elevation at Cross Section Intersection (July 2012 Through September 2013)

Notes: These cross-sections were developed to display groundwater conditions beneath the site.
Please see the cross-sections in Appendix M for detailed portrayals of the RIM occurrences in Areas 1 and 2.
Ground surface from Aerial Topography provided by Cooper Aerial Surveys Co. and is dated December 2, 2016

0 75 150

HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION 5X

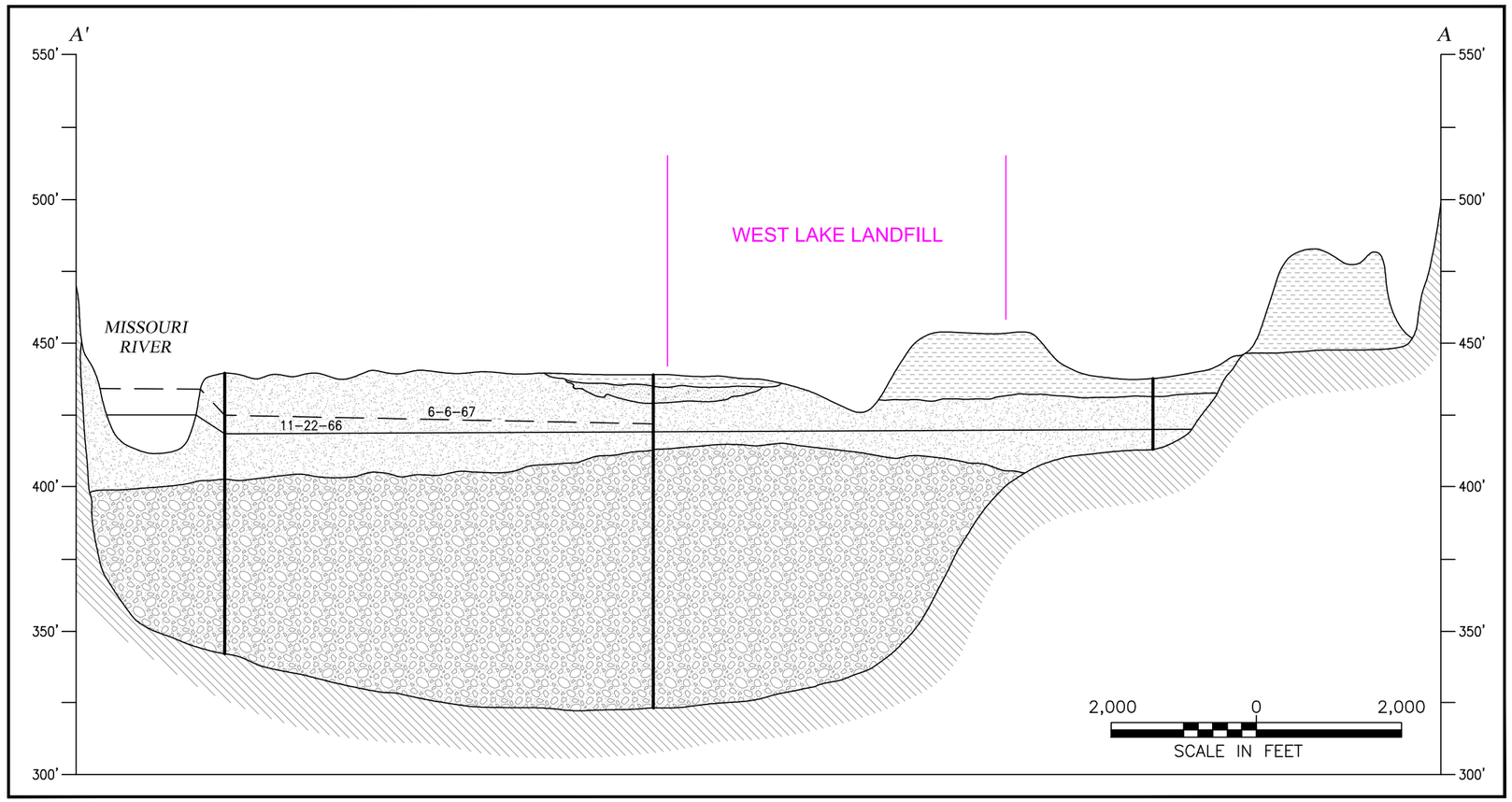
Figure 5-14

Cross Section B-B'

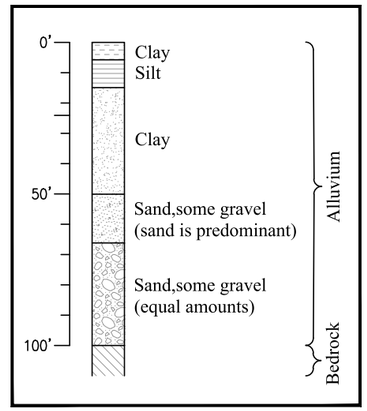
West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

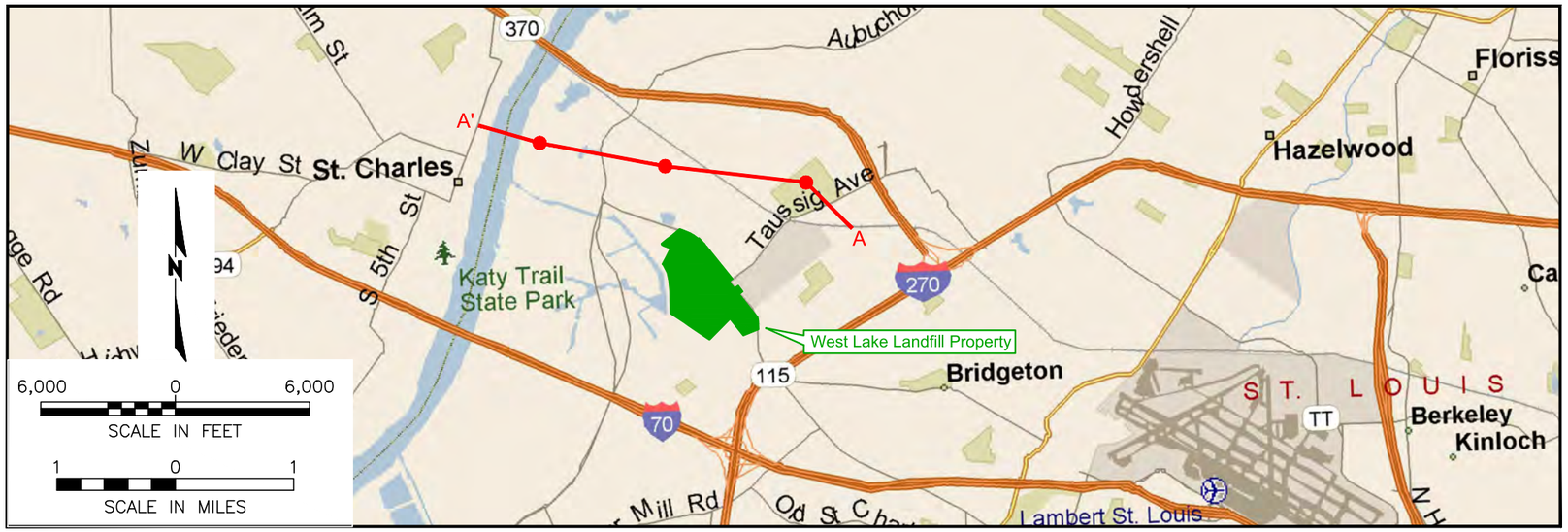
M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-5\Fig-5-13_5-14-Xsections.dwg 1/22/18



GEOLOGIC LEGEND



Source: Section A-A', USGS Reconnaissance of the Ground-Water Resources of the Missouri River Alluvium Between St Charles and Jefferson City, Missouri (Emmett and Jeffrey 1968)



CROSS SECTION INDEX

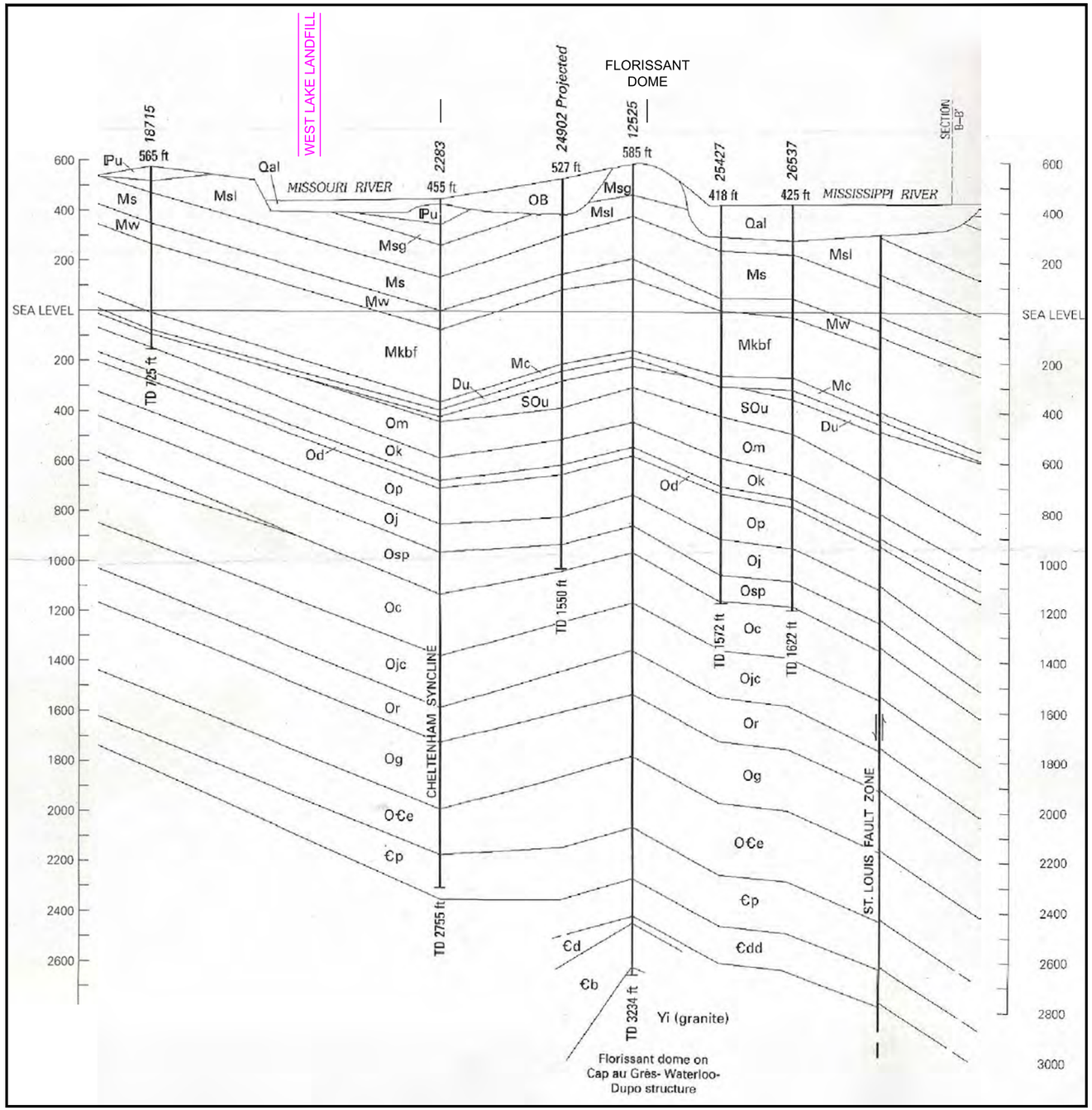
Figure 5-15

Alluvial Geology in the Vicinity of the West Lake Landfill Superfund Site

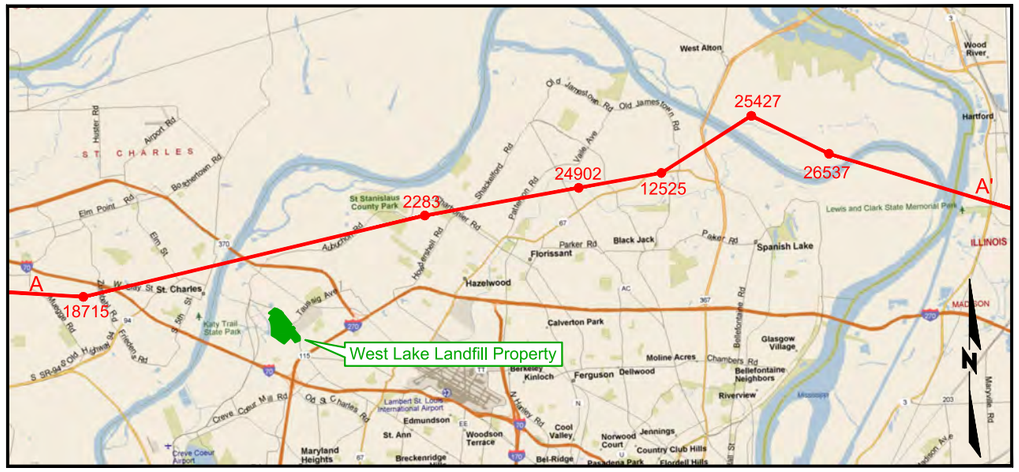
West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-5\FIG-5-15_5-16-Alluv-Bed-Sec.dwg 1/22/18



Part of Section A-A', USGS Bedrock Geologic Map of the St. Louis 30' x 60' Quadrangle (Harrison 1997)



CROSS SECTION INDEX

GEOLOGIC LEGEND

Qal	Alluvium
IPu	Pennsylvanian rocks - undivided
Msg	Ste. Genevieve Fm
Msl	St. Louis Limestone
Ms	Salem Fm
Mw	Warsaw Fm
Mkbf	Keokuk and Burlington Limestone and Fern Glen FM
Mc	Chouteau Limestone
Du	Upper and Moddle Devonian rocks - undivided
SOu	Middle Silurian to Upper Ordovician rocks - undivided
Om	Maquoketa Shale
Ok	Kimmswick Limestone
Od	Decorah Group - undivided
Op	Plattin Group - undivided
Oj	Joachim Dolimite
Osp	St. Peter Sandstone
Oc	Cotter Dolimite
Ojc	Jefferson City Dolimite
Or	Roubidoux Fm
Og	Gasconade Dolimite
O€e	Eminence Fm
€p	Potosi Fm
€dd	Derby and Doe Run Fms
€d	Davis Fm
€b	Bonneterre Fm
Yi	Igneous crystilline basement

24,000 0 24,000

SCALE IN FEET

5 0 5

SCALE IN MILES

Figure 5-16

Bedrock Geology in the Vicinity of the West Lake Landfill Superfund Site

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017RI-Addendum-edits\Section-5\FIG-5-15_5-16-Alluv-Bed-Sec.dwg 1/22/18

APPENDIX F

BEDROCK SURFACE ELEVATIONS

NORTH

0 100 200 425 850

Scale in Feet
Graphic Scale: 1 inch = 425 feet

EXPLANATION

PZ-100-SD 367.82 Top of Keokuk Formation (feet, msl) Piezometer Location

Line of Equal Elevation (feet, msl)

PZ-100-KS 126.20

126

124

122

120

118

116

PZ-104-KS 124.02

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

ACTIVE SANITARY LANDFILL PERMIT No. 118912

ST. CHARLES ROCK ROAD

ENTRANCE STATION

PZ-111-KS 115.48

CLOSED DEMOLITION LANDFILL

CONCRETE PLANT

ASPHALT PLANT

BORROW AREA

PZ-108-KS 115.37

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY

INACTIVE LANDFILL

OLD ST. CHARLES ROCK ROAD

CLOSED LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

© Allied Waste Industries (2005)

HERST & ASSOCIATES, INC.®
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-8
Structural Contour Map
Keokuk Formation Surface

NORTH

0 100 200 425 850

Scale in Feet
Graphic Scale: 1 inch = 425 feet

EXPLANATION

PZ-100-SD 367.82 Top of Warsaw Formation (feet, msl) Piezometer Location

Line of Equal Elevation (feet, msl)

PZ-100-KS 238.2

PZ-104-KS 226.0

PZ-111-SD 248.4

PZ-106-KS 260.6

240

230

230

240

250

250

260

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

ACTIVE SANITARY LANDFILL PERMIT No.118912

ENTRANCE STATION

ST. CHARLES ROCK ROAD

CLOSED DEMOLITION LANDFILL

ASPHALT PLANT

CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

BORROW AREA

AUTO REPAIR FACILITY

APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY

INACTIVE LANDFILL

OLD ST. CHARLES ROCK ROAD

CLOSED LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

© Allied Waste Industries (2005)

HERST & ASSOCIATES, INC.®
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-9
Structural Contour Map
Warsaw Formation Surface

NORTH

0 100 200 425 850

Scale in Feet
Graphic Scale: 1 inch = 425 feet

EXPLANATION

PZ-100-SD 367.82 Top of Salem Formation (feet, msl) Piezometer Location

Line of Equal Elevation (feet, msl)

PZ-100-SD 318.3

PZ-104-SD 320.0

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

320

330

340

ACTIVE SANITARY LANDFILL PERMIT No.118912

PZ-109-SS 333.6

PZ-108-SS 339.3

PZ-116-SS 347.6

ENTRANCE STATION

ST. CHARLES ROCK ROAD

PZ-111-SD 332.2

PZ-113-SS 317.7

CLOSED DEMOLITION LANDFILL

CONCRETE PLANT

ASPHALT PLANT

BORROW AREA

PZ-106-SD 328.0

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY

INACTIVE LANDFILL

CLOSED LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

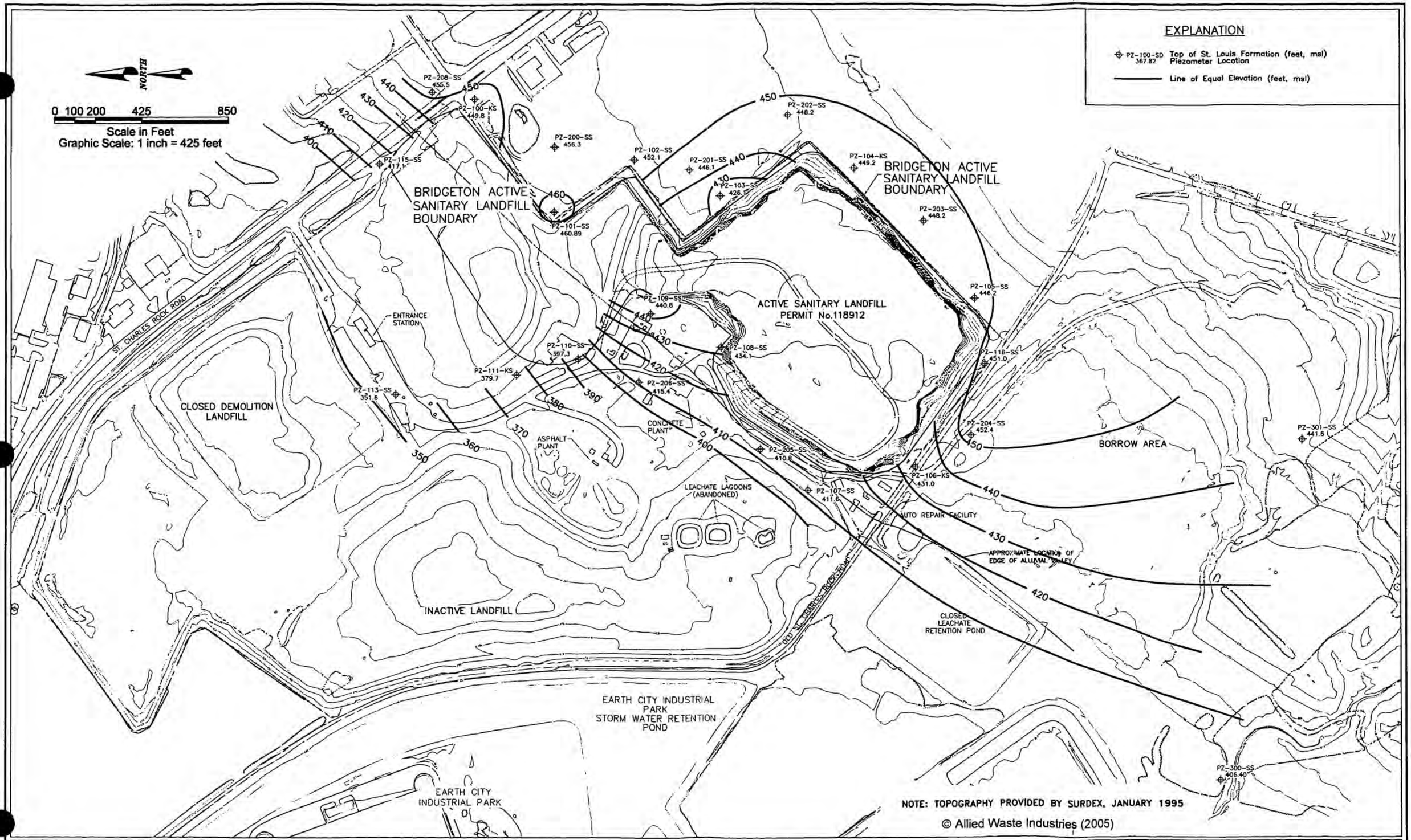
© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-10
Structural Contour Map
Salem Formation Surface



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-11
Structural Contour Map
St. Louis Formation Surface

APPENDIX G

SOUTH QUARRY PIT MAPS

1pg:

DATE: October 20, 1989

OCT 2 3 1989

TO: File

FROM: Rod Bloese RTB

RE: Laidlaw Waste Systems, Inc.
Bridgeton Landfill

On October 9, 1989, Rod Bloese and Randy Anderson (Laidlaw), obtained water level readings from groundwater monitoring wells I-73 and I-72, measured the discharges from the flows into the quarry and located the seeps (vertically and horizontally).

The depths to groundwater from the top of casing at I-73 and I-72 were 33.44 and 35.31 feet, respectively. Based upon top of casing elevations provided in the Burns and McDonnell report (1986), the groundwater elevations for I-73 and I-72 were 432.0 and 430.1 feet, respectively. The locations of these wells are indicated on the attached site map.

The locations and amounts of 6 seeps were determined. The approximate elevations and approximate flows from the seeps are summarized below.

Seep Designation	Approximate Elevation (Ft)	Approximate Flow (Gallons/Hour)
Shallow	445	100
#1	400	240
#2	330	500
#3	320	60
#4	320	<30
#5	290	180

Seep #'s 2, 3 and 4 are from the same strata (a fractured limestone zone above a massive limestone zone). The seeps are located on the attached map.

The flow from Seep #2 had a leachate odor.

Based upon the field observations and measurements described in this memo, the shallow seep appears to be water from the process water ponds and/or the water line to the asphalt plant. Seeps #'s 1 through 5 would appear to be groundwater with Seep #2 containing some leachate from the landfill located west of the quarry wall.

I recommend that the seeps be sampled and analyzed for leachate indicator parameters.

cc: Mike Whitlock
Miles Stotts

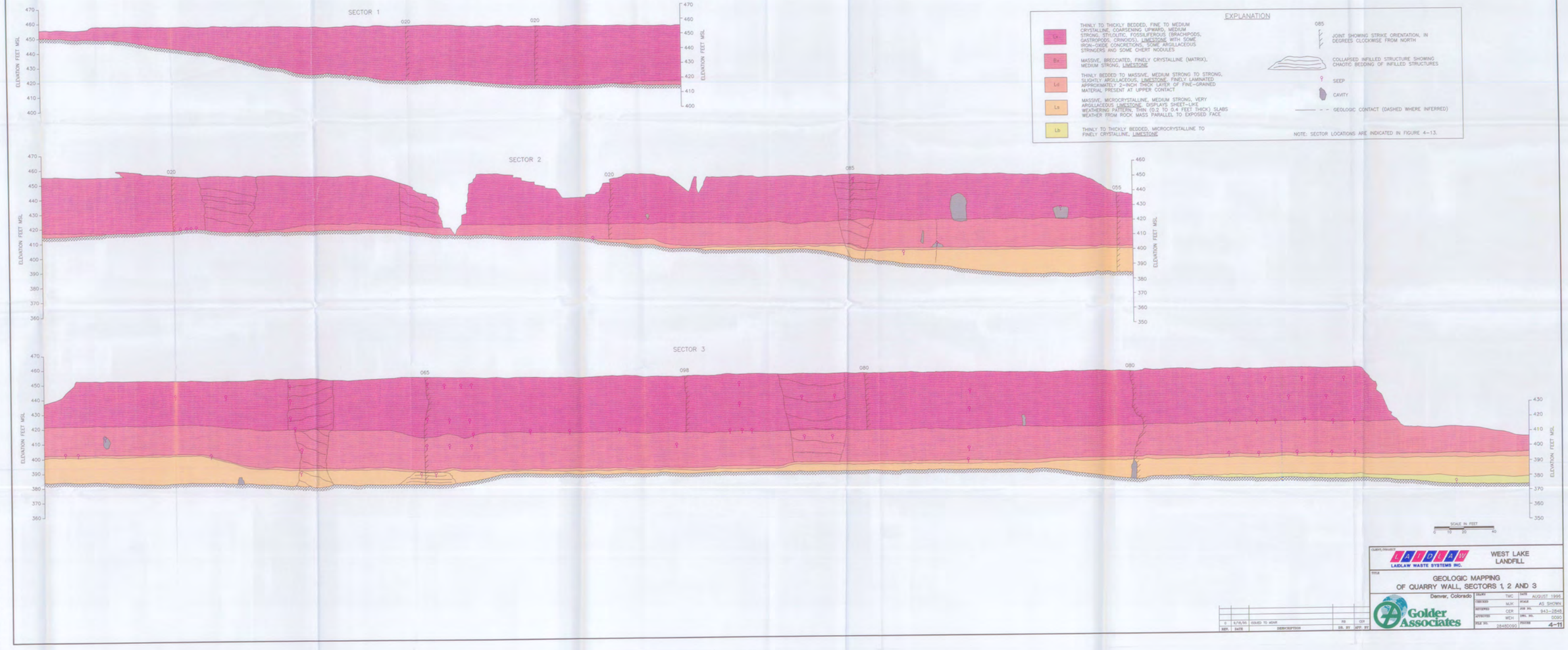
LAI 0098

BRIDGETON LANDFILL

FIGURE NO. 1

SEEP LOCATIONS

SCALE: 1" = 100'



REV.	DATE	DESCRIPTION	DR. BY	APP. BY
0	9/18/95	ISSUED TO WDNR	RB	CER

CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

TITLE: GEOLOGIC MAPPING OF QUARRY WALL, SECTORS 1, 2 AND 3

Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1995
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	0090
FILE NO.	2848D090	REVISION	4-11

C:\ACAD\943-2848\2848D090 Tue Jul 25 10:24:22 1995 Plotted From Machine Name:/

Last Updated: 7/24/95 18:34pm -95

EXPLANATION

- Lc — THINLY TO THICKLY BEDDED, FINE TO MEDIUM CRYSTALLINE, COARSENING UPWARD, MEDIUM STRONG, STYLOLITIC, FOSSILIFEROUS (BRACHIPODS, GASTROPODS, CRINOIDS), LIMESTONE WITH SOME IRON-OXIDE CONCRETIONS, SOME ARGILLACEOUS STRINGERS AND SOME CHERT NODULES
- Br — MASSIVE, BRECCIATED, FINELY CRYSTALLINE (MATRIX), MEDIUM STRONG, LIMESTONE
- Ld — THINLY BEDDED TO MASSIVE, MEDIUM STRONG TO STRONG, SLIGHTLY ARGILLACEOUS, LIMESTONE FINELY LAMINATED APPROXIMATELY 2-INCH THICK LAYER OF FINE-GRAINED MATERIAL PRESENT AT UPPER CONTACT
- La — MASSIVE, MICROCRYSTALLINE, MEDIUM STRONG, VERY ARGILLACEOUS LIMESTONE, DISPLAYS SHEET-LIKE WEATHERING PATTERN, THIN (0.2 TO 0.4 FEET THICK) SLABS WEATHER FROM ROCK MASS PARALLEL TO EXPOSED FACE
- Lb — THINLY TO THICKLY BEDDED, MICROCRYSTALLINE TO FINELY CRYSTALLINE, LIMESTONE

080 — JOINT SHOWING STRIKE ORIENTATION, IN DEGREES CLOCKWISE FROM NORTH

COLLAPSED INFILLED STRUCTURE SHOWING CHAOTIC BEDDING OF INFILLED STRUCTURES

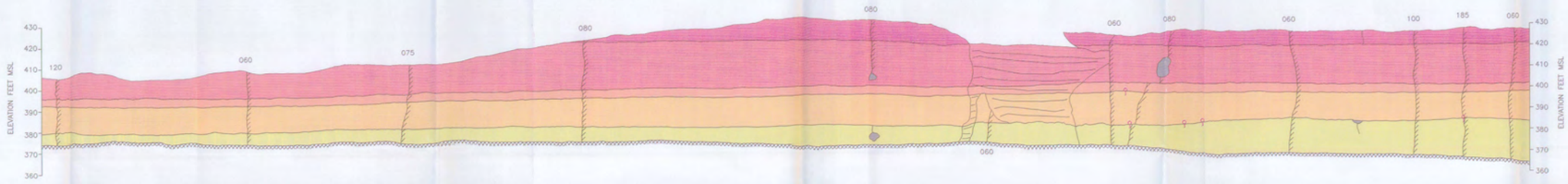
SEEP

CAVITY

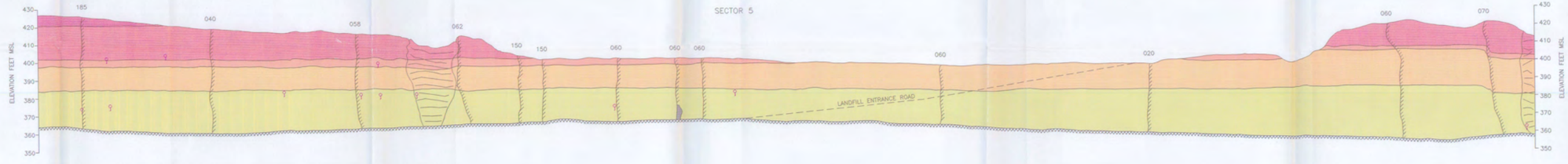
GEOLOGIC CONTACT (DASHED WHERE INFERRED)

NOTE: SECTOR LOCATIONS ARE INDICATED IN FIGURE 4-13.

SECTOR 4



SECTOR 5



SCALE IN FEET
0 10 20 40

REV.	DATE	DESCRIPTION	DR. BY	APP. BY
0	9-18-96	ISSUED TO MDNR	RB	CER

CLIENT/ENGINEER: LAIDLAW WASTE SYSTEMS INC.

WEST LAKE LANDFILL

TITLE: GEOLOGIC MAPPING OF QUARRY WALL, SECTORS 4 AND 5

Denver, Colorado

Golder Associates

DRAWN	TWC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	0102
FILE NO.	2848D102	REVISION	4-12

C:\ACAD\945-2848\2848D102 Tue Jul 23 16:27:27 1996 Plotted From Machine Jobid

Last Update: 7/25/96 by 18-Sep-96

SITE SURFACE WATER RETENTION POND

SECTOR 1

SECTOR 2

SECTOR 3

SECTOR 4

SECTOR 5

070 020 020

020 055 098

080 120

070 070 060 020 060 060 150 060 060 062 040 185 100 080 060 060 060 060 060 060 080 075 060

ACTIVE SANITARY LANDFILL
PERMIT No.118912

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

SOUTHWESTERN BELL SWITCHING STATION

LEGEND

010 — JOINT ORENTATION, IN DEGREES CLOCKWISE FROM NORTH

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

NORTH

SCALE IN FEET

0 100 200 400

Golder Associates — Denver, Colorado

CLIENT/PROJECT

LAIDLAW WASTE SYSTEMS INC.

WEST LAKE LANDFILL

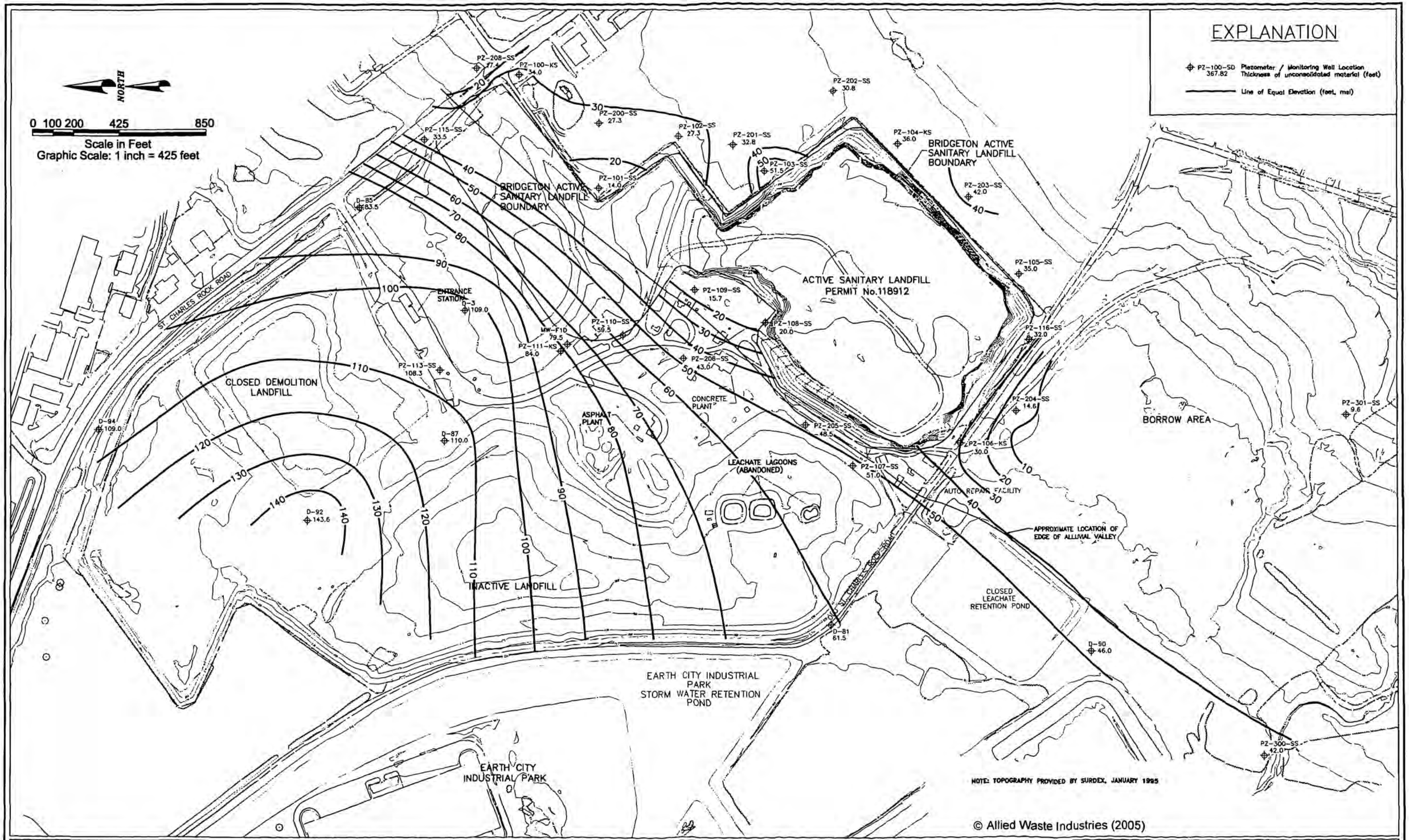
TITLE

MAPPED SECTORS AND ORIENTATIONS OF GEOLOGIC STRUCTURES

DRAWN	TMC	DATE	AUGUST 1996	JOB NO.	943-2848
CHECKED	MJK	SCALE	AS SHOWN	DWG. NO./REV. NO.	B091
REVIEWED	WEH	FILE NO.	2848B091	FIGURE NO.	4-13

APPENDIX H

ISOPACH MAPS



© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-12
Isopach Map of
Unconsolidated Materials

APPENDIX I

REGIONAL UPLAND SOIL PROFILE

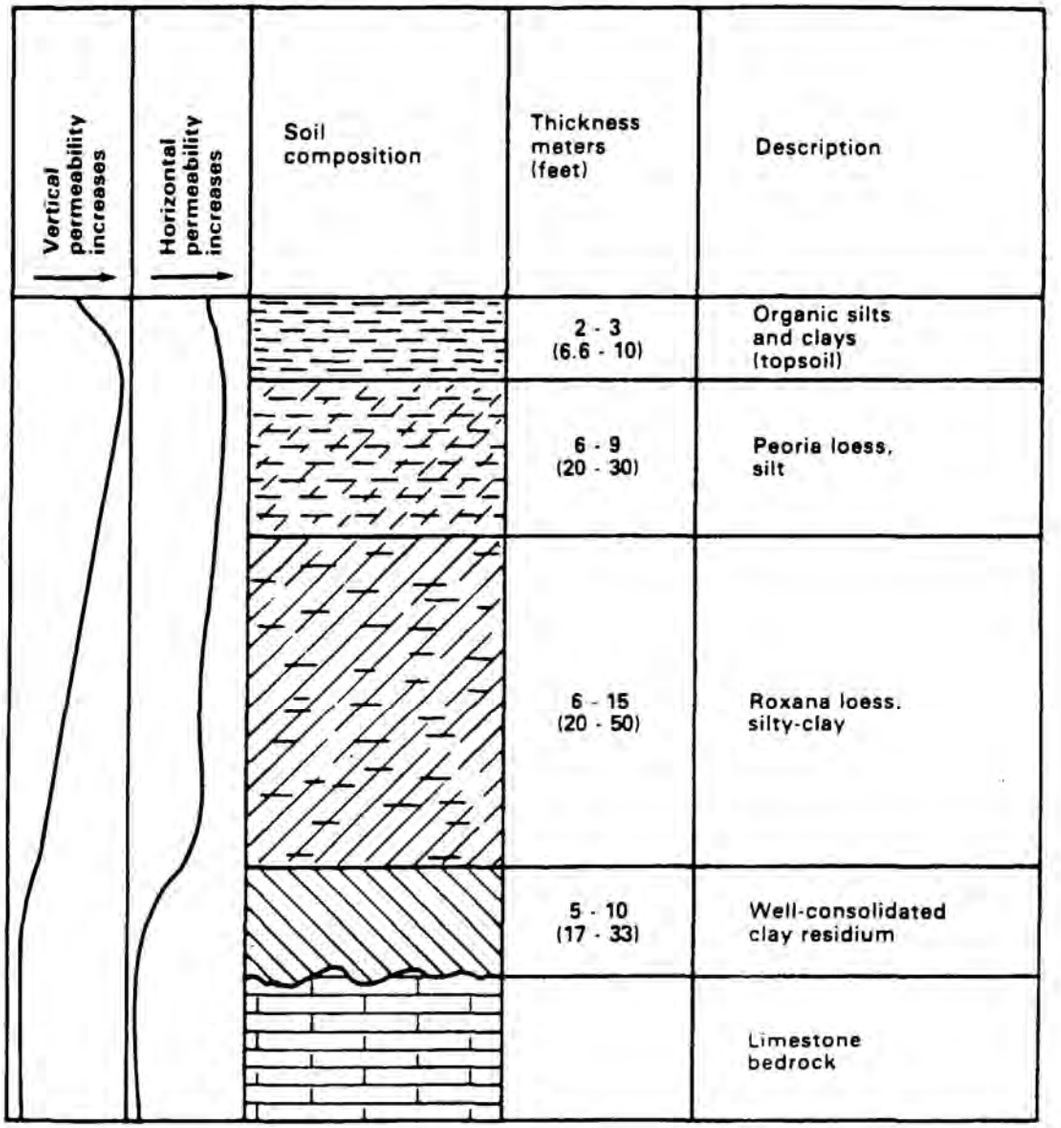


Figure 2.8 Soil profile of upland loessal soil

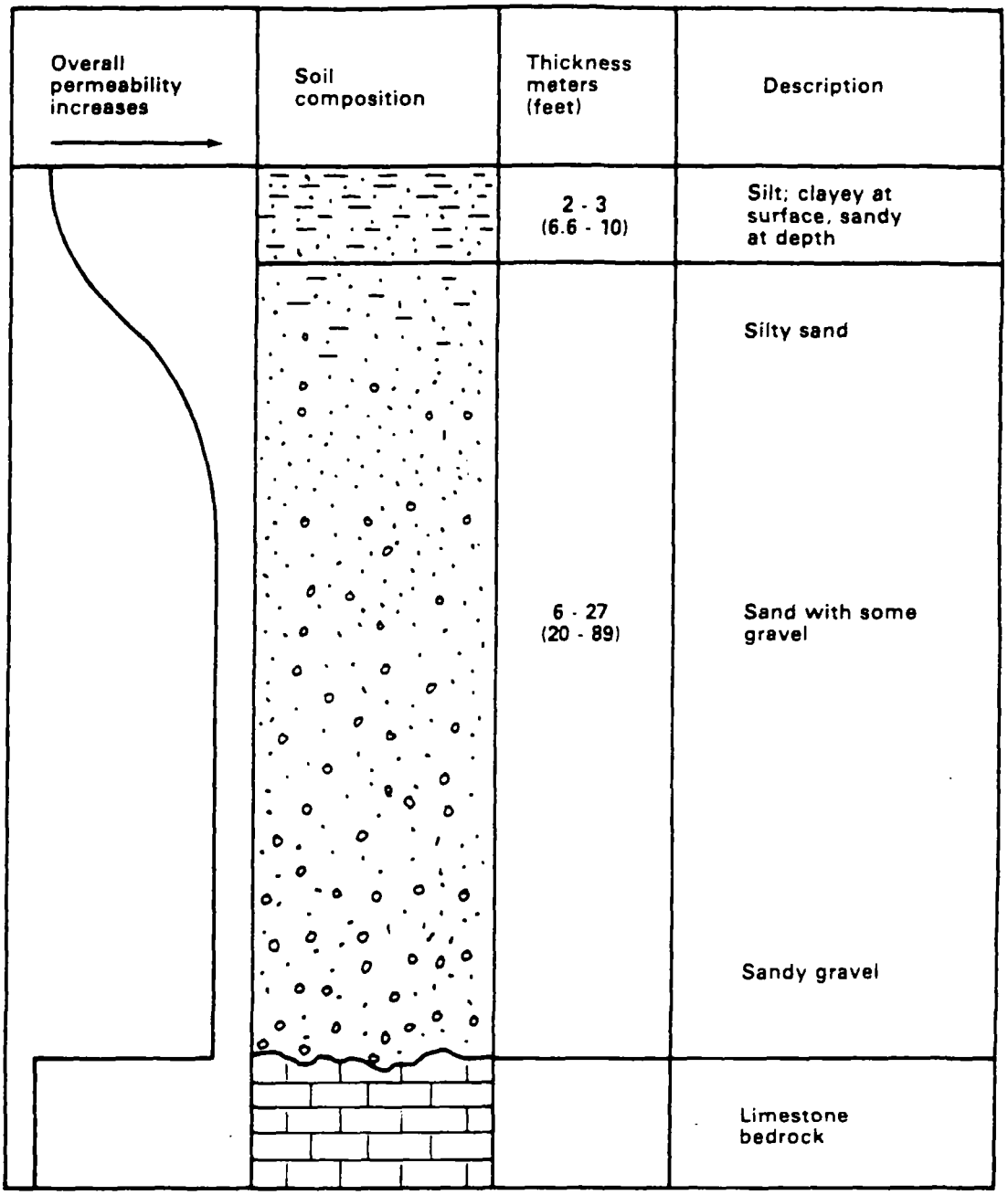


Figure 2.6 Soil profile of river alluvium

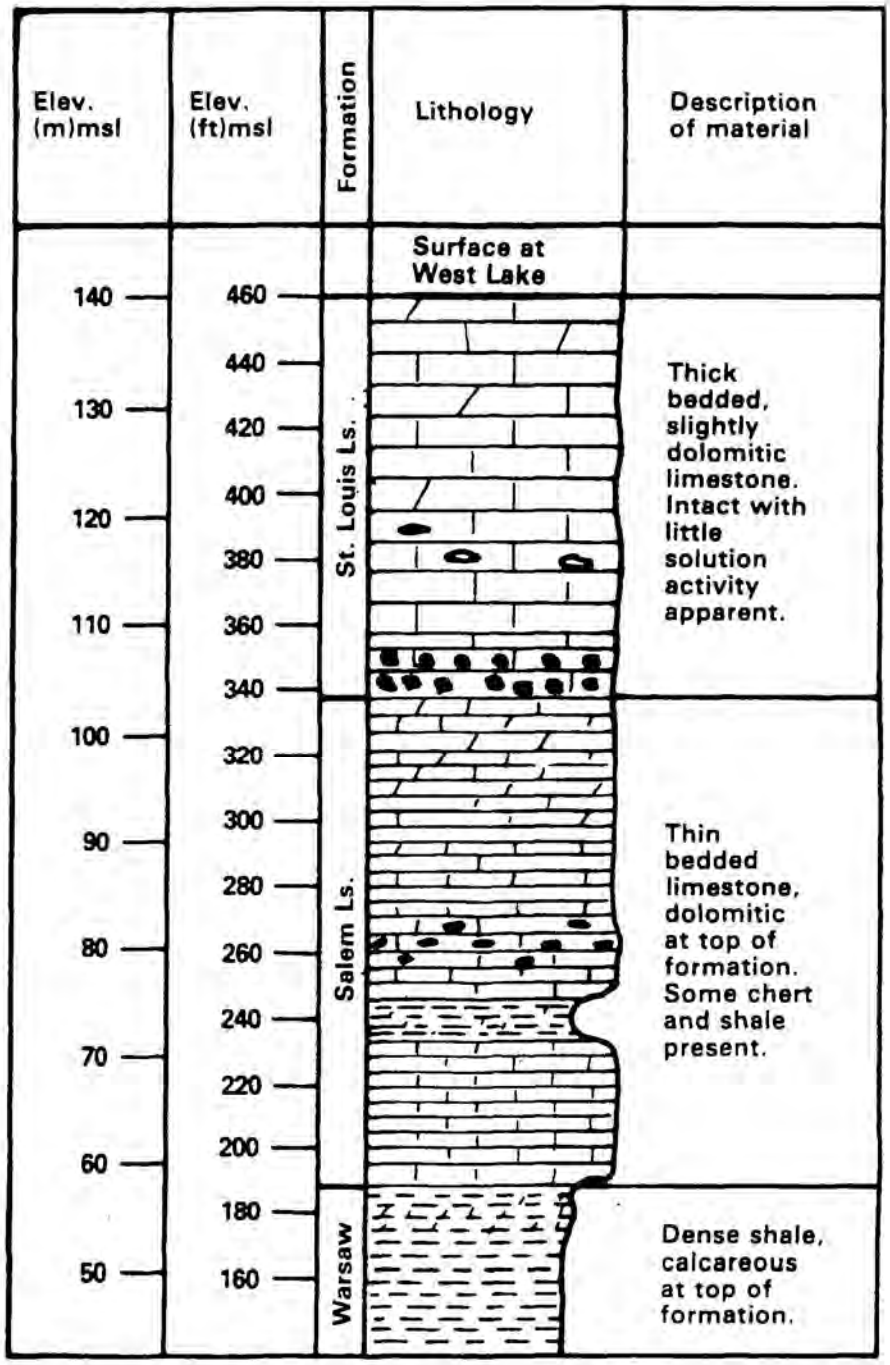


Figure 2.4 Bedrock stratigraphy

APPENDIX J

PRECIPITATION DATA

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
1970 Totals	**1970**	**1.8**	**0.45**	**0.8**	**0.35**	**1.82**	**0.63**	**0.23**	**3.02**	**2.22**	**0.1**	**0.2**	**2.03**	**2.01**	**1.54**	**0.86**	**0.74**	**1.64**	**1.28**	**2.08**	**1.58**	**0.56**	**1.56**	**3.05**	**0.94**	**0.52**	**0.5**	**0.47**	**0.73**	**0.01**	**2.47**	**0.01**	**36.2**
January	1		0.07	0	0	0	0	0	0	0	0.06	0.01	0	0	0	0	0	0.06	0	0	0	0	0.01	0.01	0	0	0	0	0	0	0	0	0.22
Feburary	2	0.1	0.07	0	0	0	0	0.04	0.06	0.09	0	0	0	0.04	0.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05				0.64
March	3	0.34	0.21	0.11	0	0	0	0	0	0	0	0.1	0.21	0	0	0	0.02	0.18	0.16	0.14	0	0	0.14	0	0	0.49	0.03	0	0.04	0	0	0	2.17
April	4	0.34	0.04	0	0.16	0.01	0	0	0	0	0	0	0.86	0.01	0	0	0.09	0.28	0.86	1.35	0.04	0	0.05	2.31	0.01	0	0	0.35	0	0	2.33		9.09
May	5	0	0	0	0	0.01	0	0	0	0.99	0.03	0	0	0.01	0.66	0.12	0	0	0	0	0	0	0.09	0.02	0	0	0	0	0	0.01	0.1	0	2.04
June	6	0.87	0.03	0.68	0.09	0.22	0	0	0	0	0	0	0.94	0.59	0.08	0.07	0	0	0	0.05	0.56	0	0	0	0.9	0	0	0	0	0	0		5.08
July	7	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0.03	0.28	0	0	0	0.05	0	0	0	0.03	0	0	0	0	0.6
August	8	0	0	0	0.06	1.55	0.63	0	1.94	0.34	0.01	0.08	0	0	0	0	0.02	0.83	0	0	0.97	0	0.01	0	0	0	0	0	0	0	0	0	6.44
September	9	0	0.01	0	0	0.03	0	0.18	0.91	0.28	0	0	0	0.57	0.56	0	0.33	0.29	0.23	0.06	0	0	1.09	0.65	0	0.03	0.32	0	0	0	0		5.54
October	10	0.15	0	0	0	0	0	0.01	0.11	0.02	0	0	0.02	0.79	0	0	0	0	0	0.03	0	0	0.17	0.01	0.03	0	0.15	0.09	0.63	0	0	0	2.21
November	11	0	0.02	0	0.04	0	0	0	0	0.5	0	0.01	0	0	0.05	0	0	0	0	0.14	0	0	0	0	0	0	0	0	0.01	0	0		0.77
December	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.47	0.28	0	0	0.03	0.01	0.56	0	0	0	0	0	0	0	0	0.04	0.01	1.4
1971 Totals	**1971**	**0.36**	**0.36**	**1.1**	**2.4**	**0.61**	**3.1**	**1.51**	**0.27**	**0.67**	**4.13**	**1.6**	**0.23**	**0.4**	**4.08**	**0.29**	**0.7**	**0**	**1.55**	**1.12**	**0.87**	**2.03**	**0.37**	**3.22**	**0.64**	**0.2**	**0.54**	**0.06**	**0.75**	**0.43**	**0.14**	**0**	**33.73**
January	1	0	0	0.55	0	0	0	0	0	0	0	0	0.01	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0.02	0	0.66
Feburary	2	0	0	0.21	1.36	0	0.01	0.04	0	0	0	0.03	0.11	0	0	0	0	0	0	0.04	0	1.12	0.14	0	0	0	0.01	0	0.01				3.08
March	3	0	0	0	0	0	0.59	0	0	0.18	0	0	0	0	0.96	0	0	0	0.04	0	0	0	0	0	0	0.04	0	0	0	0	0	0	1.81
April	4	0.04	0	0	0	0.33	0.52	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0.04	0	0	0		1.65
May	5	0.2	0	0	0.02	0.09	0.84	1.04	0.01	0	0.4	0.09	0.06	0	0	0	0	0	0	0	0	0	0.23	2.02	0.6	0	0.06	0	0	0	0	0	5.66
June	6	0	0.36	0	0	0	0	0.2	0	0	0.5	1	0.02	0.15	0.01	0	0	0	0	0	0	0.18	0	0	0	0	0	0	0	0.01	0		2.43
July	7	0	0	0	1.02	0	0	0	0	0	0.95	0	0	0.04	0.72	0	0	0	0.7	0	0	0	0	0.67	0	0	0	0	0.3	0.3	0	0	4.7
August	8	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0.08
September	9	0	0	0.1	0	0.18	0.75	0	0	0	0.13	0.44	0	0	0	0.08	0.7	0	0.29	0.95	0.2	0	0	0	0	0.16	0	0	0	0	0		3.98
October	10	0	0	0.24	0	0	0	0	0.08	0	0	0	0	0.02	0	0	0	0	0	0	0	0.69	0	0.48	0	0	0	0	0	0	0	0	1.51
November	11	0.12	0	0	0	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0.52	0	0	0	0	0.05	0.04	0	0.47	0	0.44	0.01	0		1.67
December	12	0	0	0	0	0.01	0.38	0.23	0.17	0.49	2.15	0	0.03	0.08	2.39	0.21	0	0	0	0.13	0	0	0	0	0	0	0	0	0	0.11	0.12	0	6.5
1972 Totals	**1972**	**3.42**	**2.85**	**1.16**	**0.44**	**0.55**	**0.97**	**2.7**	**0.17**	**0.19**	**0.38**	**0.35**	**2.16**	**2.23**	**1.33**	**2.51**	**0.09**	**0.08**	**0.54**	**1.53**	**0.53**	**1.89**	**0.13**	**0.8**	**0.75**	**0.47**	**0.65**	**1.09**	**1.22**	**1.21**	**0.65**	**0.7**	**33.74**
January	1	0.01	0	0.08	0.2	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0.77
Feburary	2	0	0.05	0.01	0	0	0.01	0	0.04	0.04	0	0	0.01	0.03	0.09	0.01	0	0.01	0	0	0	0	0	0.28	0	0.14	0.02	0	0	0			0.74
March	3	0	0	0	0	0	0	0	0	0	0	0	0.22	0.67	0	0.95	0.01	0	0	0	0	0.05	0	0	0	0.02	0.06	0.33	0.07	0.32	0	0.23	2.93
April	4	0	0	0.36	0	0	0	0.16	0	0.04	0	0.16	0	0.25	0.34	0.97	0.08	0	0	0.22	0.53	0.6	0	0	0	0	0	0	0.75	0	0.03		4.49
May	5	0.31	0	0	0	0	0	0	0.1	0	0	0	0.28	0.05	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0.23	0	0.01	0	0	1.02
June	6	0	0	0	0	0	0	0	0	0.07	0.13	0	0	0	0.19	0.1	0	0	0	0.61	0	0	0	0	0.02	0	0	0	0.07	0	0		1.19
July	7	0.03	1.19	0	0.15	0	0	0	0	0	0	0	0	0	0	0.43	0	0.01	0.48	0	0	0	0	0.07	0	0	0.47	0.03	0.24	0	0	0	3.1
August	8	0	0.9	0.62	0	0	0.81	0	0.03	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0.28	0.01	0.02	0	0	0	0	0	0	2.69
September	9	0.2	0.71	0	0	0	0	2.52	0	0	0	0	0	0	0.67	0	0	0	0	0	0	0	0.77	0.01	0.17	0.72	0.05	0.06	0	0.07	0.26	0	6.21
October	10	0	0	0	0	0	0.1	0	0	0	0	0	0.01	0	0	0	0	0.06	0	0	0	0.4	0.08	0	0	0	0	0.1	0	0	0.25	0.47	1.47
November	11	2.87	0	0	0	0	0.03	0	0	0.01	0.25	0	0.31	1.15	0	0	0	0	0.06	0.52	0	0.07	0.04	0	0	0.24	0.04	0	0	0	0		5.59
December	12	0	0	0.09	0.09	0.55	0.02	0.02	0	0.03	0	0.19	1.31	0	0	0.05	0	0	0	0.18	0	0	0	0	0	0	0	0	0.02	0.62	0.37	0	3.54
1973 Totals	**1973**	**0.68**	**0.55**	**1.43**	**3.1**	**0.28**	**1.27**	**1.8**	**0.55**	**4.27**	**1.75**	**0.01**	**0.63**	**2.02**	**1.23**	**0.57**	**0.83**	**0.7**	**2.21**	**2.38**	**0.8**	**0.6**	**1.58**	**2.06**	**2**	**1.04**	**0.65**	**0.73**	**0.53**	**0.55**	**1.61**	**1.41**	**39.82**
January	1	0	0	0.45	0	0	0	0.01	0.06	0.01	0	0	0	0	0	0	0	0	0.3	0	0	0.35	0.11	0	0	0	0.02	0	0.09	0	0	0	1.4
Feburary	2	0.38	0.01	0	0	0	0	0.26	0	0	0	0	0.19	0.17	0	0.01	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0			1.04
March	3	0	0.17	0	0.74	0	0.96	0	0	0.41	0.99	0	0	0.01	0.46	0	0.16	0.04	0	0.34	0.3	0	0	0	0	0.09	0.28	0.02	0	0.01	0.14	0	0.69	5.81
April	4	0.01	0.01	0.23	0.04	0	0	0	0.38	0.58	0	0	0	0	0.55	0.12	0.64	0	0.03	0.43	0.05	0.1	1.08	0	0	0	0	0	0	0	0		4.25
May	5	0.14	0	0	0	0	0.3	1.53	0.01	0.3	0.76	0.01	0	0	0	0	0	0	0	0	0	0.12	0.34	0	0	0	0.19	0.16	0.04	0.02	0	0	3.92
June	6	0	0.3	0.09	0.85	0.28	0	0	0	0	0	0	0	0.1	0.07	0.04	0	0.18	1.66	0.45	0	0.03	0	0	0.02	0	0.14	0.02	0	0	0		4.23
July	7	0	0	0	0.15	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0.1	0.03	0	0	2.05	0	0.21	0	0.04	0	0.18	0.08	0	2.85
August	8	0	0	0	0.01	0	0	0	0	0.97	0	0	0.05	1.18	0.02	0	0.03	0.01	0	0	0	0	0	0	0	0	0	0	0	0.19	0	0	2.46
September	9	0	0	0.07	0.18	0	0	0	0.1	1.98	0	0	0	0	0	0	0	0	0.26	0	0	0	0	0.05	0	0.02	0	0	0	0.34	0	0.52		3.52
October	10	0.15	0.06	0	0.13	0	0	0	0	0	0	0	0.38	0.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.36	0.04	0	0.03	0.69	2.33
November	11	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0.37	0	0.21	0	0	0.42	0	0	0	1.56	0.55	0.28	0.14	0	0	0		3.65
December	12	0	0	0.59	0.88	0	0.01	0	0	0.02	0	0	0.01	0.07	0.12	0.03	0	0	0.2	1.06	0	0	0	0.01	0.31	0	0	0.01	0.01	0.02	0.98	0.03	4.36
1974 Totals	**1974**	**0.13**	**0.61**	**0.87**	**1.26**	**0.15**	**0.8**	**0.89**	**0.5**	**1.12**	**2.61**	**1.93**	**0.15**	**0.13**	**3.49**	**0.35**	**0.51**	**0.45**	**1.08**	**1.26**	**1.4**	**2.55**	**1**	**0.5**	**0.58**	**0.09**	**0.32**	**0.17**	**5.6**	**1.17**	**3.03**	**2.13**	**36.83**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0	0	0	0	0	0	0	0.19	0.62	0.08	0.01	0	0	0	0	0	0	0.29	0.27	0.78	0	0.45	0	0	0	0.32	0	0.5	0	0	0	3.51
Feburary	2	0	0	0	0	0.02	0.68	0.02	0	0	0	0	0	0	0	0	0	0	0.77	0.45	0	1.68	0.08	0.04	0.43	0	0	0	0				4.17
March	3	0	0	0.02	0.27	0	0	0.02	0	0.2	0.05	0.31	0	0	0	0.35	0	0	0	0	0.27	0	0	0.41	0	0	0	0	0.44	0.24	0	0	2.58
April	4	0	0	0.25	0.05	0	0	0.41	0.12	0	0.19	0.11	0.04	0	0.07	0	0.35	0	0	0.02	0	0.61	0.02	0	0	0	0	0	0.06	0.05	0.05		2.4
May	5	0	0.19	0	0	0	0	0.14	0.05	0	0.12	0.66	0	0	0.68	0	0	0.45	0	0	0	0.26	0.01	0	0	0.07	0	0	0.01	0.32	2.63	0.31	5.9
June	6	0	0	0	0	0.02	0.05	0.24	0.14	0.25	0	0.14	0	0.01	1.62	0	0	0	0	0.52	0	0	0.4	0	0	0	0	0	0	0	0.06		3.45
July	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.35	0	0.04	0	0	0	0	0	0.51	0	0	0	0.9
August	8	0	0.04	0	0	0	0	0.02	0	0.05	1.09	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0.05	0	0	0.16	2.53	0.14	0	0.96	5.05
September	9	0.01	0.35	0	0	0	0	0	0	0	0.11	0.36	0.02	0	0	0	0.14	0	0	0	0	0	0	0	0	0	0	0	1.51	0	0		2.5
October	10	0	0	0	0.02	0.06	0	0	0	0	0	0	0.09	0.01	1.1	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0.04	0.17	0	0	1.51
November	11	0	0.03	0.6	0.92	0.05	0	0	0	0	0.97	0.01	0	0.11	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0.17	0.27		3.15
December	12	0.12	0	0	0	0	0.07	0.04	0	0	0	0.33	0	0	0.02	0	0.01	0	0.02	0	0	0	0	0.03	0.1	0	0	0.01	0	0.08	0.02	0.86	1.71
1975 Totals	**1975**	**0.51**	**0.41**	**0.76**	**0.05**	**1.4**	**1.25**	**0.48**	**0.85**	**0.97**	**2.48**	**2.52**	**0.24**	**0.29**	**2.01**	**1.14**	**1.72**	**1.21**	**1.14**	**1.94**	**0.18**	**0.01**	**2.09**	**2.68**	**2.27**	**2.4**	**1.37**	**1.44**	**1.16**	**2.88**	**1.93**	**0.43**	**40.21**
January	1	0	0.16	0	0	0	0.02	0.01	0.08	0.34	2.09	0	0	0	0.06	0	0	0	0	0.43	0	0	0	0	0.21	0.09	0	0	0.08	0.03	1.41	0.37	5.38
Feburary	2	0.08	0	0	0.04	0.11	0	0	0.01	0.01	0	0.23	0	0	0.03	0.03	0.43	0	0.02	0	0	0	1.62	0.48	0.5	0	0	0	0				3.59
March	3	0.02	0	0	0	0	0.03	0.36	0	0.37	0.13	0.95	0	0	0	0	0	0	0.34	0	0	0.01	0	0.02	0	0	0.03	1.44	0.38	0	0	0	4.08
April	4	0	0.04	0	0	0	0	0	0.03	0	0	0	0	0	0.31	0	0.19	0	0.48	0	0	0	0	1.76	1.44	0	0	0	0	0.31	0		4.56
May	5	0	0	0.1	0	0	0.46	0.11	0.57	0	0	0.49	0	0	0	0	0	0	0	0.47	0.03	0	0	0	0.08	0.12	0	0	0.48	0.15	0.17	0	3.23
June	6	0.19	0	0	0	0	0	0	0	0	0	0	0	0.02	0.35	0.25	1.08	0.41	0	0	0	0	0.47	0.22	0	0.79	0	0	0	0	0		3.78
July	7	0	0	0	0	0.85	0.54	0	0	0	0	0	0.2	0.1	0	0	0	0.06	0.3	0.09	0	0	0	0.2	0	0	0	0	0	0	0.16	0.06	2.56
August	8	0.12	0.1	0	0	0.36	0	0	0	0	0	0	0	0.17	0.37	0.56	0	0.48	0	0	0	0	0	0	0	1.15	0.58	0	0.02	1.53	0	0	5.44
September	9	0	0	0	0	0	0	0	0	0	0.26	0.85	0	0	0	0	0.02	0.26	0	0.95	0	0	0	0	0	0	0	0	0	0.01	0.13		2.48
October	10	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0.05	0.09	0	0	0.21
November	11	0.1	0.11	0.66	0.01	0	0.18	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0.15	0	0	0	0	0	0.76	0	0	0.34	0.06		2.62
December	12	0	0	0	0	0.08	0.02	0	0.13	0	0	0	0.04	0	0.89	0.3	0	0	0	0	0	0	0	0	0	0.25	0	0	0.15	0.42	0	0	2.28
1976 Totals	**1976**	**0.02**	**0.6**	**1.49**	**1.05**	**1.55**	**1.13**	**0.54**	**0.04**	**0.26**	**0.06**	**0.26**	**0**	**0.68**	**0.81**	**0.62**	**0.21**	**0.04**	**0**	**0.94**	**0.46**	**0.61**	**0.01**	**2.96**	**1**	**0.96**	**1.51**	**0.41**	**0.96**	**0.44**	**2.56**	**1.28**	**23.46**
January	1	0.01	0	0	0	0	0	0.28	0	0	0	0	0	0.08	0	0	0	0	0	0.06	0	0	0	0	0	0.38	0	0	0	0	0	0.02	0.83
Feburary	2	0	0.27	0	0	0.44	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0.15	0.21	0	0	0	0	0	0	0				1.08
March	3	0	0	1.49	0.93	0	0	0	0	0	0.01	0.26	0	0	0	0.28	0.2	0	0	0	0.01	0	0.01	0	0.05	0	0.51	0.16	0.01	0.36	0	0	4.28
April	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.71	0.29	0	0	0	0.18	0.13	0	0.06	0	0	0		1.37
May	5	0.01	0	0	0	0.03	0.2	0	0	0	0	0	0	0.6	0.06	0.32	0	0.04	0	0	0	0	0	0	0	0	0	0.04	0.11	0.02	1.78	0.69	3.9
June	6	0	0	0	0.04	0.1	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	1.52	0.65	0	0	0	0	0	0		2.32
July	7	0	0.33	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0.05	0	0.68	0	0	0.57	2.28
August	8	0	0	0	0	0.21	0.04	0	0	0	0	0	0	0	0.75	0.01	0	0	0	0	0	0	0	0	0	0.26	0	0	0	0	0	0	1.27
September	9	0	0	0	0	0	0	0	0.02	0.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0.17	0.29	0.13	0	0	0		0.9
October	10	0	0	0	0.08	0.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.01	0	0	1.38	0.12	0	0	0	0	0.06	0.78	0	3.37
November	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0.02	0.66	0.02	0	0	0		0.73
December	12	0	0	0	0	0	0.89	0.01	0.02	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.16	0	0	0	1.13
1977 Totals	**1977**	**0.75**	**0.44**	**0.18**	**1.34**	**2.22**	**0.97**	**2.38**	**1.77**	**1.34**	**1.98**	**2.52**	**1.38**	**1.9**	**0.7**	**1.46**	**0.05**	**0.2**	**0.93**	**1.19**	**0.34**	**3.25**	**0.08**	**3.08**	**2.43**	**1.54**	**2.34**	**1.95**	**3.09**	**0.07**	**1.27**	**0.27**	**43.41**
January	1	0	0.22	0.01	0.61	0.01	0.14	0	0	0.39	0.03	0	0	0.33	0.02	0.09	0	0	0.01	0.12	0	0	0	0.32	0	0.02	0	0.03	0.03	0	0	0	2.38
Feburary	2	0	0	0	0	0	0	0	0	0	0	0	0.38	0	0.01	0	0	0	0	0.11	0	0	0	0.74	0	0	1.01	0.05	0.17				2.47
March	3	0.01	0.1	0.02	0	0	0	0	0	0	0	2.26	0.26	0	0	0	0	0.17	0.02	0.02	0	0.17	0	0	0	0	0	0.87	2.38	0	0	0	6.28
April	4	0.2	0.02	0	0.05	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.01	0.33	0	0	0	0	0	0	0	0	0.07		0.99
May	5	0.21	0	0.01	0.38	0.08	0.69	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.56	0	0	0	0	0.18	0	2.13
June	6	0	0	0	0	0	0	0	0.1	0	0	0	0	0.73	0	0	0	0	0	0	0	1.24	0.08	0.4	0.85	0.01	1.28	0.68	0.04	0	0.06		5.47
July	7	0	0	0	0	0	0	0	0.07	0	1.31	0.23	0.11	0	0	0	0	0	0	0	0	1.49	0	0	0.31	0.76	0	0	0	0	0	0	4.28
August	8	0	0	0	0	0	0	0.63	1.2	0.77	0.6	0.02	0	0	0	0	0	0	0	0	0	0	0	1.58	0	0	0	0	0.47	0.07	0	0	5.34
September	9	0	0	0.07	0.01	0.58	0	0	0	0	0	0	0.63	0.14	0.66	0.15	0	0	0.9	0	0	0	0	0	0.32	0.18	0	0	0	0	0		3.64
October	10	0.04	0	0	0.13	0.68	0	1.65	0	0	0.04	0.01	0	0	0	0.02	0	0	0	0	0	0	0	0	0.95	0.01	0	0	0	0	0	0.23	3.76
November	11	0.21	0.1	0.06	0.02	0	0.14	0.06	0	0.18	0	0	0	0	0	1.2	0.02	0	0	0.64	0.33	0	0	0.04	0	0	0.05	0.32	0	0	0.96		4.33
December	12	0.08	0	0.01	0.14	0.86	0	0.02	0.4	0	0	0	0	0.7	0.01	0	0.03	0.03	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0.04	2.34
1978 Totals	**1978**	**0.25**	**1.84**	**0.56**	**0.53**	**0.02**	**0.71**	**2.71**	**0.58**	**0.38**	**0.88**	**0.76**	**2.47**	**2.64**	**2.75**	**0.81**	**4.55**	**1.44**	**1.09**	**0.14**	**0.34**	**0.13**	**1.03**	**1.59**	**3.34**	**1.58**	**1.93**	**0.36**	**0.57**	**0.45**	**0.65**	**0.63**	**37.71**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0	0	0	0	0	0	0.04	0	0	0	0	0.11	0.02	0.01	0.05	0.84	0.16	0	0	0.01	0	0	0	0.23	0.2	0	0	0	0	0.02	0.01	1.7
Feburary	2	0	0	0	0.08	0	0	0	0	0	0	0	0.24	0.78	0.01	0	0	0	0	0	0.01	0	0.08	0.02	0	0	0	0.22	0.16				1.6
March	3	0	0.34	0.02	0	0	0.02	1.8	0.5	0	0	0.06	0.01	0.75	0	0	0	0.08	0	0	0.28	0	0	0.5	1.9	0.35	0.05	0	0	0.01	0	0	6.67
April	4	0	0.07	0	0.03	0	0.31	0	0	0	0.39	0	0	0	0	0.29	0.33	0.98	0.14	0.14	0	0	0.21	0.08	0.08	0.02	0	0	0	0.01	0.13		3.21
May	5	0	0	0.09	0.42	0	0.06	0.59	0.01	0	0	0.65	0.54	0.31	0	0	0	0	0	0	0.04	0	0.44	0.1	0	0.07	0	0	0.37	0	0	0	3.69
June	6	0.16	0	0	0	0	0.14	0.09	0	0	0	0	0	0	0	0	0	0	0.95	0	0	0	0.06	0.45	0.54	0	0	0	0	0	0		2.39
July	7	0	1.14	0	0	0	0	0	0	0.21	0.24	0	0.1	0.02	2.5	0	0	0	0	0	0	0	0	0.36	0.59	0	0.87	0	0	0	0	0	6.03
August	8	0.09	0.06	0	0	0	0	0	0	0	0.16	0.05	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0.02	0	0.14	0.02	0	0.2	0	0.76
September	9	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0.04	0	2.58	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0.2		3.1
October	10	0	0.16	0.14	0	0.02	0	0	0	0.17	0.09	0	1.32	0.12	0.01	0	0	0	0	0	0	0	0	0.07	0	0.18	0	0	0	0	0	0	2.28
November	11	0	0	0	0	0	0.16	0	0	0	0	0	0	0.64	0.18	0.45	0.8	0.22	0	0	0	0	0.24	0.01	0	0.74	1.01	0	0	0.02	0		4.47
December	12	0	0.07	0.31	0	0	0.02	0.19	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.41	0.1	0.62	1.81
1979 Totals	**1979**	**0.59**	**0.59**	**0.92**	**0.39**	**0.14**	**0.07**	**0.27**	**0.71**	**0.55**	**0.18**	**5.04**	**0.12**	**0.57**	**0.11**	**0.92**	**0.11**	**0.24**	**0.15**	**0.6**	**0.73**	**1.64**	**2.01**	**2.55**	**1.53**	**2.06**	**0.93**	**1.63**	**1.64**	**1.17**	**0.79**	**0.53**	**29.48**
January	1	0.03	0	0	0	0.12	0.06	0.13	0	0	0	0.06	0.02	0.22	0	0	0	0	0.07	0.31	0	0	0	0.4	0	0	0.07	0.35	0	0	0.11	0	1.95
Feburary	2	0	0.05	0.01	0	0	0	0	0.14	0	0	0	0	0	0	0.03	0.01	0	0.02	0	0.44	0.01	0.5	0.12	0	0	0	0	0.15				1.48
March	3	0	0	0.69	0.11	0	0.01	0.01	0	0.19	0	0	0	0.01	0	0	0	0.04	0.06	0.21	0.14	0	0.79	0.7	0.06	0.07	0.03	0.07	0.03	0.22	0.19	0	3.63
April	4	0.23	0.02	0	0.25	0	0	0	0.34	0	0.12	4.79	0	0	0	0	0.04	0.08	0	0.03	0.05	0.1	0	0.4	0.48	0.13	0.41	0	0	0	0		7.47
May	5	0	0.48	0.15	0.03	0	0	0	0	0	0	0.19	0.1	0.01	0	0	0	0	0	0.01	0.05	0	0	0	0.02	0	0.26	0	0	0	0.2	0.12	1.62
June	6	0	0	0	0	0	0	0.06	0.19	0	0.06	0	0	0.01	0	0	0	0	0	0	0.01	0	0	0.29	0	0	0	0	1.05	0	0		1.67
July	7	0	0.04	0.02	0	0.02	0	0	0	0	0	0	0	0.32	0	0	0	0	0	0	0	0	0	0.04	0	0.99	0.13	1.12	0.38	0.28	0.25	0.08	3.67
August	8	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0	0	0	0	0	0.04	0.96	0.15	0	0	0	0	0	0.01	0.66	0	0	2.26
September	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
October	10	0	0	0.05	0	0	0	0	0	0.01	0	0	0	0	0	0.89	0.06	0.12	0	0.04	0	0	0.46	0	0	0	0	0	0	0	0	0.18	1.81
November	11	0	0	0	0	0	0	0.07	0.04	0.35	0	0	0	0	0	0	0	0	0	0	0	0.57	0.02	0	0	0.87	0.03	0.09	0.02	0.01	0		2.07
December	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0.6	0.97	0	0	0	0	0	0.04	0.15	1.85
1980 Totals	**1980**	**0.49**	**0.21**	**1.94**	**0.97**	**0.4**	**0.21**	**0.61**	**0.77**	**0.18**	**0.77**	**0.03**	**0.88**	**0.55**	**0.74**	**1.22**	**4.56**	**1.96**	**0.01**	**0.04**	**0.43**	**1.33**	**0.14**	**2.13**	**0.56**	**0.06**	**0.21**	**1.82**	**1.08**	**0.22**	**2.02**	**0.94**	**27.48**
January	1	0	0	0.02	0	0.06	0.1	0	0	0	0.05	0.01	0	0	0	0	0.08	0	0	0.01	0.01	0	0	0	0	0	0	0	0	0	0.28	0.01	0.63
Feburary	2	0	0	0	0	0.13	0	0	0.26	0.01	0	0	0	0	0.16	0.71	0	0	0	0	0	0.04	0	0	0	0.06	0	0	0	0.17			1.54
March	3	0.18	0	0	0.02	0.02	0	0.01	0	0	0	0	0.59	0.07	0	0	0.12	0.53	0	0	0.42	0	0	0.2	0.25	0	0	0	0.29	0	1.28	0	3.98
April	4	0	0	0.11	0	0	0	0.6	0.09	0.04	0	0.02	0	0.17	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0		1.54
May	5	0	0	0	0	0	0	0	0	0	0.25	0	0.29	0	0	0	0.81	0.07	0.01	0	0	0	0.12	0.68	0	0	0	0	0	0	0.46	0.71	3.4
June	6	0	0	0	0.47	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0.88	0	0	0	0	0.79	0	0		2.19
July	7	0	0.13	1.8	0	0	0	0	0	0	0.37	0	0	0	0	0	0	0	0	0	0	1.18	0	0	0	0	0.02	0.06	0	0	0	0	3.56
August	8	0.03	0	0	0.14	0.19	0	0	0	0	0.1	0	0	0.04	0.03	0.37	1.36	0.09	0	0	0	0.11	0	0	0	0	0	0	0	0.04	0	0.22	2.72
September	9	0.25	0.08	0	0.32	0	0.09	0	0	0	0	0	0	0.27	0	0	2.08	0.01	0	0	0	0	0.02	0	0	0	0	0	0	0	0		3.12
October	10	0.03	0	0.01	0.02	0	0	0	0	0	0	0	0	0	0	0.08	0.11	1.23	0	0	0	0	0	0	0.15	0	0	1.26	0	0	0	0	2.89
November	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.06	0	0.03	0	0	0	0	0	0.37	0.05	0	0.19	0.5	0	0	0		1.25
December	12	0	0	0	0	0	0	0	0.42	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0	0	0	0	0	0	0	0.66
1981 Totals	**1981**	**1.58**	**0.45**	**0.63**	**1.54**	**2.32**	**0.02**	**0.5**	**0.09**	**0.98**	**2.71**	**0.53**	**0.04**	**0.34**	**1.22**	**1.86**	**1.35**	**1.34**	**2.25**	**4.22**	**2.83**	**2.37**	**3.26**	**2.03**	**0.85**	**0.37**	**1.54**	**2.62**	**1.1**	**1.95**	**1.17**	**1.46**	**45.52**
January	1	0.01	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0.28	0.01	0	0	0	0	0	0	0	0.04	0	0.28	0.64
Feburary	2	0.27	0.01	0	0	0	0	0	0	0.54	0.61	0	0	0	0	0	0	0	0	0	0	0.02	0.55	0.07	0	0	0	0.11	0				2.18
March	3	0	0	0.1	0.89	0.1	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0.01	0	0	0	1.86	0	0	2.97
April	4	0	0	0.18	0.01	0	0	0	0.01	0	0	0.26	0.01	0	0.52	0	0	0	0.22	0.95	0	0	0.43	0	0	0	0	0	0.76	0.05	0		3.4
May	5	0.03	0	0	0	1.04	0	0	0	0.04	1.41	0.02	0	0.17	0.06	0	0	0.79	2.03	0.32	0	0	0	0.15	0.47	0	0.14	0	0	0	0.12	0	6.79
June	6	0.61	0.03	0	0	0.25	0	0	0.05	0	0.06	0.25	0.01	0.02	0	0.34	0.06	0	0	0.29	1.45	2.32	0	0	0	0.08	0	0	0	0	0		5.82
July	7	0	0.12	0.3	0.59	0.06	0	0	0	0.01	0.63	0	0	0	0	0.31	0.03	0	0	2.59	1.1	0	0	1.74	0.38	0.05	0.23	2.43	0.14	0	0	0	10.71
August	8	0	0.18	0.02	0	0.05	0	0	0	0	0	0	0	0	0	0.75	0	0	0	0	0	0	0	0	0	0.19	0.85	0.05	0	0	0.04	1.18	3.31
September	9	0.13	0	0	0	0	0	0.5	0	0	0	0	0	0	0.2	0.1	0.1	0	0	0	0	0	0	0	0	0	0.14	0	0	0	0		1.17
October	10	0	0	0	0.01	0.77	0	0	0	0.14	0	0	0.02	0.15	0.44	0.01	0.81	0.44	0	0	0	0.01	0.97	0	0	0.04	0	0	0	0	0	0	3.81
November	11	0.53	0.11	0.03	0.04	0.05	0	0	0.03	0.25	0	0	0	0	0	0.34	0	0	0	0.07	0	0	0	0.07	0	0	0.18	0	0	0	1.01		2.71
December	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.35	0.11	0	0	0	0.01	1.31	0	0	0	0	0.03	0.2	0	0	0	2.01
1982 Totals	**1982**	**0.37**	**4.94**	**4.48**	**4.67**	**1.11**	**1.17**	**0.85**	**4.84**	**0.36**	**4.09**	**0.09**	**1.26**	**0.82**	**2.44**	**1.32**	**1.15**	**1.25**	**0.92**	**0.83**	**1.14**	**0.25**	**0.63**	**1.79**	**1.36**	**0.73**	**3.2**	**1.85**	**1.86**	**1.01**	**2.87**	**1.32**	**54.97**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0	0.82	0.45	0	0	0	0	0	0.04	0	0	0.16	0.02	0.01	0.01	0	0	0	0	0.03	0	0.59	0	0	0	0	0	0	0.21	1.92	0.64	4.9
Feburary	2	0	0	0.23	0	0.02	0	0	0.43	0	0	0	0.09	0	0	0	0.56	0	0.03	0	0.01	0	0	0	0	0	0	0	0	0			1.37
March	3	0	0	0.06	0.2	0	0.04	0	0	0.1	0	0	0.46	0	0.88	0	0	0	0.02	0	0	0	0	0	0.19	0.64	0	0	0	0	0.29	0	2.88
April	4	0	0.4	0	0	0.31	0	0.24	0.14	0	0	0	0	0	0	0.27	0.47	0	0	0.24	0	0	0	0	0	0.07	0.41	0	0	0	0		2.55
May	5	0	0	0	0	0	0.35	0.09	0	0	0	0	0	0	0.16	0	0	0	0	0	0.04	0.11	0	0	0	0	0.04	1.02	1.4	0.8	0.54	0.3	4.85
June	6	0	0	0	1.32	0	0	0.44	1.66	0.22	0	0.01	0	0	0	0.51	0.12	0	0.77	0.03	0.04	0	0.03	0	0	0	0.81	0	0	0	0		5.96
July	7	0.12	0.82	0.51	3.03	0	0	0.02	0	0	3.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.03	0	0	0	0	7.91
August	8	0	0	0	0	0	0.33	0.04	2.2	0	0.48	0	0	0	0	0.49	0	0	0	0	0	0	0	0.14	0.05	0	1.1	0.02	0	0	0.12	0.3	5.27
September	9	0.25	1.41	0	0	0	0	0.02	0	0	0	0	0.02	0.8	1.39	0.04	0	1.25	0	0	0	0	0	0.09	0	0	0	0	0	0	0		5.27
October	10	0	0	0.5	0	0	0.45	0	0.41	0	0	0	0	0	0	0	0	0	0	0.53	0	0	0	0	0	0	0	0	0.33	0	0	0.08	2.3
November	11	0	0.02	0	0	0	0	0	0	0	0	0.08	0.53	0	0	0	0	0	0	0.1	0.03	1.02	0.14	0.01	0.6	0	0.02	0.77	0.44	0.13	0	0	3.89
December	12	0	1.47	2.73	0.12	0.78	0	0	0	0	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.96	1.12	0	0.06	0.34	0	0	0	0	7.82
1983 Totals	**1983**	**3.02**	**3.74**	**2.53**	**0.32**	**1.56**	**0.5**	**0.31**	**0.66**	**0.95**	**1.59**	**0.84**	**1.12**	**2.23**	**0.71**	**0.16**	**0.04**	**0.78**	**1.17**	**3.66**	**3.37**	**3**	**3.14**	**1.57**	**0.3**	**1.13**	**0.73**	**3.19**	**1.09**	**0.66**	**0.73**	**0**	**44.8**
January	1	0	0	0	0	0	0	0.09	0.05	0	0.02	0	0	0	0	0	0	0	0	0	0	0.21	0.21	0.02	0	0	0	0	0	0.12	0	0	0.72
Feburary	2	0.4	0.51	0	0	0	0.03	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0				0.95
March	3	0	0	0	0	0.64	0.19	0.16	0	0.04	0	0	0	0	0	0	0	0.06	0.91	0.21	0.64	0.02	0	0	0	0	0.48	0.04	0	0.04	0.11	0	3.54
April	4	1.19	0.29	0.01	0.02	0.5	0.07	0	0.61	0.24	0.11	0	0.16	0.92	0	0	0	0.21	0.03	0	0	0	0.14	0	0	0	0	0.91	0.8	0.5	0.59		7.3
May	5	1.43	0	0.01	0	0	0	0.06	0	0	0	0.04	0.17	1.15	0.5	0	0	0	0.2	0	0	1.82	0.67	0	0	0	0	0.22	0.02	0	0.03	0	6.32
June	6	0	1.81	1.04	0	0.41	0	0	0	0	0	0	0	0	0.07	0	0	0	0	0.5	0.15	0	0	0	0	0	0.25	0.05	0.04	0	0		4.32
July	7	0	0	0	0.16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.77	0	0	0	0	0	0	1.23
August	8	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.01	0.03	0	0	0	0	0	0	0	0	2.24
September	9	0	0	0	0	0	0	0	0	0	0	0.07	0.43	0	0	0.13	0	0	0	0	0.25	0	0	0	0	0.36	0	0	0	0	0		1.24
October	10	0	0	0	0.13	0	0	0	0	0	0	0.28	0.32	0	0	0	0.03	0.51	0	1.49	2.08	0.54	0	0.02	0	0	0	0	0	0	0	0	5.4
November	11	0	0.92	0.74	0	0	0	0	0	0.67	0.14	0	0.04	0	0	0	0	0	0	1.46	0.24	0	0.11	1.5	0	0	0	1.94	0.03	0	0		7.79
December	12	0	0.21	0.73	0.01	0.01	0.01	0	0	0	1.32	0.45	0	0.16	0.14	0.03	0	0	0.03	0	0.01	0.41	0	0	0	0	0	0.03	0.2	0	0	0	3.75
1984 Totals	**1984**	**1.72**	**1.89**	**2.39**	**1.47**	**0.79**	**0.7**	**0.74**	**5.47**	**1.56**	**3.46**	**0.6**	**1.11**	**1.34**	**0.45**	**1.11**	**0.46**	**0.88**	**2.38**	**1.32**	**2.92**	**2.09**	**1.98**	**2.27**	**0.96**	**2.14**	**2.54**	**2.35**	**0.66**	**2.09**	**0.12**	**1.69**	**51.65**
January	1	0	0	0	0	0	0	0	0	0.46	0	0	0	0	0	0.08	0.01	0.04	0.09	0	0	0	0	0.14	0	0	0	0	0.01	0	0.01	0	0.84
Feburary	2	0	0.07	0	0	0.11	0	0	0	0.34	0.22	0	0.45	0	0	0	0.16	0	0.35	0	0	0	0	0	0	0.16	1.2	0.35	0.02	0			3.43
March	3	0	0	0	0.76	0	0	0.04	0.05	0.01	0.02	0	0.51	0	0	0.47	0	0.28	0.4	0.86	0	0	0	0	0.91	0.01	0.35	0.08	0.62	0	0	0	5.37
April	4	0	0.5	2.08	0	0	0	0.26	0.49	0.03	0	0	0.08	0	0.08	0.05	0.06	0	0	0	0.35	1.75	0.07	0.01	0	0	0	0	0	0.48	0		6.29
May	5	0	0	0	0.11	0.38	0.18	0.25	0	0	0	0	0	0.46	0	0	0	0	0	0.25	0.85	0.09	0.22	0	0	1.4	0	0.99	0.01	0	0	0	5.19
June	6	0	0	0	0.07	0	0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0.07	2.11	0	0	0	0.28	0	0	0		2.74
July	7	0	0	0.04	0.47	0	0	0	0.01	0	0	0.08	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0.76
August	8	0	0	0.27	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.2	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.64
September	9	0	1.24	0	0	0.12	0.03	0	2.58	0	2.89	0.1	0	0.04	0.21	0	0	0	0	0	0	0	1.52	0.01	0	0.05	0	0.09	0	0	0		8.88
October	10	0	0	0	0	0	0.34	0.19	2.16	0	0.06	0.33	0.07	0.38	0.15	0.27	0.15	0	0.95	0.01	1.22	0.01	0	0	0.05	0.52	0	0	0	0.18	0.08	0	7.12
November	11	1.72	0	0	0	0	0	0	0.18	0.72	0.27	0.02	0	0	0.01	0.12	0	0.55	0.39	0.01	0	0	0	0	0	0	0.95	0.56	0	0	0		5.5
December	12	0	0.08	0	0	0.18	0	0	0	0	0	0.07	0	0.46	0	0	0.08	0	0	0.19	0.5	0.18	0	0	0	0	0	0	0	1.43	0.03	1.69	4.89
1985 Totals	**1985**	**2.57**	**1.02**	**0.51**	**3.19**	**1.59**	**1.39**	**0.52**	**0.01**	**0.88**	**3.62**	**3.5**	**0.3**	**3.13**	**1.75**	**1.67**	**0.06**	**0.85**	**3.47**	**2.14**	**0.21**	**1.77**	**1.33**	**3.05**	**1.05**	**2.9**	**0.45**	**1.15**	**0.01**	**2.47**	**1.2**	**2.97**	**50.73**
January	1	0.05	0	0	0	0	0	0	0	0.11	0.06	0	0	0	0	0	0.06	0	0	0.04	0	0	0	0	0	0	0	0	0	0.09	0.11	0.01	0.53
Feburary	2	0	0	0	0.02	0.06	0	0	0	0	0.49	0.04	0	0	0	0	0	0	0	0	0	1.16	0.25	1.52	0.07	0	0.16	0	0				3.77
March	3	0.11	0	0.1	0.66	0	0	0.32	0.01	0	0.13	0.22	0	0.43	0	0	0	0	0	0	0.12	0.03	0	0	0	0	0	0.25	0	1.93	0.82	0.05	5.18
April	4	0	0	0	0.03	1.31	0.09	0.2	0	0	0.5	0	0	0.19	0.27	0	0	0	0	0	0	0	0.04	0.95	0.02	0	0	0	0	0	0		3.6
May	5	1.29	0.07	0	0	0	0.02	0	0	0	0	0	0	1.7	0.16	0	0	0.02	0	0	0	0	0	0	0	0	0	0.03	0	0	0.01	0	3.3
June	6	0.08	0.95	0.32	2.07	0.22	1.02	0	0	0.03	0.73	1.83	0.15	0	0.15	0.12	0	0.83	0	0	0	0.05	0.19	0.15	0.36	0	0	0	0	0	0.18		9.43
July	7	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0.22	0.28	0	0	2.63	0	0	0	0	0	2.09	5.23
August	8	0.06	0	0.09	0.37	0	0.06	0	0	0	0.09	0	0	0.53	0.25	0.12	0	0	0	0.79	0	0.13	0.48	0.21	0.44	0	0	0	0	0.04	0	0	3.66
September	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0.17	0	0.09	0	0	0	0.07	0.01		0.43
October	10	0	0	0	0.04	0	0	0	0	0	0	0.29	0.03	0.03	0.01	0	0	0	0.32	0	0.08	0	0	0	0	0	0	0	0	0.34	0	0.82	1.96
November	11	0.6	0	0	0	0	0.2	0	0	0.02	0.47	0	0.12	0.06	0.91	1.43	0	0	3.15	1.18	0	0.18	0	0.05	0.16	0.18	0.29	0.87	0.01	0	0.07		9.95
December	12	0.38	0	0	0	0	0	0	0	0.72	1.15	1.11	0	0.19	0	0	0	0	0	0.13	0.01	0	0	0	0	0	0	0	0	0	0	0	3.69
1986 Totals	**1986**	**4.33**	**1.49**	**4.28**	**0.5**	**1.32**	**1.95**	**0.94**	**1.12**	**0.86**	**0.29**	**1.85**	**0.64**	**0.27**	**1.31**	**1.07**	**0.45**	**0.45**	**1.42**	**0.17**	**0.47**	**0.19**	**0.28**	**0.37**	**1**	**1.47**	**0.65**	**1.3**	**0.42**	**1.22**	**2.76**	**0.04**	**34.88**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0.09	0	0	0	0.1
Feburary	2	1.3	1.02	1.57	0.04	0	0.26	0	0	0	0	0	0	0	0.46	0	0	0	0	0	0	0.01	0	0.02	0	0	0	0	0				4.68
March	3	0	0	0	0	0.1	0	0.01	0	0	0.02	0.24	0.39	0	0	0	0	0	0.39	0	0	0	0	0	0	0	0.07	0	0	0	0	0	1.22
April	4	0.07	0	0.01	0	0	0.01	0.11	0	0	0	0	0	0	0.15	0.04	0.02	0	0.01	0	0.45	0.18	0	0	0	0	0	0.02	0.11	0	0.05		1.23
May	5	0.16	0	0	0	0	0	0	0.11	0.01	0.02	0.07	0	0.01	0.12	0.4	0.41	0.01	0.01	0	0	0	0	0	0.51	0.36	0	0	0.22	0	0	0	2.42
June	6	0.04	0	0	0.1	1.1	0.55	0	0.82	0.73	0	0.06	0.01	0	0.2	0.26	0	0	0	0	0	0	0.02	0	0	0	0	0.18	0	0	0.36		4.43
July	7	1.4	0.12	0	0	0	0	0	0	0	0.08	0.23	0.07	0.2	0.38	0.01	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0.07	0	0.04	2.61
August	8	0	0	0	0	0.04	1.13	0.25	0	0.03	0.13	0	0	0	0	0.36	0.02	0	0	0	0	0	0	0	0	0	0.18	0.08	0	0	0	0	2.22
September	9	0	0	0.01	0.06	0	0	0.09	0	0	0	1.22	0	0	0	0	0	0.41	1.01	0	0	0	0.25	0.2	0.02	0	0.2	1.02	0	1.15	2.35		7.99
October	10	0.7	0.3	2.67	0	0	0	0	0	0	0	0	0.17	0.06	0	0	0	0	0	0	0	0	0.01	0.15	0.47	0.63	0.18	0	0	0	0	0	5.34
November	11	0	0	0.02	0.3	0.08	0	0.36	0.08	0	0.04	0.03	0	0	0	0	0	0	0	0.17	0.02	0	0	0	0	0.48	0	0	0	0	0		1.58
December	12	0.66	0.05	0	0	0	0	0.12	0.11	0.09	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.06
1987 Totals	**1987**	**0.74**	**1.02**	**3.03**	**0.39**	**0.44**	**3.36**	**1.24**	**2.13**	**1.14**	**1.19**	**0.04**	**0.2**	**2.15**	**1.88**	**0.35**	**2.01**	**0.6**	**1.08**	**3.35**	**0.91**	**0.13**	**0.48**	**0.13**	**2.92**	**0.96**	**1.12**	**2.4**	**1.92**	**0.84**	**0.23**	**0**	**38.38**
January	1	0.14	0	0	0	0	0	0	0	0.88	0.03	0	0	0	0	0	0	0.31	0.06	0.46	0	0	0.03	0.07	0	0	0	0	0	0	0	0	1.98
Feburary	2	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.42	0	0	0	0	0	0	0	0	0	0.24	0.03	0.63				1.4
March	3	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0.23	0.95	0	0	0	0.33	0	0.33	0	0	0	0.01	0.15	0	0	2.16
April	4	0	0	0	0	0	0	0	0	0	0.31	0	0	1.2	0.09	0.03	0	0	0	0	0	0.07	0.01	0.03	0	0	0	0	0	0	0		1.74
May	5	0	0	1.64	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0.22	0	0.06	0	0	0	0	0	0	0	0	0.02	0	2
June	6	0	1.02	0	0	0	0	0	0	0.07	0.02	0.03	0.17	0	0	0	0.09	0	0	1.09	0.43	0	0.11	0	0	0	0	0	0	0.35	0.21		3.59
July	7	0.4	0	0	0.36	0.44	3.1	0.32	0	0	0	0	0.03	0.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.04
August	8	0	0	1.38	0.02	0	0	0	1.84	0.18	0	0	0	0.56	0	0.01	0.02	0	0	0	0.47	0	0	0	0	0	0.77	0.31	0	0	0	0	5.56
September	9	0	0	0	0	0	0	0.05	0.11	0	0.02	0	0	0	0.01	0	0.29	0	0.02	0	0	0	0	0	0	0	0	0	0.89	0.23	0		1.62
October	10	0	0	0	0	0	0.03	0	0	0.01	0.81	0	0	0	0	0	0.27	0	0	0.21	0.01	0	0	0.03	0.34	0	0.03	0	0	0	0	0	1.74
November	11	0.01	0	0	0	0	0.06	0.06	0.14	0	0	0	0	0	0	0.01	0.92	0.01	0	0	0	0	0	0	1.73	0.2	0.08	0.4	0.36	0.11	0		4.09
December	12	0.01	0	0.01	0	0	0.17	0.81	0.04	0	0	0.01	0	0	1.78	0.24	0	0	0.05	1.37	0	0	0	0	0.52	0.76	0	1.66	0.03	0	0	0	7.46
1988 Totals	**1988**	**1.44**	**1.07**	**1.3**	**0.87**	**0.4**	**0.13**	**0.12**	**1.92**	**0.76**	**0.26**	**0.46**	**0.95**	**0.03**	**0.15**	**1.18**	**0.14**	**1**	**0.93**	**4.12**	**3.25**	**0.05**	**2.62**	**1.59**	**0.43**	**1.14**	**1.37**	**1.08**	**0**	**2.13**	**1.31**	**1.73**	**33.93**
January	1	0	0	0	0	0	0	0.06	0	0	0	0	0	0	0	0	0.01	0.24	0	1.36	0	0	0	0	0	0.01	0	0	0	0	0	1.62	3.3
Feburary	2	0.89	0.02	0.2	0	0	0	0	0	0	0.26	0.06	0.04	0	0.13	0	0	0	0.11	0.56	0	0	0	0	0	0	0	0	0	0			2.27
March	3	0	0.89	1.06	0.15	0	0	0	0.11	0	0	0.35	0	0	0	0	0	0	0.07	0.07	0	0	0	0	0	0.38	0	0.07	0	0	1.58	0	0	4.73
April	4	0.07	0.16	0	0	0.33	0.13	0	0	0	0	0	0	0	0	0	0	0	0.23	0.23	0	0	0	0	0	0	0	0	0	0	0	0	1.15
May	5	0	0	0.04	0.07	0	0	0	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.61	0	0	0	0	0	0	0	0	1.44
June	6	0	0	0	0	0	0	0	1.26	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.2		1.97
July	7	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0.26	0.02	1.75	0	0	0	0	0.8	0	0	0	0.05	0.09	0	3.02
August	8	0	0	0	0	0	0	0	0	0	0	0	0.18	0.03	0.02	0	0	0	0.01	0.65	0.02	0	0.86	0.5	0	0	0	0.04	0	0	0	0	2.31
September	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0.07	0.83	0	0	0	0.05	0.01	0	0	0	0	0	1.02		1.99
October	10	0.48	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0.11	0.46	0	0	0.18	0.05	0.13	0.32	0	0	0	0.11	0	0	0	0	1.86
November	11	0	0	0	0.65	0.07	0	0	0	0.74	0	0	0.73	0	0	1.18	0	0	0.18	0.7	1.3	0	0	0	0	0.33	0.77	0	0	0	0		6.65
December	12	0	0	0	0	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.46	0.11	0.04	0	0.53	0.93	0	0	0	0.11	3.24
1989 Totals	**1989**	**1.03**	**1.29**	**0.78**	**0.61**	**1.84**	**0.97**	**0.57**	**0.25**	**0.36**	**0**	**0.18**	**0.14**	**0.8**	**0.58**	**0.75**	**0.64**	**0.54**	**1.07**	**1.01**	**4.04**	**0.39**	**0.42**	**1.37**	**0.84**	**1.11**	**0.66**	**0.71**	**2.55**	**1.64**	**1.46**	**0**	**28.6**
January	1	0	0	0	0	1.27	0.01	0.41	0	0	0	0.05	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0.44	0.24	0	0.08	0.02	0	0	2.58
Feburary	2	0	0.3	0.07	0.08	0.04	0.04	0	0	0	0	0	0.05	0.14	0.18	0.2	0	0	0	0	0.29	0.04	0	0	0	0	0	0	0				1.43
March	3	0	0	0.04	0.14	0.23	0.56	0	0	0	0	0	0	0.04	0	0	0	0.46	0	0.23	2.02	0	0	0	0	0	0	0	0.2	0.01	0.6	0	4.53
April	4	0	0.95	0.67	0	0	0	0.14	0	0	0	0	0	0	0.01	0.01	0	0	0.02	0	0	0	0	0	0	0	0	0	0.26	0.03	0.01		2.1
May	5	0	0	0	0.13	0	0	0	0.04	0.22	0	0	0	0	0	0	0	0	0.01	0.73	0	0.05	0.34	0	0	0.61	0.03	0	1.95	0	0	0	4.11
June	6	0.04	0	0	0.26	0.04	0	0	0	0	0	0.13	0.08	0	0	0	0	0.05	0.97	0	0	0	0	0	0	0	0.39	0.38	0	0	0		2.34
July	7	0.34	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.03	1.62	0.06	0.08	0.28	0.17	0.01	0	0	0	1.43	0.51	0	4.59
August	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.59	0	0	0.01	0.11	0.23	0	1.09	0.67	0.01	0	0.23	0.06	0	0	0	3
September	9	0.65	0	0	0	0	0	0	0.1	0.14	0	0	0.01	0.58	0.13	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1.69
October	10	0	0	0	0	0.26	0.26	0	0	0	0	0	0	0	0	0	0.05	0.03	0	0	0	0	0	0	0	0.04	0	0	0	0	0.31	0	0.95
November	11	0	0	0	0	0	0.02	0.02	0.11	0	0	0	0	0	0.05	0.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0.59
December	12	0	0	0	0	0	0.08	0	0	0	0	0	0	0.04	0.15	0.07	0	0	0.05	0.01	0	0.01	0	0	0	0	0	0.1	0	0.15	0.03	0	0.69
1990 Totals	**1990**	**1.27**	**0.85**	**4**	**2.39**	**0.23**	**1.03**	**3.15**	**1.21**	**1.01**	**1.02**	**1.36**	**1.43**	**0.63**	**1.03**	**2.6**	**3.32**	**1.52**	**0.58**	**1.19**	**2.42**	**2.54**	**1.78**	**0.48**	**0.45**	**0.85**	**0.72**	**2.3**	**0.98**	**1.78**	**0.97**	**0**	**45.09**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0.01	0	0.16	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0.59	0.04	0	0	0	0.06	0.23	0	0	0	0	0	0	1.42
Feburary	2	0.95	0.01	0.13	0.42	0	0.07	0	0	0.07	0	0	0	0	0.51	0.42	0	0	0	0	0	0.11	0.73	0.04	0	0	0	0.07	0				3.53
March	3	0	0	0	0	0	0.09	0.14	0.19	0	0	0.17	0.01	0	0.44	0.07	0	0	0	0	0	0	0.18	0.32	0.33	0	0	0	0.39	0.12	0.21	0	2.66
April	4	0.31	0	0	0	0	0	0	0	0.01	0.83	0	0	0.59	0	0.03	0.01	0.04	0	0.04	0.46	0	0	0.02	0	0	0	0.54	0.19	0	0		3.07
May	5	0	0	1.11	0.13	0	0.02	0	0	0.17	0	0.26	1.21	0	0	1.91	2.8	0	0	0.53	0	0	0	0	0.06	0.62	0.3	0.08	0.39	0	0	0	9.59
June	6	0	0.1	0	0	0	0.84	1.27	0	0.06	0	0	0	0	0.01	0	0	0.05	0	0	0.58	0	0.09	0	0	0	0	0	0	0.01	0.01		3.02
July	7	0	0	0	0	0.14	0	0	0	0	0.09	0.93	0.03	0.04	0.03	0.03	0	0	0	0.03	1.11	0.54	0.37	0	0	0	0	0	0	0	0	0	3.34
August	8	0	0	1.3	0.49	0	0	0	0	0	0	0	0.18	0	0	0.13	0.51	0	0	0	0.23	0	0	0	0	0	0	0	0	0	0	0	2.84
September	9	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0.45	0	0	0.32	0	0	0	0	0	0	0	0	0		0.78
October	10	0	0	0.93	0	0	0.01	1.74	1.01	0.69	0.1	0	0	0	0	0.01	0	0.44	0	0	0	0.03	0	0	0	0	0	0	0	0	0	0	4.96
November	11	0	0	0	1.35	0.09	0	0	0	0.01	0	0	0	0	0	0	0	0	0.03	0	0	0.2	0	0	0	0	0.42	1.26	0	0	0		3.36
December	12	0	0.74	0.37	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0.66	0.1	0	0	1.34	0.41	0.1	0	0	0	0.35	0.01	1.65	0.75	0	6.52
1991 Totals	**1991**	**1.38**	**1.62**	**1.62**	**2.01**	**1.08**	**0.36**	**0.36**	**0.11**	**0.94**	**1.11**	**2.88**	**1.63**	**1.1**	**0.65**	**0.78**	**1.12**	**2.05**	**1.38**	**0.87**	**1.08**	**0.86**	**1.63**	**1.37**	**0.23**	**0.55**	**0.71**	**0.07**	**0.77**	**2.74**	**0.4**	**0.02**	**33.48**
January	1	0	0	0	0	0.32	0.03	0	0	0	0.36	0.3	0	0	0	0.22	0.04	0	0	0	0.04	0	0	0	0	0.02	0.01	0	0	0.17	0.01	0	1.52
Feburary	2	0	0	0	0	0	0.05	0.01	0	0	0	0	0	0.47	0	0	0	0.01	0.44	0	0	0	0	0	0	0	0	0	0				0.98
March	3	0.32	0	0	0	0	0.05	0	0	0	0	0	0.5	0.07	0.1	0	0	1.14	0	0	0	0.84	0.16	0	0	0	0	0.02	0	0	0	0	3.2
April	4	0	0	0.05	0.36	0	0	0.26	0	0	0	0.03	0.69	0.56	0.51	0.07	0	0	0.23	0.28	0.01	0	0	0.01	0	0.03	0	0	0.18	0	0		3.27
May	5	0.27	0	0.54	0	0.69	0	0	0	0	0.01	0.08	0	0	0	0	0.22	0	0.32	0	0	0	0	0	0	0.5	0.02	0	0	1.22	0	0	3.87
June	6	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0.39	0.02	0	0	0	0	0.01	0	0	0	0	0	0	0	0.01	0		0.44
July	7	0	0.82	0.1	0	0	0	0	0	0.94	0.74	2.47	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0.02	0.07	0	0	5.18
August	8	0	0	0	0.13	0.05	0.03	0	0.11	0	0	0	0	0	0	0	0	0.36	0	0	0	0	0	0	0	0	0	0	0.08	0.22	0	0	0.98
September	9	0	0.01	0.74	0	0	0	0	0	0	0	0	0	0	0	0	0.82	0	0.23	0	0	0.01	1.12	0	0.05	0	0	0	0	0	0		2.98
October	10	0	0.32	0.19	1.51	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0.16	0	0	0	0	1.28	0.16	0	0.64	0	0.4	0.61	0.39	0.02	5.7
November	11	0.76	0	0	0	0	0.2	0.09	0	0	0	0	0.06	0	0.04	0.1	0.02	0.54	0	0.59	0.34	0	0	0	0	0	0.04	0.05	0	0.43	0		3.26
December	12	0.03	0.47	0	0	0	0	0	0	0	0	0	0.38	0	0	0	0	0	0	0	0	0.69	0	0.35	0.08	0	0	0	0.09	0.01	0	0	2.1
1992 Totals	**1992**	**0.49**	**2.26**	**1.03**	**0**	**0.09**	**0.09**	**1.25**	**0.51**	**1.65**	**0.88**	**1.8**	**1.49**	**0.49**	**1.61**	**3.59**	**0.11**	**0.89**	**1.5**	**1.44**	**3**	**0.26**	**1.5**	**1.02**	**0.23**	**0.34**	**2.12**	**1.12**	**0.07**	**1.22**	**0.96**	**0.48**	**33.49**
January	1	0	0.02	0	0	0	0	0.03	0.47	0	0	0	0.03	0.38	0.04	0.03	0	0	0	0	0	0	0.1	0.02	0	0	0	0	0	0	0	0	1.12
Feburary	2	0	0	0	0	0	0	0	0	0	0	0	0.37	0	0.79	0	0	0.45	0	0	0	0	0	0.06	0.22	0	0	0	0				1.89
March	3	0	0	0	0	0.04	0.07	0	0	0.07	0.1	0	0	0.11	0	0	0	0	0.94	0.34	0	0.13	0.02	0	0	0.18	0	0	0.02	0.83	0.56	0.04	3.45
April	4	0	0	0	0	0	0	0	0	0.12	0.06	0	0	0	0	0.23	0.05	0.28	0.42	0.76	0.4	0	0	0.03	0	0.04	0	0	0	0.07	0		2.46
May	5	0	0	0	0	0	0	0	0	0	0	0.27	0.19	0	0.12	0	0.02	0.02	0.09	0	0.49	0.01	0.19	0.01	0	0	0.04	0	0	0	0	0	1.45
June	6	0	0	0.32	0	0	0	0	0	0	0	0	0	0	0	0.24	0	0	0	0.08	0.05	0	0	0.5	0	0	0	0	0	0	0		1.19
July	7	0	2.09	0.16	0	0.05	0	0.03	0	0	0.04	0	0	0	0.62	0	0.04	0.12	0	0	0.66	0.06	0	0.4	0	0	0	0	0	0	0.04	0	4.31
August	8	0	0	0	0	0	0	0.24	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.76	1.12	0	0	0	0.23	3.45
September	9	0.11	0.11	0	0	0	0	0.95	0.02	1.02	0	0	0	0	0	0	0	0	0.04	0	0.34	0.06	0	0	0	0.01	0.32	0	0	0	0		2.98
October	10	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0.33	0	0	0	0.09	0.15	0	0	0	0	0	0	0	0	0.16	0.33	0.14	1.21
November	11	0.37	0.04	0.55	0	0	0	0	0.01	0.09	0.58	1.53	0.9	0	0	0	0	0.02	0.01	0	0.91	0	1.19	0	0.01	0.11	0	0	0	0	0		6.32
December	12	0.01	0	0	0	0	0.02	0	0	0.35	0	0	0	0	0.04	2.76	0	0	0	0.17	0	0	0	0	0	0	0	0	0.05	0.16	0.03	0.07	3.66
1993 Totals	**1993**	**0.35**	**2.74**	**1.78**	**1.62**	**0.22**	**2.88**	**0.47**	**0.32**	**0.57**	**1.49**	**4.46**	**4.3**	**2.88**	**4.71**	**2.22**	**2.75**	**0.55**	**0.5**	**2.16**	**2.58**	**0.27**	**3.61**	**1.81**	**2.86**	**3.33**	**0.74**	**0.06**	**1.12**	**0.2**	**0.65**	**0.56**	**54.76**
January	1	0	0.04	0.51	1.29	0	0	0	0	0.39	0.02	0	0.18	0	0	0	0	0	0.03	0	0.95	0.08	0	0.05	0	0	0	0	0	0	0	0	3.54
Feburary	2	0	0	0	0	0	0	0	0	0	0	0.55	0.05	0.01	0	0.5	0.16	0	0	0	0.13	0.19	0	0	0.17	0.99	0	0	0				2.75
March	3	0	0.34	0.58	0.24	0	0	0	0	0	0	0	0.04	0.01	0	0.04	0.19	0	0	0.47	0	0	0.94	0	0	0.01	0	0	0	0	0.29	0.16	3.31
April	4	0.1	0	0.08	0.02	0	0	0.05	0.11	0	0	0	1.18	0.78	0.66	0.54	0.06	0	0	0.65	0.03	0	0	0	1.36	0.34	0	0	0	0.2	0		6.16
May	5	0.08	0.11	0.08	0.02	0	0.89	0	0	0	0.46	0.17	1.04	0	0	0	0.14	0.3	0.45	0	0	0	0.09	0	0	0	0	0	0	0	0.11	0	3.94
June	6	0	0.07	0.01	0.02	0	1.47	0	0.13	0	0.26	1.51	0	0	0	0	0	0	0	0.33	0	0	0	0	1.05	0.9	0	0	1.12	0	0.25		7.12
July	7	0.16	0	0	0	0.02	0.52	0.42	0	0.16	0	0	0	0.71	0.04	1.14	0.1	0	0	0	0.37	0	0.8	0.16	0.03	0.03	0	0	0	0	0	0.4	5.06
August	8	0	0	0.05	0	0.2	0	0	0	0	0.75	2.16	1.01	0	0	0	0	0	0	0	0	0	0.01	0.51	0.09	0	0	0	0	0	0	0	4.78
September	9	0	1.56	0.24	0	0	0	0	0.01	0	0	0	0	0.76	1.8	0	0	0	0	0.71	0	0	1.77	1.09	0.04	0.73	0.45	0	0	0	0		9.16
October	10	0	0	0	0	0	0	0	0	0.07	0.02	0	0.07	0	0	0	0	1.33	0	0.02	0	1.1	0	0	0	0	0	0	0	0	0	0	2.61
November	11	0	0.07	0	0	0	0	0	0	0	0	0	0.8	0.41	1.86	0	0.77	0.24	0	0	0	0	0	0	0.02	0.33	0.29	0.06	0	0	0		4.85
December	12	0.01	0.55	0.23	0.03	0	0	0	0	0	0	0	0	0.2	0.35	0	0	0.01	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	1.48
1994 Totals	**1994**	**0.84**	**0.79**	**0.45**	**1.45**	**1.59**	**0.53**	**0.78**	**2.09**	**0.99**	**1.76**	**2.53**	**0.62**	**1.09**	**1**	**0.74**	**1.1**	**0.05**	**0.81**	**0.42**	**2.2**	**0.59**	**1.07**	**0.76**	**0.4**	**1.14**	**1.6**	**1.38**	**3.34**	**0.18**	**1.71**	**0.7**	**34.7**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0.06	0	0.08	0.02	0	0.06	0	0	0	0.18	0	0	0.04	0	0	0.6	0	0	0	0	0	0	0	0.01	0.31	0.07	0.65	0	0	0	0.01	2.09
Feburary	2	0	0	0.04	0	0	0	0	0.12	0	0	0	0	0	0	0	0	0	0	0.2	0.12	0	0.79	0.13	0	0	0	0	0.11				1.51
March	3	0.08	0	0	0	0	0	0.22	0	0	0	0	0	0.15	0	0	0	0	0.02	0	0	0	0	0.01	0	0	0.75	0	0	0.04	0	0	1.27
April	4	0	0.13	0.08	0	0.34	0.19	0	0	0.46	1.58	2.1	0.5	0	0	0.74	0	0	0	0	0	0.09	0	0	0	0	0.29	0.19	2.96	0.14	0.53		10.32
May	5	0	0	0	0	0	0.2	0.5	0	0	0	0.43	0	0	0.23	0	0	0	0	0	0	0	0	0	0.09	0.13	0	0	0	0	0.14	0	1.72
June	6	0	0.63	0.13	0	0	0	0.01	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0.56	0.02	0.58	0.18	0	0	0	0		2.16
July	7	0	0.01	0	0	0	0	0.02	0.84	0	0	0	0	0	0.02	0	0.01	0	0	0	0.52	0	0	0	0	0	0	0	0	0	0	0	1.42
August	8	0.7	0.02	0	0.53	0	0	0	0.06	0	0	0	0	0.66	0.2	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0.27	0	1.04	0.03	3.76
September	9	0	0	0	0.06	0.18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.28	0	0.22	0.12	0.31	0	0	0	0		1.18
October	10	0	0	0	0	0	0	0	0.98	0	0	0	0.07	0.24	0.01	0	0	0.05	0.79	0	0	0.01	0	0.06	0.06	0	0	0	0	0	0	0.58	2.85
November	11	0	0	0.05	0.84	1.07	0	0	0	0.5	0	0	0	0	0.54	0	0	0	0	0.22	1.09	0.05	0	0	0	0	0	0.54	0	0	0		4.9
December	12	0	0	0.07	0	0	0.08	0.03	0.09	0.03	0	0	0	0	0	0	0.49	0	0	0	0.22	0.43	0	0	0	0	0	0	0	0	0	0.08	1.52
1995 Totals	**1995**	**2.31**	**1.75**	**1.35**	**0.54**	**0.13**	**2.38**	**1.95**	**1.04**	**0.08**	**1.37**	**0.43**	**0.23**	**2.33**	**0.67**	**0.15**	**6.24**	**4.5**	**1.73**	**3.25**	**1.52**	**0.04**	**0.2**	**0.86**	**0.44**	**1.13**	**2.55**	**1.3**	**0.25**	**0.58**	**0.35**	**0.03**	**41.68**
January	1	0.08	0	0	0	0	0.35	0	0	0	0	0	0.1	2.12	0.12	0	0	0.01	0.44	0.54	0	0	0	0.03	0	0	0	0.5	0.1	0	0	0	4.39
Feburary	2	0.02	0.08	0.74	0	0	0.02	0.04	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0.34	0.02	0.02				1.33
March	3	0	0.04	0	0.08	0.12	0.47	1.67	0	0	0	0	0	0	0	0	0	0	0	0	0.16	0	0	0	0	0	0.65	0	0	0	0	0	3.19
April	4	0.12	0	0.12	0	0	0	0	0	0.02	0.02	0.33	0.02	0	0	0	0.46	0.08	0.1	0.05	0.73	0	0	0.6	0.01	0	0.09	0	0	0.58	0		3.33
May	5	0.7	0	0.21	0.13	0	0.01	0.02	0.71	0	0.06	0	0.1	0.19	0	0	5.59	3.95	0.24	0	0	0	0	0.15	0.38	0.18	0.01	0.29	0	0	0	0	12.92
June	6	0.6	0.09	0	0	0	0.06	0	0.17	0.06	0.28	0.05	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0.07	0.91	0.49	0.13	0	0		2.96
July	7	0	0	0.15	0.12	0	0.13	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0.56	0	0.19	0.01	0.05	0.88	0.06	0	0	0	0	0	2.16
August	8	0.56	1.13	0	0.21	0	1.28	0.05	0	0	0	0	0	0	0.5	0.1	0.02	0	0	0.66	0	0	0	0	0	0	0	0	0	0	0	0.01	4.52
September	9	0	0	0	0	0	0	0.17	0.03	0	0	0	0	0	0	0	0.16	0	0	0.17	0	0.04	0	0	0	0	0	0	0	0	0.17		0.74
October	10	0	0.39	0.13	0	0	0	0	0	0	0.07	0	0	0.02	0	0	0	0	0	0.72	0.02	0	0	0.07	0	0	0.49	0	0	0	0.08	0.02	2.01
November	11	0.23	0.02	0	0	0.01	0.02	0	0	0	0.94	0.05	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1.28
December	12	0	0	0	0	0	0.04	0	0.13	0	0	0	0	0	0	0.05	0	0.46	0.95	1.11	0	0	0.01	0	0	0	0	0	0	0	0.1	0	2.85
1996 Totals	**1996**	**2.04**	**0.88**	**0.01**	**1.03**	**1.09**	**2.96**	**1.55**	**0.46**	**1.12**	**0.44**	**0.25**	**0.07**	**0.37**	**1.85**	**0.85**	**0.51**	**1.29**	**1.26**	**0.85**	**0.34**	**1.46**	**2.7**	**4.15**	**1.97**	**1.51**	**1.27**	**2.06**	**6.53**	**1.37**	**0.48**	**0.95**	**43.67**
January	1	0.02	0.84	0	0.03	0.09	0.06	0	0	0	0	0.13	0	0	0	0	0	0.03	1.08	0	0.12	0	0.11	0.68	0.01	0	0.06	0	0	0	0.01	0	3.27
Feburary	2	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0.1	0	0	0	0	0	0	0	0	0	0	0.25	0.13	0	0			0.52
March	3	0	0	0	0	0.5	0.02	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0.46	0.9	0	0	0	0.04	0	0.12	0.95	3.06
April	4	0	0	0	0	0	0	0.01	0	0	0	0	0.01	0	0.48	0.03	0	0	0.01	0	0	0.49	1.77	0	0	0	0	0.11	4.46	0.35	0.25		7.97
May	5	0	0.04	0.01	0.79	0.17	0.03	0.39	0.04	0	0.04	0	0.04	0.01	0.73	0	0	0	0	0	0.11	0.16	0	0	0	0.45	0	1.33	0	0	0	0	4.34
June	6	0.44	0	0	0	0.11	0.58	0	0	1.11	0.4	0.12	0	0.36	0	0.44	0	0.16	0	0	0	0	0	0	0	0	0	0	0	0	0		3.72
July	7	1.48	0	0	0	0	0	0	0.24	0	0	0	0	0	0.61	0	0	0	0	0.85	0.02	0.21	0	0	0	0	0	0.22	2.03	0.66	0.01	0	6.33
August	8	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0.02	0.06	0	0.17	0	0	0	0	1.3	0.01	0	0	0	0	0	0	0	1.57
September	9	0	0	0	0	0	0.02	0.03	0	0	0	0	0	0	0	0.25	0.27	0	0	0	0	0	0	1.23	0	0	0.94	0.12	0	0	0		2.86
October	10	0	0	0	0	0	0	0	0.16	0.01	0	0	0	0	0	0	0	0.81	0	0	0	0.54	0.82	0.12	0	0	0	0.15	0	0.06	0	0	2.67
November	11	0	0	0	0.05	0	2.25	1.11	0.02	0	0	0	0	0	0	0	0.18	0.29	0	0	0.03	0.06	0	0.01	1.05	1.06	0	0	0	0.3	0.09		6.5
December	12	0.09	0	0	0.15	0.22	0	0	0	0	0	0	0.02	0	0	0.01	0	0	0	0	0	0	0	0.35	0	0	0.02	0	0	0	0	0	0.86
1997 Totals	**1997**	**0.29**	**1.71**	**0.83**	**0.53**	**1.76**	**0.15**	**0.04**	**0.62**	**1.2**	**0.37**	**0.17**	**0.11**	**2.27**	**0.11**	**1.46**	**0.92**	**1.38**	**1.04**	**2.6**	**1.71**	**0.89**	**0.19**	**0.27**	**2.49**	**1.44**	**3.07**	**1.29**	**0.33**	**0.58**	**1.41**	**0**	**31.23**
January	1	0	0	0	0	0	0	0	0.05	0.3	0	0	0	0	0	0.55	0	0	0	0	0	0.07	0.12	0	0.63	0	0.06	0.96	0	0	0	0	2.74
Feburary	2	0	0	0.44	0	0	0	0.04	0	0	0	0	0	0	0	0	0.01	0	0	0	0.96	0.39	0	0	0	0	2.19	0	0.11				4.14
March	3	0.12	0	0	0	0.02	0	0	0	0.47	0	0	0	0.87	0.02	0	0	0.05	0.45	0	0	0	0	0	0	0.32	0	0.1	0.16	0	0.27	0	2.85
April	4	0	0	0	0.32	0.52	0	0	0	0	0.34	0.07	0	0	0	0.03	0	0.48	0	0.64	0.02	0	0	0	0.05	0	0	0.19	0	0	0		2.66
May	5	0	0.41	0.05	0	0.03	0	0	0.28	0	0	0.06	0.02	0	0.03	0	0	0	0.11	0	0	0	0	0	0	0.1	0.63	0.6	0.04	0.02	0	0.67	0	3.05
June	6	0.04	0	0.01	0	0	0.09	0	0.02	0	0	0	0	0.7	0	0	0.88	0.02	0	0	0	0	0	0	0	0.23	0	0	0.01	0	0		2
July	7	0	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.36	0	0	0	0	0	0	0	0	0	0	0	0	1.44
August	8	0	0	0	0.11	0	0	0	0.03	0.19	0	0	0.04	0	0.06	0.9	0	0.35	0	1.24	0	0	0	0	0	0	0.06	0	0	0	0.38	0	3.36
September	9	0	1.27	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0.96	0	0	0	0	0	0.27	0.03	0	0	0	0	0	0		2.73
October	10	0	0	0	0	0	0	0	0	0.02	0	0	0.05	0.47	0	0	0	0	0	0	0	0	0	0	1.09	0.26	0.16	0	0	0	0	0	2.05
November	11	0.13	0.03	0.03	0	1.19	0.06	0	0	0	0.03	0	0	0.23	0	0.01	0	0	0	0	0.11	0	0	0	0	0	0	0	0.03	0.46	0.05		2.36
December	12	0	0	0.22	0.1	0	0	0	0.04	0.22	0	0.04	0	0	0	0	0	0	0	0	0	0.41	0.07	0	0.59	0	0	0	0	0.12	0.04	0	1.85
1998 Totals	**1998**	**1.33**	**2.02**	**1.31**	**4.35**	**0.81**	**1.65**	**2.05**	**2.63**	**0.33**	**0.59**	**1.85**	**0.13**	**0.99**	**1.1**	**1.44**	**1.53**	**2.48**	**1.35**	**1.28**	**1.5**	**1.3**	**1.07**	**0.45**	**0.05**	**0.53**	**1.21**	**1.17**	**1**	**2.74**	**2.57**	**0.81**	**43.62**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0	0	0	0.37	0.13	0.33	0.69	0.88	0	0	0	0	0	0.29	0	0	0.04	0	0	0	0	0.08	0	0.03	0	0.04	0	0	0	0	0	2.88
Feburary	2	0	0	0	0	0.03	0	0	0	0	0.26	0.78	0	0	0	0	0.49	0.6	0.05	0.02	0	0	0	0	0	0	0.69	0.01	0				2.93
March	3	0	0.01	0.02	0	0.01	0.01	0.32	0.9	0.11	0	0.05	0	0	0	0	0.26	0.95	0	0.91	0.89	0	0	0	0	0	0	0.73	0.31	0	0	0.52	6
April	4	0	0	0.72	0	0	0	0	0	0.02	0	0	0	0.74	0	1.22	0.02	0	0	0	0	0	0.12	0	0	0.1	0	0.43	0.68	0.57	0.01		4.63
May	5	0.76	0.08	0	0	0	0.7	0.07	0	0	0	0	0.13	0	0	0	0	0	0	0	0.03	0.7	0.28	0.45	0	0.36	0.05	0	0	0	0	0.01	3.62
June	6	0	0	0.05	2.47	0.05	0	0	0.85	0	0	1.01	0	0.03	0.55	0.19	0.29	0	0.03	0	0.45	0.3	0.02	0	0	0	0	0	0.01	0.6	0		6.9
July	7	0	0	0.47	1.11	0	0	0.4	0	0	0.14	0	0	0	0	0	0	0	0	0	0	0	0.57	0	0	0	0.43	0	0	0.94	2.33	0	6.39
August	8	0.06	0	0	0.38	0.29	0	0.46	0	0	0	0.01	0	0	0	0	0.06	0	0.81	0	0	0	0	0	0	0	0	0	0	0	0	0.28	2.35
September	9	0.51	0	0	0	0	0	0	0	0	0	0	0	0.22	0.26	0.03	0.09	0.49	0	0	0	0.2	0	0	0.02	0.04	0	0	0	0			1.86
October	10	0	0.09	0.01	0	0.3	0.35	0	0	0	0	0	0	0	0	0	0.32	0.4	0.41	0	0	0	0	0	0	0	0	0	0	0.63	0	0	2.51
November	11	0	1.84	0.04	0	0	0	0.11	0	0.2	0.19	0	0	0	0	0	0	0	0	0.18	0	0	0	0	0	0.03	0	0	0	0.13			2.72
December	12	0	0	0	0.02	0	0.26	0	0	0	0	0	0	0	0	0	0	0	0.05	0.17	0.13	0.1	0	0	0	0	0	0	0	0	0.1	0	0.83
1999 Totals	**1999**	**3.38**	**1.01**	**1.59**	**0.98**	**0.71**	**1.54**	**2.74**	**3.15**	**2.64**	**0.36**	**0.9**	**4.41**	**0.23**	**0.24**	**0.73**	**0.37**	**0.31**	**0.02**	**0.17**	**0.01**	**0.34**	**0.45**	**2.71**	**0.2**	**0.27**	**0.28**	**0.68**	**0.93**	**0.25**	**1.02**	**1.44**	**34.06**
January	1	0.7	0.54	0	0	0	0.03	0.09	0.01	0	0	0	0.04	0.21	0	0	0	0.27	0	0	0	0.01	0.15	0.87	0	0	0	0	0.07	0	0.68	1.43	5.1
Feburary	2	0.02	0.01	0	0	0	0.81	1.79	0	0	0	0.41	0	0	0	0	0.26	0	0.02	0	0	0	0	0.12	0	0	0	0.08	0				3.52
March	3	0	0.19	0	0	0.27	0	0	0.85	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.64	0	0	0	0	0.14	0	0	0	2.4
April	4	0	0	1.17	0	0.01	0	0	0.2	0	0	0	0	0	0.23	0.52	0.06	0	0	0	0	0.18	0	0.17	0	0.27	0.13	0.6	0.18	0	0		3.72
May	5	0	0	0.01	0.72	0	0.05	0	0	0	0	0.05	0.71	0.01	0.01	0.19	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.34	0.01	2.2
June	6	0.43	0	0	0	0	0	0	0.58	0	0.29	0.37	3.04	0	0	0	0	0	0	0	0	0.05	0	0.11	0.2	0	0.15	0	0.04	0	0		5.26
July	7	2.21	0.12	0	0	0	0.65	0	0	1.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	4.22
August	8	0	0	0	0	0	0	0.86	0.58	0	0	0	0.22	0.01	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.18	0	0	1.95
September	9	0	0	0	0	0	0	0	0	0	0	0	0.35	0	0	0	0	0	0	0.17	0.01	0	0	0	0	0	0	0	0.49	0.07	0		1.09
October	10	0	0.15	0.27	0	0	0	0	0.93	0.6	0	0	0	0	0	0	0.05	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.04
November	11	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0		0.72
December	12	0	0	0.14	0.26	0.43	0	0	0	0.8	0.07	0.07	0.05	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.84
2000 Totals	**2000**	**0.02**	**0.37**	**0.82**	**0.98**	**1.07**	**1.29**	**3.36**	**0.63**	**0.86**	**0.03**	**1.72**	**1.37**	**0.71**	**0.45**	**0.4**	**1.37**	**1.93**	**3.01**	**0.57**	**1.46**	**0.05**	**1.54**	**1.17**	**4.52**	**1.85**	**2.45**	**1.63**	**1.29**	**0.36**	**0.07**	**0.02**	**37.37**
January	1	0	0	0.52	0	0	0	0	0.16	0.02	0.01	0	0	0	0	0	0	0.21	0	0.01	0	0	0.01	0.01	0	0	0	0	0.02	0.23	0.03	0	1.23
Feburary	2	0	0	0	0	0	0	0	0	0	0	0	0	0.18	0	0	0	0.36	2.24	0	0	0	0	0	0	0.2	0.13	0	0	0			3.11
March	3	0	0	0.24	0	0	0	0	0	0	0	0.34	0	0	0	0	0	0	0.19	0.39	0.23	0	0	0	0.01	0	0.48	0	0	0	0	0	1.88
April	4	0	0	0	0	0.03	0.02	0.83	0	0	0	0.02	0	0	0	0	0.18	0	0	0.04	0	0.01	0	0.33	0.24	0	0	0.1	0.04	0	0		1.84
May	5	0	0	0	0	0	0.46	2.02	0	0.07	0	0	0.18	0	0	0	0	0	0.02	0	0	0	1.31	0	0	0	0.68	1.1	0	0	0	0	5.84
June	6	0	0	0	0.6	0	0	0	0	0	0	0.59	0.58	0	0.19	0	0.52	0.13	0	0	0.82	0.04	0	0.65	2.94	0	1.12	0	0	0.04			8.22
July	7	0	0.12	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0.22	0.52	0	0	0	0	0	0	0	0	0.01	1.22	0.09	0	0.01	2.25
August	8	0	0	0	0	0	0.07	0.51	0.45	0	0	0	0	0	0	0	0	1.01	0	0.13	0.35	0	0	0.07	0.63	0	0	0.42	0	0	0	0	3.64
September	9	0	0	0	0	0	0	0	0	0	0.02	0.41	0.24	0	0.03	0	0	0	0	0	0.06	0	0.11	0.11	0.48	1.16	0	0	0	0	0		2.62
October	10	0	0	0	0.38	1.04	0	0	0	0	0	0	0	0	0.23	0.24	0.6	0	0	0	0	0	0.11	0	0	0	0	0	0	0	0	0	2.6
November	11	0	0.2	0	0	0	0.72	0	0.02	0.77	0	0	0.37	0	0	0	0	0	0	0	0	0	0	0	0.22	0.49	0	0	0	0	0		2.79
December	12	0.02	0.05	0	0	0	0.02	0	0	0	0	0.36	0	0.53	0	0.16	0.07	0	0.04	0	0	0	0	0	0	0	0.04	0	0.01	0.04	0	0.01	1.35
2001 Totals	**2001**	**0.05**	**0.72**	**0.9**	**0.92**	**1.57**	**0.41**	**0**	**1.41**	**1.28**	**2.32**	**1.43**	**1.07**	**0.54**	**1.36**	**2.46**	**1.31**	**1.01**	**2.96**	**0.46**	**0.81**	**0.43**	**0.31**	**2.1**	**4.18**	**0.13**	**0.24**	**1.23**	**0.81**	**1.14**	**1.32**	**0.41**	**35.29**
January	1	0	0	0	0	0	0	0	0	0	0	0.02	0.01	0.19	0.01	0	0	0	0	0.01	0	0	0	0	0	0	0.09	0	0.11	0.59	0.08	0.01	1.12
Feburary	2	0	0	0	0	0	0	0	0.01	0.55	0	0	0	0.1	0.08	0	0	0	0	0	0	0.03	0.03	0.12	1.49	0	0	0.07	0				2.48
March	3	0.01	0	0	0	0	0	0	0	0	0	0	0.02	0	0.02	1.1	0.14	0	0	0	0	0	0.07	0	0.04	0	0	0	0	0	0	0.05	1.45
April	4	0	0.27	0.48	0	0	0	0	0	0.38	1.02	0.14	0	0	0.01	0.36	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0.27		3.01
May	5	0	0	0	0	0.04	0.01	0	0	0	0	0	0	0	0	0	0	0.43	0.52	0	0.24	0.19	0.05	0.04	0	0.05	0	0	0	0.13	0.76	0.35	2.81
June	6	0.04	0	0.42	0.41	0	0.4	0	0	0	0	0	0	0	0.73	0.01	0	0	0	0	0.21	0.21	0	0	0	0	0	1.16	0.01	0	0		3.6
July	7	0	0.05	0	0.51	0.55	0	0	0	0	0	0	0.24	0	0	0	0	0.04	1.29	0.42	0.15	0	0	0.53	0.22	0	0	0	0	0	0	0	4
August	8	0	0.26	0	0	0	0	0	0	0.2	0.03	0	0	0	0	0.08	0.01	0.08	0	0	0	0	0	0.8	0.43	0.08	0	0	0	0	0.02	0	1.99
September	9	0	0	0	0	0	0	0	1.4	0.15	0	0	0	0	0	0	0	0.01	1.04	0	0.21	0	0	0	0	0	0	0	0	0	0		2.81
October	10	0	0	0	0	0.9	0	0	0	0	1.27	1.27	0	0.22	0	0.64	0	0	0	0	0	0	0	0	0.49	0.71	0	0	0	0	0	0	5.5
November	11	0	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0.03	0	0	0	0.04	1.29	0	0.15	0	0.69	0.42	0.19		3.06
December	12	0	0	0	0	0.08	0	0	0	0	0	0	0.8	0.03	0.51	0.27	1.16	0.45	0	0	0	0	0.16	0	0	0	0	0	0	0	0	0	3.46
2002 Totals	**2002**	**0.02**	**3.12**	**0.59**	**1**	**1.02**	**3.51**	**1.53**	**1.43**	**0.96**	**0.6**	**1.57**	**3.34**	**0.62**	**0.64**	**0.67**	**0.83**	**1.14**	**2.82**	**4.32**	**0.99**	**0.03**	**0.09**	**0.69**	**2.12**	**1.48**	**0.5**	**1.03**	**0.63**	**1.1**	**1.49**	**1.07**	**40.95**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0	0	0	0	0.09	0.04	0	0	0	0	0	0	0	0	0	0	0	0.11	0.06	0	0	0	0.24	0	0	0	0	0	0.28	1.37	0.97	3.16
Feburary	2	0.01	0	0	0	0	0	0	0	0.01	0.14	0	0	0	0	0	0	0	0	0.4	0.04	0	0	0	0	0.2	0.03	0	0				0.83
March	3	0	0.95	0	0	0	0	0	0.03	0.59	0	0.03	0	0	0	0.6	0.01	0	0.04	0.36	0.06	0	0	0	0.32	0.41	0.22	0	0.01	0.04	0	0	3.67
April	4	0	0.01	0	0	0	0	0.13	0.54	0	0	0	0.07	0	0.02	0	0.06	0	0	1.76	0.53	0.03	0	0	0.07	0	0	1.03	0	0	0		4.25
May	5	0.01	0.13	0	0.03	0	0.56	1.4	0.86	0.19	0	0.01	2.18	0.48	0	0	0.47	0.72	0	0	0	0	0	0	0.19	0	0	0	0.57	0	0.01	0	7.81
June	6	0	0	0	0.56	0.58	0	0	0	0.15	0.44	1.53	0.96	0	0	0	0	0	0	0	0	0	0	0	1.01	0.03	0	0	0	0	0		5.26
July	7	0	0	0.47	0	0	0	0	0	0	0.02	0	0.02	0	0	0	0.26	0	0.14	0	0	0	0.09	0.25	0	0	0.22	0	0	0	0	0	1.47
August	8	0	0	0	0	0	2.68	0	0	0	0	0	0	0.11	0.21	0	0.03	0	0.85	0.02	0.02	0	0	0.2	0	0	0	0	0	0	0	0	4.12
September	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0.41	0	1.64	0.34	0	0	0	0	0	0	0	0	0	0		2.44
October	10	0	1.82	0.05	0.24	0	0.23	0	0	0	0	0	0.11	0	0	0	0	0	0.5	0.07	0	0	0	0	0	0.84	0.03	0	0.05	0.78	0.05	0.01	4.78
November	11	0	0.21	0.07	0	0.35	0	0	0	0.02	0	0	0	0	0.36	0.07	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0		1.14
December	12	0	0	0	0.17	0	0	0	0	0	0	0	0	0.03	0	0	0	0.01	1.18	0.01	0	0	0	0	0.47	0	0	0	0	0	0.06	0.09	2.02
2003 Totals	**2003**	**2.93**	**2.09**	**0.14**	**1.02**	**0.79**	**1.79**	**0.08**	**0.07**	**1.69**	**5.03**	**0.66**	**2.39**	**1.78**	**1.03**	**0.49**	**2.28**	**1.57**	**2.73**	**1.65**	**0.66**	**0.05**	**1.12**	**1.01**	**1.41**	**4.23**	**1.82**	**0.55**	**1.17**	**0.49**	**1.94**	**1.4**	**46.06**
January	1	0.19	0.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0.02	0	0	0	0.07	0	0	0	0	0	0	0.01	0	0.21	0.96
Feburary	2	0	0	0.01	0	0	0.11	0	0	0.04	0	0	0	0	0.51	0.41	0.16	0	0.03	0.18	0	0	0.15	0.2	0	0	0	0.14	0.06				2
March	3	0.01	0	0	0	0.05	0	0	0	0	0	0.41	0.07	0.69	0	0	0	0	0.05	0.99	0.19	0.01	0	0	0	0.03	0	0	0.3	0	0	0	2.8
April	4	0	0	0	0.1	0	0.59	0	0.07	0	0	0	0	0	0	0	1.2	0.12	0	0.03	0.38	0	0	0	0.83	0.4	0	0	0.39	0.18	0		4.29
May	5	0.06	0	0	0.78	0.21	0.51	0	0	0	1.02	0	0	0	0	0.04	0.08	0.06	0.01	0.01	0.09	0	0	0	0.55	0.29	0	0	0	0	0.26	0	3.97
June	6	0	0.55	0	0	0	0.29	0	0	0	2.68	0.18	2.09	0.86	0	0	0	0	0	0.44	0	0	0	0	0	3.31	0.47	0	0	0	1.48		12.35
July	7	0	0.39	0	0	0	0	0	0	0.22	0.96	0	0	0	0	0	0	0	0.74	0	0	0	0.12	0	0	0	0	0	0.08	0	0	0	2.51
August	8	0.06	0.45	0	0	0	0.15	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.37	0	0.24	0	1.19	2.54
September	9	1.98	0.27	0	0	0	0	0	0	0	0	0	0.23	0.02	0.01	0	0	0	0	0	0	0	0.04	0.01	0	0.03	0	1.35	0.01	0	0	0.2		4.15
October	10	0	0	0.03	0	0	0	0	0	1.13	0	0.07	0	0.08	0.25	0	0.8	0.04	0	0	0	0	0	0	0	0.2	0	0.03	0.18	0	0	0	2.81
November	11	0.63	0	0	0.06	0.43	0.14	0	0	0	0	0	0	0	0.26	0.04	0	1.35	1.85	0	0	0	0	0.58	0	0	0	0	0	0	0		5.34
December	12	0	0	0.1	0.08	0.1	0	0	0	0.3	0.37	0	0	0.13	0	0	0.01	0	0.03	0	0	0	0.77	0.23	0	0	0	0	0.16	0.06	0	0	2.34
2004 Totals	**2004**	**1.72**	**0.92**	**1.08**	**4.66**	**1.9**	**1.02**	**0.48**	**0.18**	**0.32**	**0.32**	**1.66**	**0.87**	**1.65**	**1.2**	**0.24**	**0.44**	**1.07**	**1.51**	**1.32**	**0.56**	**0.09**	**0.59**	**0.8**	**2.83**	**3.45**	**3.05**	**2.54**	**0.33**	**0.53**	**4.6**	**0.34**	**42.27**
January	1	0.03	0	0.12	2.2	0	0	0	0	0	0	0	0	0	0	0	0.1	1.02	0	0	0	0	0	0	0	0.45	0.02	0.03	0	0	0	0	3.97
Feburary	2	0.06	0.64	0	0	0.06	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0.03	0	0	0	0	0	0.03			0.85
March	3	0	0	0.25	1.26	0.09	0	0	0	0.01	0	0	0	0.06	0.05	0.02	0.07	0.05	0	0	0	0	0	0.06	0	0.46	1.57	0.07	0.31	0.02	0	0.01	4.36
April	4	0	0	0	0	0	0	0	0	0	0.18	0	0	0	0	0	0	0	0	0	0.06	0	0.21	0	0.75	0	0	0	0	0.03	0.71		1.94
May	5	0.69	0.05	0	0	0	0	0	0	0	0.03	0	0.05	1.53	0.62	0	0	0	0.36	1.1	0	0	0	0.02	0.17	0.76	0.95	2.09	0	0	1.18	0.15	9.75
June	6	0	0	0	0	0	0	0	0	0.31	0.02	0	0.01	0.03	0	0	0.23	0	0.11	0	0	0.09	0.01	0	0	0	0	0	0.02	0	0		0.83
July	7	0.03	0.22	0.41	0	1.51	0.19	0	0	0	0	0.1	0	0	0	0	0.02	0	0	0	0	0	0.09	0	0.15	0.48	0	0	0	0.07	2.25	0	5.52
August	8	0	0	0.07	1.18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.49	0	0	0.45	0.37	1.3	0.08	0.09	0	0.02	0	0	4.1
September	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.22	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0.23
October	10	0.09	0	0	0	0	0	0	0.18	0	0	0.2	0.81	0.03	0.53	0	0	0	0.65	0.03	0	0	0	0.19	0	0	0.43	0.01	0	0	0	0.06	3.21
November	11	0.82	0.01	0.23	0.02	0	0	0	0	0	0	1.33	0	0	0	0	0.01	0	0.39	0.14	0	0	0.28	0.05	1.39	0	0	0.25	0	0.36	0.46		5.74
December	12	0	0	0	0	0.24	0.81	0.48	0	0	0.09	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.12	1.77
2005 Totals	**2005**	**0.14**	**0.54**	**1.86**	**2.13**	**2.16**	**0.26**	**0.51**	**0.78**	**1.23**	**0**	**3.35**	**2.52**	**4.21**	**1.17**	**3.01**	**0.05**	**0**	**0.8**	**1.82**	**0.3**	**0.29**	**1.48**	**0.25**	**0.3**	**3**	**0.85**	**1.61**	**1.65**	**0.32**	**0.2**	**1.06**	**37.85**
January	1	0.14	0.47	1.83	1.83	1.58	0	0.05	0	0	0	0.08	1.67	1.11	0	0.02	0.01	0	0	0	0	0	0	0	0	0	0	0	0.05	0.17	0	0	9.01
Feburary	2	0	0.07	0	0	0	0.18	0.35	0.14	0.12	0	0	0.05	0.76	0	0	0	0	0	0	0.01	0	0	0.03	0.02	0	0	0	0.11				1.84
March	3	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.05	0.1	0.12	0.1	0	0	0	0	0	0	1.47
April	4	0	0	0	0	0	0.02	0.01	0	0	0	0.27	0.4	0.13	0	0	0	0	0	0	0.07	0.28	0.3	0.12	0	0.21	0.12	0	0.14	0.1	0		2.17
May	5	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0.24	0	0	0	0	0.31	0	0.01	0.1	0	0	0	0	0.06	0	0.05	0	0	0.78
June	6	0	0	0	0	0	0.03	0	0.48	1.1	0	2.02	0	0.59	0	0	0	0	0	0	0	0	0	0	0	0.88	0	0	0	0	0		5.1
July	7	0	0	0	0.06	0	0	0	0	0	0	0.91	0.35	0.04	0.04	0.03	0	0	0.35	0	0	0	0	0	0	0	0.38	0.06	0	0	0	0	2.22
August	8	0	0	0	0.24	0.1	0	0	0	0	0	0.06	0.05	1.09	0.11	1.14	0.04	0	0.23	0	0	0	0	0	0.02	0.44	0.35	0	0	0	0	0	3.87
September	9	0	0	0	0	0	0	0	0	0	0	0	0	0.49	0.17	1.03	0	0	0.21	1.42	0	0	0	0	0.01	1.04	0	0	0.93	0	0		5.3
October	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0.22	0	0.03	0	0	0	0	0	0	0	0.12	1.06	1.52
November	11	0	0	0	0	0.48	0.03	0	0	0	0	0	0	0	0.27	0.79	0	0	0	0	0	0	0	0	0	0	0	1.49	0.29	0	0		3.35
December	12	0	0	0.03	0	0	0	0	0.16	0	0	0.01	0	0	0.34	0	0	0	0.01	0	0	0	0	0	0.13	0.33	0	0	0.13	0	0.08	0	1.22
2006 Totals	**2006**	**2.22**	**0.68**	**0.13**	**0.09**	**0.26**	**0.71**	**0.02**	**0.67**	**1.02**	**2.59**	**1.59**	**0.26**	**1.1**	**0.23**	**1.55**	**2.34**	**0.66**	**0.84**	**0.24**	**1.09**	**2.06**	**0.1**	**0.03**	**0.05**	**0.3**	**1.38**	**1.67**	**0.75**	**1.25**	**3.44**	**0.61**	**29.93**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0	0.18	0	0	0	0	0	0	0	0.43	0	0	0.24	0	0	0.08	0	0	0	0.1	0	0	0	0	0	0	0	0.58	0.02	0	0	1.63
Feburary	2	0	0	0	0	0	0	0	0.19	0	0	0	0	0	0	0.01	0.26	0	0	0	0	0	0	0	0	0	0	0	0				0.46
March	3	0	0	0	0	0.19	0	0	0.48	0.79	0	0.41	0.23	0.09	0	0	0	0	0	0	0.43	0.2	0	0	0	0	0	0.31	0	0	0	0.13	3.26
April	4	0	0.5	0	0	0.03	0.55	0	0	0	0	0	0	0	0	0.03	0	0	0.17	0	0	0	0	0.01	0	0.01	0	0	0	0.48	0.32		2.1
May	5	0.56	0	0.13	0	0	0	0	0	0.23	1.18	0.16	0	0	0.08	0.08	0.36	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0.05	2.88
June	6	1.23	0	0	0	0	0	0	0	0	0.61	0.32	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.01	0	0	0.1	0		2.37
July	7	0	0	0	0	0	0	0	0	0	0	0.08	0.01	0.74	0	0	0	0	0	0.12	0	1.35	0	0	0	0	0	0.1	0	0.33	0	0	2.73
August	8	0	0	0	0	0	0	0	0	0	0.14	0	0	0	0.01	0	0	0	0.67	0.12	0	0	0	0	0	0.06	1.03	0.07	0.17	0	0	0	2.27
September	9	0.05	0	0	0.09	0.03	0	0	0	0	0	0.39	0.02	0	0	0	0	0.66	0	0	0	0	0	0.02	0	0	0	0	0	0	0.02		1.28
October	10	0	0	0	0	0	0	0	0	0	0	0.09	0	0	0	0	1.64	0	0	0	0	0.16	0	0	0	0.23	0.34	1.19	0	0	0.01	0	3.66
November	11	0	0	0	0	0.01	0.16	0.01	0	0	0.23	0	0	0.03	0.14	1.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.32	2.92		5.25
December	12	0.38	0	0	0	0	0	0.01	0	0	0	0.14	0	0	0	0	0	0	0	0	0.56	0.35	0	0	0	0	0	0	0	0	0.17	0.43	2.04
2007 Totals	**2007**	**1.41**	**1.4**	**1.53**	**2.09**	**0.63**	**0.66**	**0.68**	**0.21**	**0.56**	**1.01**	**0.44**	**2.37**	**1.32**	**2.22**	**1.14**	**0.04**	**0.5**	**0.51**	**2.13**	**0.42**	**0.42**	**0.62**	**0.59**	**1.55**	**0.53**	**1.05**	**1.52**	**0.64**	**0.49**	**0.93**	**0.96**	**30.57**
January	1	0	0	0	0.25	0	0	0.06	0	0.01	0	0	1.43	0.29	0.8	0.02	0	0	0	0	0.1	0.11	0	0	0	0	0	0	0.01	0	0	0.03	3.11
Feburary	2	0.01	0	0	0	0.03	0	0	0	0	0	0	0.5	0.44	0	0	0.01	0.04	0	0	0	0	0	0	0.82	0.12	0	0	0.01				1.98
March	3	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0.84	0.01	0	0	0	0	0.05	0	0.18	0.21	0	0	0	0.03	0.03	0	0.84	0.55	2.8
April	4	0	0	1.02	0	0	0	0	0	0	0.65	0.1	0	0.35	0.58	0	0	0	0	0	0	0	0	0	0.1	0.19	0.19	0	0	0	0		3.18
May	5	0.58	0.17	0.15	1.42	0	0	0	0	0	0.07	0.03	0	0	0	0.43	0	0	0	0	0	0	0	0	0	0	0.21	0.72	0.01	0	0.09	0.38	4.26
June	6	0.82	0.11	0	0.01	0.06	0	0	0.01	0	0	0	0	0	0	0	0	0	0.21	0	0	0	0	0.34	0	0	0	0.68	0.52	0.12	0		2.88
July	7	0	0	0	0.41	0.07	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	2.12	0	0	0	0	0	0	0	0.08	0	0.23	0	0	3.11
August	8	0	0	0.34	0	0	0	0	0	0	0	0	0	0.23	0	0	0	0	0.02	0.01	0.18	0.02	0	0	0.63	0	0	0	0	0.14	0	0	1.57
September	9	0	0	0	0	0.47	0.51	0.62	0.05	0	0.04	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0		1.71
October	10	0	0.86	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.36	0.28	0	0	0	0.17	0.04	0	0.05	0.19	0	0	0	0	1.97
November	11	0	0	0	0	0	0	0	0	0	0	0.02	0.44	0.01	0	0	0	0	0	0	0	0.29	0	0	0	0.17	0.32	0	0	0	0		1.25
December	12	0	0.26	0	0	0	0.15	0	0.15	0.49	0.15	0.29	0	0	0	0.67	0.03	0	0	0	0.09	0	0.27	0	0	0	0.13	0.01	0.06	0	0	0	2.75
2008 Totals	**2008**	**0.36**	**0.92**	**2.68**	**3.99**	**2.36**	**0.48**	**1.71**	**2.78**	**0.91**	**2.49**	**0.8**	**1.76**	**0.66**	**5.7**	**0.98**	**0.5**	**1.48**	**3.44**	**0.63**	**0.64**	**1.49**	**1.44**	**1.86**	**0.99**	**2.77**	**3.47**	**4.19**	**0.42**	**0.33**	**3.99**	**1.74**	**57.96**
January	1	0	0	0	0	0	0	0	1.56	0	0.11	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0.3	1.98
Feburary	2	0.32	0	0.14	0	2.36	0.06	0	0.01	0	0	0.04	0	0	0	0	0.46	0.63	0	0	0	0.34	0.02	0	0.1	0.05	0.03	0	0.04	0			4.6
March	3	0	0	0.74	0.73	0	0	0	0	0	0	0	0	0.04	0	0.21	0	0.85	2.46	0.31	0	0	0	0.04	0	0	1.24	0.22	0	0	0.33	1.22	8.39
April	4	0	0	0.82	0	0	0	0	0.12	0	1.45	0	0	0.03	0	0	0	0	0.64	0.03	0	0	0.06	0	0.14	0.35	0	0.07	0.05	0	0		3.76
May	5	0	0.23	0	0	0	0	1.24	0.72	0.21	0.93	0.28	0	0.41	0.04	0.22	0	0	0	0	0	0	0.16	0.25	0.03	1.61	2.19	0.62	0	0	1.48	0.22	10.84
June	6	0	0	0.24	0.2	0	0.2	0.01	0	0.06	0	0	0	0.18	0	0	0	0	0	0	0.58	0	0.01	0	0.28	0	0.01	0.12	0	0	0		1.89
July	7	0	0.69	0.3	0	0	0	0	0.33	0.28	0	0.02	0.01	0	0	0	0	0	0	0.01	0	0.42	1.19	0	0.14	0.76	0	1.34	0.19	0	1.82	0	7.5
August	8	0	0	0.33	0	0	0.18	0.16	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0.72	0	0	0	0	0	0	0.14	0	0	0	1.59
September	9	0	0	0.04	3.06	0	0	0.08	0	0	0	0.01	1.71	0	4.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.29	0		9.77
October	10	0	0	0	0	0	0	0.22	0	0	0	0	0	0	0	0.37	0	0	0	0	0	0	0	0.54	0.1	0	0	0	0	0	0	0	1.23
November	11	0	0	0	0	0	0.03	0	0	0	0	0.45	0.04	0	0.81	0.1	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0.04	0.36		1.86
December	12	0.04	0	0.07	0	0	0.01	0	0.04	0.36	0	0	0	0	0.27	0.08	0.04	0	0.34	0.28	0	0	0	1	0.2	0	0	1.82	0	0	0	0	4.55
2009 Totals	**2009**	**1.3**	**1.43**	**0.13**	**1.78**	**1.67**	**0.59**	**0.15**	**4.11**	**1.96**	**2.67**	**1.36**	**1.54**	**2**	**0.78**	**3.55**	**4.19**	**1.48**	**0.65**	**0.77**	**1.7**	**0.46**	**2**	**1.21**	**1.88**	**2.46**	**1.11**	**1.84**	**1.92**	**2.28**	**1.85**	**0.1**	**50.92**
January	1	0	0	0	0	0	0.01	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0.17	0.42	0.08	0	0	0	0.77
Feburary	2	0	0	0	0	0	0	0	0	0.1	0.44	1.22	0	0.01	0	0	0	0	0	0	0	0.03	0	0	0	0	0.53	0	0				2.33
March	3	0	0	0	0	0	0	0	0	0.07	0.49	0	0	0	0	0	0	0	0.29	0	0	0.04	0	0	0.54	0	0	0	1.14	0.37	0	0.1	3.04
April	4	0	0.24	0	0	0.09	0.04	0	0	1.11	0.33	0	0.13	0.5	0	0	0	0	0.23	0.45	0.01	0	0	0	0	0	0	0.45	0.01	0.42	0.05		4.06
May	5	0.16	0.01	0	0	0.02	0.1	0.14	0.67	0	0	0	0	0.13	0	0.47	0.03	0	0	0	0	0	0	0.03	0.03	2.01	0.07	0.4	0.24	0	0.21	0	4.72
June	6	0	0.92	0.13	0	0	0	0.01	0.21	0.02	1.14	0.14	0	0	0	1.86	1.59	0	0	0.21	0.07	0	0	0	0	0	0	0.02	0.1	0	0		6.42
July	7	0	0	0	1.78	0.08	0	0	0	0	0	0	0.9	0	0	0.36	0.74	0	0	0	0	0	0	0	0	0	0	0	0.25	0.08	0.01	0	4.2
August	8	0.09	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0.11	1.18	0	0.06	0.67	0.02	0	0	0	0	0	0	0.1	0	0	0	2.48
September	9	0	0	0	0	1.48	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0.95	0.37	0.03	0	0.1	0	0.22	0	0	0	0		3.16
October	10	1.05	0	0	0	0	0.42	0	2.66	0.64	0	0	0.05	0.8	0.78	0.16	0	0	0	0	0	0	1.91	0.08	0	0.29	0.12	0.51	0	1.41	1.5	0	12.38
November	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	1.72	0.3	0.09	0.03	0	0	0	0	0.26	0.01	0	0	0	0	0		3.11
December	12	0	0.26	0	0	0	0.01	0	0.57	0.02	0	0	0.46	0.56	0	0	0	0	0.04	0.02	0	0	0.06	1.1	0.95	0.08	0	0.04	0	0	0.08	0	4.25
2010 Totals	**2010**	**0.11**	**1.15**	**0.4**	**0.53**	**1.33**	**0.2**	**0.21**	**1.75**	**0.82**	**0.94**	**1.23**	**1.93**	**0.74**	**2.41**	**0.96**	**1.01**	**0.71**	**0.74**	**0.97**	**3.18**	**2.88**	**1.32**	**0.56**	**6.15**	**2.1**	**0.74**	**1.43**	**0.26**	**0.57**	**1.2**	**0.54**	**39.07**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0.03	0	0	0	0	0.12	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0.29	0	0.43	0.09	0	0.01	0.05	0	0	0	0	1.2
Feburary	2	0	0	0	0.12	0.67	0	0	0.12	0.04	0	0	0	0	0.19	0.01	0	0	0	0.01	0	0.86	0.07	0	0	0	0	0	0				2.09
March	3	0	0	0	0	0	0	0	0	0.13	0	0.4	0.23	0.21	0.03	0	0	0	0	0	0.03	0.28	0.03	0	0	0.74	0	0.01	0.26	0	0	0	2.35
April	4	0	0.1	0.32	0.25	0.27	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0.37	0.13	0.78	0.33	0.03	0.12	0	0	0.29		3.01
May	5	0.01	0.13	0.02	0	0	0	0	0	0	0.27	0.01	1.29	0.09	0.3	0.5	0.99	0.02	0	0	0.35	0.27	0	0	0	0	0.38	0	0	0	0	0.01	4.64
June	6	0	0.58	0.05	0	0	0	0	0.68	0.03	0	0	0.26	0.34	0.25	0.38	0	0.41	0	0.07	0	0	0.01	0	0.03	0	0	0.95	0	0	0		4.04
July	7	0	0	0	0.13	0	0.08	0.14	0.95	0.36	0	0.01	0.02	0.08	0	0	0	0.14	0.25	0.02	1.97	0.74	0	0	0.97	0	0	0.3	0	0.01	0.52	0	6.69
August	8	0	0	0	0	0.39	0	0	0	0	0.04	0	0	0	1.64	0	0	0	0	0	0.72	0.44	0	0	0	0	0	0	0	0	0.39	0	3.62
September	9	0.07	0.33	0.01	0	0	0	0	0	0.26	0.63	0.54	0	0	0	0.06	0	0	0.46	0.86	0	0	0.07	0	0.16	0.2	0.08	0	0	0	0		3.73
October	10	0	0.01	0	0	0	0	0	0	0	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0	0	0.79	0	0.24	0	0	0	0	0	1.06
November	11	0	0	0	0.03	0	0	0	0	0	0	0	0	0.01	0	0	0	0.14	0.03	0	0	0	0.77	0	3.08	0.78	0	0	0	0.5	0		5.34
December	12	0	0	0	0	0	0	0	0	0	0	0.26	0.13	0	0	0.01	0	0	0	0.01	0	0	0	0	0.25	0.05	0	0	0	0.06	0	0.53	1.3
2011 Totals	**2011**	**1.18**	**0.06**	**2.88**	**2.28**	**1.18**	**0.02**	**1.84**	**0.85**	**0.89**	**1.66**	**0.34**	**0.45**	**0.79**	**4.44**	**1.3**	**0.03**	**1.72**	**2**	**3.52**	**0.76**	**0.61**	**3.18**	**1.59**	**1.09**	**5.53**	**3.53**	**2.46**	**0.42**	**0.01**	**0.22**	**0.34**	**47.17**
January	1	0	0	0	0	0	0	0.03	0	0	0.1	0.13	0	0	0	0	0	0.01	0.08	0.21	0.37	0	0	0.05	0.01	0	0	0	0	0	0	0.34	1.33
Feburary	2	0.9	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0.43	0	0.08	0.8	0.4	0	0.39	0.16				3.37
March	3	0	0	0	1.36	0.37	0	0	0.47	0	0	0	0	0.27	1.21	0	0	0	0.03	0.31	0	0	0	0	0.02	0.27	0.39	0	0	0	0.04	0	4.74
April	4	0	0	0	0.67	0	0	0	0.01	0.69	0.18	0.17	0	0	0	0.81	0.01	0	0.01	1.66	0	0.09	1.29	0.64	0.26	0.66	0.05	0.65	0.03	0	0		7.88
May	5	0.28	0.01	0	0	0.05	0	0.05	0	0	0.26	0	0	0.03	0.53	0.35	0	0	0	0.04	0.01	0.03	0.5	0.25	0	1.4	0.31	0.04	0.02	0	0	0	4.16
June	6	0	0	0	0	0	0	0	0	0	1.06	0.04	0.01	0	0.54	0.14	0	1.12	0.34	0.33	0	0.05	0	0	0	2.8	1.65	1.02	0	0	0		9.1
July	7	0	0	1.59	0.06	0	0	0.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.53	0	0	0	0	0	0	0.17	0	2.91
August	8	0	0	0	0	0.56	0.02	0	0	0	0.04	0	0.1	0.09	0	0	0	0	0	0	0.11	0.07	0	0.05	0	0	0	0	0	0	0	0	1.04
September	9	0	0	0.16	0	0	0	0	0	0.18	0.02	0	0	0	1.78	0	0.02	0.02	0.93	0	0	0	0.03	0.04	0	0	0	0	0	0	0		3.18
October	10	0	0	0	0	0	0	0	0	0	0	0	0.34	0.01	0	0	0	0.57	0.61	0.05	0	0	0	0	0	0	0.08	0	0	0	0	0	1.66
November	11	0	0.05	0.96	0	0	0	1.2	0.37	0.02	0	0	0	0.03	0	0	0	0	0	0	0.06	0	1.31	0	0	0	0.45	0.02	0.21	0	0		4.68
December	12	0	0	0.17	0.19	0	0	0	0	0	0	0	0	0.36	0.38	0	0	0	0	0.8	0.25	0.01	0	0	0	0	0.6	0.34	0	0.01	0.01	0	3.12
2012 Totals	**2012**	**1.14**	**0.35**	**1.77**	**1.47**	**1.51**	**0.03**	**1.55**	**1.18**	**0.31**	**0.05**	**2.5**	**0.18**	**1.46**	**2.46**	**2.17**	**1.74**	**2.82**	**0.02**	**0.09**	**0.54**	**0**	**0.5**	**0.41**	**0**	**2.26**	**1.36**	**0.14**	**1.61**	**0.83**	**0.05**	**1.8**	**32.3**
January	1	0	0	0	0	0	0	0	0	0	0	0.04	0.15	0	0	0	0	0.85	0	0	0	0	0	0	0	0.77	0.34	0.12	0.07	0	0	0	2.34
Feburary	2	0	0	1.05	0.23	0.04	0	0.09	0.04	0	0.04	0.01	0	0.13	0	0.16	0.14	0	0	0	0.03	0	0	0.03	0	0	0	0	0	0.02			2.01
March	3	0	0.2	0	0	0	0	0.01	0.2	0	0	0.19	0	0	0	0.74	0.22	1.34	0.01	0	0	0	0.19	0.13	0	0	0	0	0	0.1	0	0	3.33
April	4	0	0	0.72	0.31	0.72	0	0	0	0	0	0	0	1.12	1.3	0.92	0	0	0	0	0.1	0	0.14	0	0	0	0	0	1.4	0.52	0.05		7.3
May	5	0.57	0	0	0.1	0	0.01	0.82	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1	1.7
June	6	0	0	0	0.04	0	0	0	0	0	0	1.06	0	0	0	0	0	0.87	0	0	0	0	0	0	0	0	0	0	0	0	0		1.97
July	7	0	0	0	0	0	0	0.01	0.24	0.03	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.19	0	0	0.72
August	8	0	0.01	0	0.48	0	0	0	0.46	0.01	0	0	0.03	0.09	0	0	0.51	0	0	0	0	0	0	0	0	0.08	0.83	0.02	0	0	0	1.48	4
September	9	0.57	0.11	0	0.01	0.13	0	0.57	0	0	0	0	0	0	0.1	0	0	0.29	0.01	0	0	0	0	0	0	0.97	0.19	0	0.08	0	0		3.03
October	10	0	0	0	0	0.54	0	0	0	0.01	0.01	0	0	0.12	0.77	0	0	0.27	0	0.01	0	0	0.08	0.25	0	0.44	0	0	0	0	0	0	2.5
November	11	0	0	0	0	0.08	0.02	0	0	0	0	1.2	0	0	0	0	0	0	0	0.01	0	0	0.09	0	0	0	0	0	0	0	0		1.4
December	12	0	0.03	0	0.3	0	0	0.05	0.24	0.26	0	0	0	0	0.04	0.35	0	0.07	0	0.07	0.31	0	0	0	0	0	0	0	0.06	0	0	0.22	2
2013 Totals	**2013**	**2.15**	**1.65**	**2.24**	**0.02**	**1**	**0.31**	**0.25**	**0.88**	**1.2**	**4.06**	**0.17**	**0.84**	**0.37**	**0.69**	**2.07**	**0.86**	**1.84**	**3.21**	**0.17**	**1.62**	**2.22**	**0.25**	**2.36**	**1.26**	**0.3**	**2.35**	**1.18**	**0.11**	**1.97**	**2.42**	**2.66**	**42.68**
January	1	0	0	0	0	0	0	0	0	0	0.62	0	0.65	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0.24	0	1.44	0.15	0	3.12
Feburary	2	0	0.14	0.12	0	0	0	0.23	0	0.09	0.46	0	0	0	0	0	0	0	0.16	0	0	0.94	0.01	0	0	0.19	0.84	0.06	0.03				3.27
March	3	0.08	0	0	0.02	0.25	0	0	0	0.44	1.35	0.01	0	0.01	0	0	0.09	1.19	0.02	0	0	0	0	0.06	1.25	0.03	0	0	0	0	0.15	0	4.95
April	4	0	0	0	0	0	0	0.02	0	0	1.02	0.1	0	0	0	0.45	0.45	0	2.48	0	0	0	0	0.72	0.01	0	0	0.41	0.01	0	0		5.67
May	5	0	0.37	1.99	0	0.15	0	0	0	0.18	0	0	0	0	0	0	0	0.27	0	0	1.22	0.01	0	0.02	0	0.08	0.02	0.47	0.05	0	0.56	1.74	7.13
June	6	0.26	0	0	0	0.05	0	0	0	0.49	0.06	0	0	0	0	1.13	0.24	0.28	0	0	0	0	0.02	1.54	0	0	1.44	0	0.01	0.4	0.01		5.93
July	7	0	0.54	0	0	0	0.07	0	0	0	0.55	0	0	0	0.28	0	0	0.05	0.28	0	0	0	0	0	0	0	0.05	0	0	0	1.53	0	3.35
August	8	0	0.42	0	0	0	0	0	0.42	0	0	0	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.18	1.19
September	9	1.81	0	0	0	0	0	0	0.41	0	0	0	0	0	0	0.01	0	0.03	0.17	0	0.3	0	0	0	0	0	0	0	0	0.01	0		2.74
October	10	0	0.18	0.13	0	0.23	0.01	0	0	0	0	0	0.02	0	0	0.48	0	0.02	0.1	0.17	0	0	0.1	0.02	0	0	0	0	0	0.13	0.02	0.74	2.35
November	11	0	0	0	0	0.21	0.23	0	0	0	0	0.06	0	0	0	0	0.08	0	0	0	0.07	0.37	0	0	0	0	0	0	0	0	0		1.02
December	12	0	0	0	0	0.11	0	0	0.05	0	0	0	0	0.36	0.41	0	0	0	0	0	0.03	0.9	0.1	0	0	0	0	0	0	0	0	0	1.96
2014 Totals	**2014**	**3.27**	**4.38**	**2.5**	**1.85**	**2.34**	**1.16**	**3.25**	**0.4**	**2.26**	**3.24**	**0.87**	**0.73**	**1.59**	**2**	**0.88**	**1.14**	**0.36**	**0.08**	**0**	**0.25**	**1.08**	**0.78**	**0.91**	**1.5**	**1.5**	**0.93**	**2.03**	**1.84**	**0**	**0.17**	**0.14**	**43.43**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0.11	0.09	0	0	0.64	0	0	0	0.07	0.55	0.02	0	0	0.01	0	0.03	0	0.06	0	0	0.09	0	0	0	0	0	0	0	0	0	0	1.67
Feburary	2	0.53	0	0	0.37	0.11	0	0	0.04	0.02	0	0	0	0	0.09	0	0	0.09	0	0	0.23	0	0	0	0	0	0	0	0				1.48
March	3	0	0.32	0	0	0	0	0	0	0	0	0.68	0.34	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0.02	0.17	0.01	0	0	0	1.55
April	4	0.07	2.53	2.23	0	0	0	0.66	0	0	0	0	0	0.49	0.07	0	0	0	0	0	0	0.09	0	0	0.5	0	0	0.59	1.15	0	0		8.38
May	5	0	0	0	0	0	0	0	0.02	0	0.32	0.17	0.17	0.15	0.53	0.35	0	0	0	0	0	0.13	0	0	0	1.48	0.52	0	0	0	0	0.14	3.98
June	6	0	0	0	0.87	0	0	0.66	0	0.9	0.43	0	0.15	0	0	0	0	0	0	0	0	0.73	0	0.06	0.51	0	0	0.95	0	0	0		5.26
July	7	0.02	0	0	0	0	0	0	0.33	0	0	0	0	0.11	1.11	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	1.59
August	8	0	0	0	0	0.23	1.14	1.79	0.01	0.01	0	0	0	0	0	0.09	0.98	0.19	0	0	0.02	0	0	0	0	0	0.07	0.18	0.19	0	0.16	0	5.06
September	9	2.15	0.21	0	0	0.01	0.02	0	0	0.56	1.13	0	0.01	0	0	0.03	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0		4.2
October	10	0.31	1.23	0.27	0	0	0	0.14	0	0.7	0.81	0	0.06	0.84	0.19	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0.49	0	0	0	5.08
November	11	0	0	0	0.58	0	0	0	0	0	0	0	0	0	0	0.04	0.13	0	0	0	0	0.04	0.1	0.85	0.47	0	0.24	0	0	0	0.01		2.46
December	12	0.08	0	0	0.03	1.35	0	0	0	0	0	0	0	0	0	0.33	0	0	0.01	0	0	0	0.68	0	0.02	0	0.08	0.14	0	0	0	0	2.72
2015 Totals	**2015**	**1.58**	**0.69**	**1.03**	**0.19**	**6.52**	**0.17**	**1.89**	**4.46**	**3.06**	**1.89**	**1.31**	**0.12**	**1.92**	**3.02**	**0.6**	**2.27**	**2.16**	**1.4**	**3.01**	**0.97**	**1.26**	**0.91**	**1.16**	**0.83**	**2.58**	**6.46**	**3.71**	**3.95**	**1.24**	**0.66**	**0.22**	**61.24**
January	1	0.02	0.03	0.61	0.01	0	0.02	0.01	0	0	0	0.29	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0.19	0	0	0	0	0	0	1.21
Feburary	2	0.66	0	0	0.06	0	0	0	0	0	0	0	0	0	0.01	0.14	0.25	0.02	0.01	0	0.14	0.09	0	0	0	0	0.05	0	0.31				1.74
March	3	0.04	0	0.12	0.01	0	0	0	0	0	0.2	0	0.02	1.1	0.15	0	0	0	0.03	0	0	0	0	0.13	0.59	0.52	0.07	0	0	0.02	0	0	3
April	4	0	0.61	0.3	0	0	0.01	1.76	0.48	1.14	0	0	0	0.06	0	0	0	0	0	0.77	0	0	0	0	0	0.29	0	0	0	0	0		5.42
May	5	0	0	0	0.01	0	0	0	0.3	0.32	0.55	0.55	0	0	0.05	0.35	0.09	0.15	0	0	0.24	0	0	0	0.24	0	0.15	0	0	0.08	0.54	0	3.62
June	6	0	0	0	0.1	1.9	0	0.06	1.32	0	0	0	0.07	0.02	2.43	0.11	0.75	0.08	0.87	1.33	0	0.38	0	0	0	1.57	1.11	0	1.02	0.02	0		13.14
July	7	0.86	0.04	0	0	0	0.14	0.06	1.01	0	0.77	0	0	0	0	0	0	0	0	0.45	0.56	0	0	0	0	0	0.21	0.03	0	0	0	0	4.13
August	8	0	0	0	0	3.25	0	0	0	1.49	0.05	0	0	0	0	0	0	0	0.06	0.45	0.46	0	0	0.91	0	0	0	0	0	0	0	0	6.67
September	9	0	0	0	0	0	0	0	1.35	0.11	0.32	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.03	0		3.11
October	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0.01	0	0	0	0.72	0.02	0	0	0.22	0.98
November	11	0	0	0	0	1.37	0	0	0	0	0	0.17	0	0	0	1.04	1.85	0.04	0	0	0.02	0.52	0	0	0	0.01	0	1.24	0.01	0.09	0.12		6.48
December	12	0	0.01	0	0	0	0	0	0	0	0	0	0	0.74	0.38	0	0.14	0	0	0	0	0.01	0.26	0	1.02	0	0	4.87	1.72	2.59	0	0	11.74
2016 Totals	**2016**	**0.44**	**2.57**	**2.83**	**0.62**	**0.17**	**1.08**	**0.64**	**0.65**	**2.24**	**3.89**	**2.59**	**0.91**	**0.95**	**0.67**	**2.62**	**1.75**	**0.58**	**0.31**	**3.35**	**1.97**	**0**	**0.16**	**0.37**	**0.63**	**1.92**	**2.27**	**1.49**	**0.3**	**0.73**	**2.13**	**0.61**	**41.44**
January	1	0	0	0	0	0	0	0.06	0.01	0.45	0	0	0	0	0	0.09	0	0.01	0	0.17	0.01	0	0	0	0	0	0	0	0	0	0	0	0.8
Feburary	2	0	0.15	0	0	0	0	0	0	0.01	0.06	0	0.03	0	0.16	0	0.06	0	0	0	0.02	0	0	0	0.31	0	0	0	0	0			0.8
March	3	0	0	0.05	0	0	0.01	0.04	0.07	0.05	0.19	0	0.05	0.12	0.14	0	0	0	0.1	0	0.12	0	0	0	0.16	0	0	0.23	0	0	0.41	0.55	2.29
April	4	0.04	0	0	0	0	0.36	0	0	0	0.18	0.99	0	0	0	0	0	0	0	0	0.22	0	0	0	0	0	1.07	0.14	0	0.37	1.12		4.49
May	5	0	0	0	0	0	0	0.05	0	0.29	0.14	1.59	0.04	0.12	0	0	0.37	0.51	0	0	0.01	0	0	0	0	0.01	0.53	1.01	0	0	0	0	4.67
June	6	0.09	0	0	0.24	0	0	0	0	0	0	0	0	0.12	0	0.01	0	0	0	0	0.03	0	0	0	0	0.42	0	0	0	0.38			1.29
July	7	0	0.15	1.11	0.11	0	0.52	0.49	0.18	0	1.91	0	0	0.57	0.01	0	0	0	0	0.7	0.97	0	0.07	0	0.16	1.21	0.15	0	0	0	0	0.06	8.37
August	8	0.31	0.16	0.96	0	0.17	0	0	0	0	0	0	0.73	0	0.36	2.52	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0.35	0.18	0	5.77
September	9	0	0	0	0	0	0.19	0	0.32	1.44	1.41	0	0	0	0	0	1.32	0	0	0	0	0	0	0	0	0.14	0.08	0	0	0.01	0.04		4.95
October	10	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0	2.48	0.59	0	0	0	0	0	0.02	0	0	0	0	0	3.15
November	11	0	2.11	0.71	0	0	0	0	0.07	0	0	0	0	0	0	0	0	0	0.21	0	0	0	0.09	0.15	0	0	0	0.11	0.28	0	0		3.73
December	12	0	0	0	0.27	0	0	0	0	0	0	0.01	0	0.02	0	0	0	0.06	0	0	0	0	0	0.19	0	0.14	0.42	0	0.02	0	0	0	1.13
2017 Totals	**2017**	**0.57**	**0.23**	**2.34**	**1.36**	**3.08**	**0.29**	**0.58**	**0.02**	**1.87**	**0.9**	**0.12**	**0.02**	**0.4**	**1.52**	**1.26**	**2.28**	**0.38**	**1.5**	**0.89**	**1.32**	**0.5**	**1.07**	**1.02**	**0.26**	**0.91**	**1.51**	**1.53**	**1.75**	**3.65**	**3.5**	**0.02**	**36.65**
January	1	0	0.22	0.04	0	0.04	0	0	0	0	0.01	0	0	0.16	0.64	0.21	0.11	0	0	0.37	0	0	0	0	0	0	0	0	0	0	0	0	1.8
Feburary	2	0	0	0	0	0	0.01	0.01	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0.43	0	0	0	0	0	0.02	0				0.49
March	3	0.54	0	0	0	0	0	0.44	0	0.15	0	0.04	0	0.18	0	0	0	0.08	0	0	0	0	0	0.11	0.18	0.91	0	0.33	0	0.09	1.17	0.02	4.24
April	4	0	0.01	0.34	0.02	2.01	0.03	0	0	0	0.03	0	0	0	0.04	0	0.24	0.01	0	0	0	0.06	0.07	0	0	0	1.44	0.05	0.88	3.15	1.99		10.37
May	5	0.02	0	1.84	0.9	0	0	0	0	0	0.38	0.04	0	0	0	0	0	0	0	0.52	1.32	0	0	0.18	0	0	0	0.41	0	0.39	0	0	6
June	6	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0.63	0.29	0	0.21	1.06	0	0	0	0	0	0	0	0	0	0	0.02	0.26		2.72
July	7	0	0	0	0	0.07	0.01	0	0	0	0	0	0	0.01	0.17	0	0.01	0	0	0	0	0	0.02	0.32	0	0	0.05	0.72	0	0	0	0	1.38
August	8	0	0	0	0	0.01	0.09	0	0	0	0	0.04	0	0	0.04	0	1.92	0.08	0	0	0	0	0.25	0	0	0	0	0	0	0.87	0	0	0	3.3
September	9	0	0	0	0.01	0	0	0	0	0	0	0	0.01	0.05	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0		0.27
October	10	0	0	0.12	0.03	0.04	0.01	0.13	0	1.72	0.48	0	0	0	0	0.61	0	0	0	0	0	0.01	0.5	0.05	0	0	0	0	0	0	0.01	0	3.71
November	11	0.01	0	0	0	0.91	0.14	0	0	0	0	0	0.01	0	0	0.15	0	0	0.24	0	0	0	0	0	0	0	0	0	0	0	0.07		1.53
December	12	0	0	0	0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.23	0.36	0.08	0	0.02	0	0	0	0	0	0.84
2018 Totals	**2018**	**2.64**	**1.06**	**1.26**	**0.56**	**1.01**	**0.84**	**1.97**	**0.98**	**0.91**	**1.11**	**0.31**	**0.31**	**1.47**	**1.51**	**1.21**	**0.34**	**0.1**	**1.69**	**2.45**	**3.17**	**0.49**	**1.41**	**1.03**	**3.66**	**0.58**	**2.44**	**3.06**	**0.42**	**1.6**	**0.2**	**2.81**	**42.6**

APPENDIX J. LAMBERT FIELD PRECIPITION
WEST LAKE LANDFILL OU-3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Grand Total
January	1	0	0	0	0	0	0	0.35	0	0	0	0.04	0	0	0.01	0.06	0	0	0	0	0	0	0.76	0.01	0	0	0	0	0	0	0	0	1.23
Feburary	2	0	0	0	0.01	0	0	0	0	0	0.03	0	0	0	0.13	0.26	0	0.1	0	0.89	1.04	0.29	0.26	0.31	1.73	0	0	0	0.2				5.25
March	3	0.27	0	0	0	0.62	0.04	0	0	0	0	0.27	0	0	0	0	0.34	0	0	1.43	0	0	0	0.26	0.81	0	1.01	1.12	0.02	0.79	0	0.14	7.12
April	4	0.28	0.45	0.19	0	0	0	0	0.01	0	0	0	0	0.97	0.28	0.01	0	0	0	0	0	0	0.02	0.07	0	0	0	0	0	0	0		2.28
May	5	0	0	1.02	0	0	0.01	0	0	0.17	0	0	0	0	0.15	0.03	0	0	1.61	0.07	0.37	0.12	0	0	0	0.13	0	1.33	0	0	0.04	0	5.05
June	6	0	0.31	0	0	0	0	0	0	0.43	0	0	0	0	0	0	0	0	0	0.03	0.92	0.01	0.37	0	0	0	0.82	0	0.2	0	0		3.09
July	7	0.59	0	0.05	0	0	0	0	0	0.25	0	0	0	0	0.28	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0.2	0.01	0.6	2
August	8	0	0.19	0	0	0	0	0.46	0	0	0.98	0	0	0	0.05	0.45	0	0	0	0.01	0.75	0.02	0	0	1.12	0	0	0	0	0.61	0	0.02	4.66
September	9	0	0	0	0	0	0	0.66	0.92	0.02	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0	0.35	0	0	0	0		2
October	10	0	0	0	0.07	0	0.68	0.5	0	0	0.1	0	0.22	0	0.1	0.02	0	0	0	0	0	0	0	0	0	0.22	0.24	0	0	0	0	1.05	3.2
November	11	0.72	0.11	0	0.35	0.39	0	0	0.05	0.04	0	0	0.09	0	0.09	0.21	0	0	0.08	0	0	0	0	0.38	0	0.23	0	0	0	0	0		2.74
December	12	0.78	0	0	0.13	0	0.11	0	0	0	0	0	0	0.5	0.42	0.17	0	0	0	0	0.09	0	0	0	0	0	0.02	0.61	0	0	0.15	1	3.98
2019 Totals	**2019**	**0**	**0**	**0.22**	**0**	**0.05**	**1.18**	**1.05**	**0**	**1.28**	**0.16**	**0.97**	**0.6**	**0.96**	**0**	**0.13**	**0**	**0.04**	**0.19**	**0.59**	**0.23**	**0**	**0.76**	**0.59**	**0.55**	**0.01**	**0**	**0**	**0.11**	**0**	**0.03**	**0**	**9.7**
January	1	0	0	0	0	0	0	0.1	0	0	0	0.65	0.45	0.03	0	0	0	0.03	0.19	0.24	0.05	0	0.76	0.33	0	0	0	0	0.07	0	0.03	0	2.93
Feburary	2	0	0	0	0	0.05	1.18	0.95	0	0	0.16	0.32	0.01	0	0	0.13	0	0.01	0	0.35	0.16	0	0	0.2	0	0	0	0	0.04				3.56
March	3	0	0	0.22	0	0	0	0	0	1.28	0	0	0.14	0.93	0	0	0	0	0	0	0.02	0	0	0.06	0.55	0.01	0	0					3.21
	Grand Total	**62.73**	**65.78**	**72.44**	**67.88**	**59.84**	**50.87**	**56**	**61.3**	**56.16**	**76.88**	**64.93**	**54.05**	**62.15**	**75.75**	**62.47**	**63.11**	**52.22**	**65.25**	**77.22**	**65.8**	**47.8**	**57.97**	**72.38**	**70.83**	**71.85**	**74.99**	**73.05**	**62.64**	**53.14**	**69.9**	**39.38**	**1966.76**

APPENDIX K

SURFACE WATER FLOW

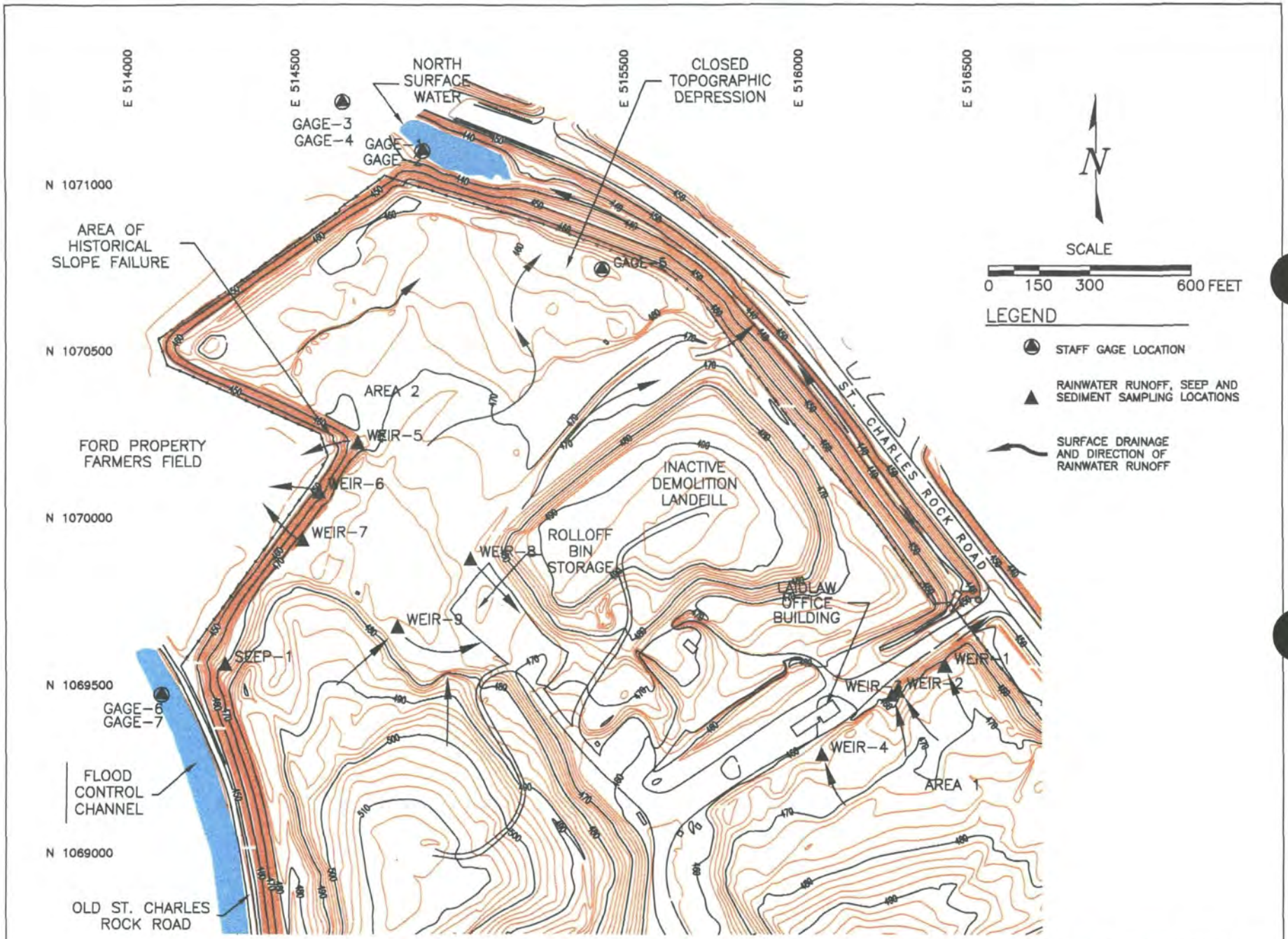


Figure 3-6: Area 1 and 2 Drainage Patterns and Runoff Locations

NORTH

0 100 200 425 850

Scale in Feet
Graphic Scale: 1 inch = 425 feet

EXPLANATION

→ Generalized Surface Water Flow Directions

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

ACTIVE SANITARY LANDFILL PERMIT No.118912

ST. CHARLES ROCK ROAD

ENTRANCE STATION

CLOSED DEMOLITION LANDFILL

CONCRETE PLANT

ASPHALT PLANT

BORROW AREA

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY

INACTIVE LANDFILL

CLOSED LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

© Allied Waste Industries (2005)

HERST & ASSOCIATES, INC.®
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 2-1
Surface Water Drainage

APPENDIX L

AQUIFER TESTING SUMMARY

L-1. SLUG TESTING SUMMARY

L-2. PACKER TESTING SUMMARY

L-3. LABORATORY TESTING SUMMARY

APPENDIX L-1

SLUG TESTING SUMMARY

Aquifer Testing Results

Aquifer Test Results

West Lake Landfill, Bridgeton, Missouri

Monitoring Well	Hydraulic Conductivity K (cm/s) *		
Shallow Depth Wells			
S-1	3.78E-03		
S-5	8.76E-04	Max	3.43E-02
S-8	3.43E-02	Min	8.76E-04
S-84	2.32E-03	Avg	8.22E-03
MW-101	4.17E-03		
MW-F3	3.83E-03		
Intermediate Depth Wells			
I-2	3.27E-02		
I-4	5.41E-02	Max	6.68E-02
I-7	6.68E-02	Min	1.22E-02
I-9	5.47E-02	Avg	4.45E-02
I-11	4.63E-02		
I-68	1.22E-02		
Deep Depth Wells			
D-3	3.15E-02		
D-6	4.29E-02	Max	8.85E-02
D-12	4.14E-02	Min	4.50E-03
D-13	8.85E-02	Avg	4.28E-02
D-85	4.50E-03		
D-93	4.78E-02		

* All Hydraulic Conductivities were determined using the computer software program AQTESOLV ™ (Geraghty & Miller, Inc. 1989). A graph of the data points was assigned a best fit line that was visually positioned on the graph.

Equations for Determining Hydraulic Conductivity (K)
using the Bouwer and Rice method

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_o}{y_t}$$

where r_c = radius of well casing
L_e = length of well screen
y_o = displacement at time 0
y_t = displacement at time t

$$\ln\frac{R_e}{r_w} = \left[\left(\frac{1.1}{\ln\frac{L_w}{r_w}}\right) + \left(\frac{A + B\ln\left[\frac{(H-L_w)}{r_w}\right]}{\frac{L_e}{r_w}}\right)\right]^{-1}$$

where L_w = depth from potentiometric surface to bottom of well screen
r_w = radial distance from center of well to native aquifer sediments
H = saturated thickness of the aquifer
A and B = constants taken from a plot in article entitled "the Bouwer and Rice Slug Test - An Update" by Herman Bouwer from Ground Water May-June 1989 Vol. 27, No. 3.

A semi-logarithmic plot of y and t with a best fit line drawn through the data will be plotted. The straight line drawn through the data will allow for selection of y_o and y_t to be substituted into equation 1. See next page for this plot for well S-8. Note this is where the "double straight line effect" will skew the value of K if the wrong part of the double line is chosen.
The use of the Hermit Data recorder will allow for collection of data in more frequent steps and will allow for data to be taken at quicker intervals. This increase in data will help in the decision of which of the double lines is correct for the aquifer conditions.

RISING HEAD SLUG TEST
DATA RECORDED WITH THE TELOG WLS-2109E DATA RECORDER

DATE	TIME	MIN	AVG	MAX
12/12/95"	9 56 48	15.42	15.42	15.42
12/12/95"	9 56 49	14.96	14 96	14.96
12/12/95"	9:56:50	14.81	14.81	14.81
12/12/95"	9:56:51	14.96	14.96	14.96
12/12/95"	9:56:52	15.02	15.02	15.02
12/12/95"	9:56:53	15.33	15.33	15.33
12/12/95"	9:56:54	15.42	15.42	15.42
12/12/95"	9:56:55	15.39	15.39	15.39
12/12/95"	9:56:56	15.36	15.36	15.36
12/12/95"	9:56:57	15.37	15.37	15.37
12/12/95"	9:56:58	15.39	15.39	15.39

BOUWER AND RICE CALCUATION DATA

STATIC WATER LEVEL	13.02'
SCREEN LENGTH	20'
TOP OF SCREEN DEPTH	6.3'
BOTTOM OF SCREEN DEPTH	26.3'
BOTTOM OF AQUIFER DEPTH	109'
WELL DIAMETER	2"
DIAMETER OF FILTER PACK	4.25"

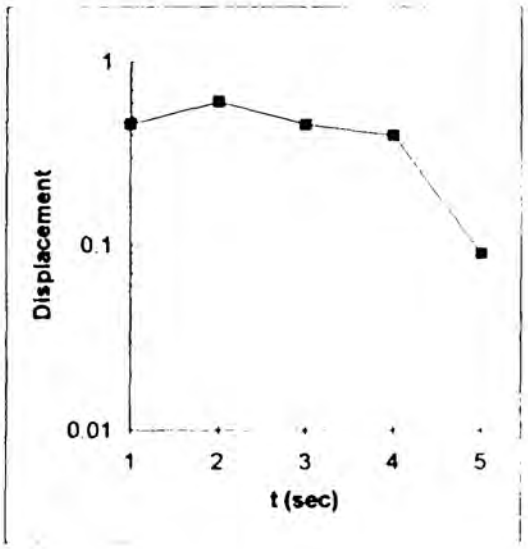
ASSUMPTIONS

Filter pack sand was placed through the middle of the auger flites as the augers were pulled from the ground.
Assume the borehole collapsed around the filter pack (see boring logs for the lithology of the native material) therefore the radial distance from the center of the well to the normal conductivity of the aquifer is 2.125"

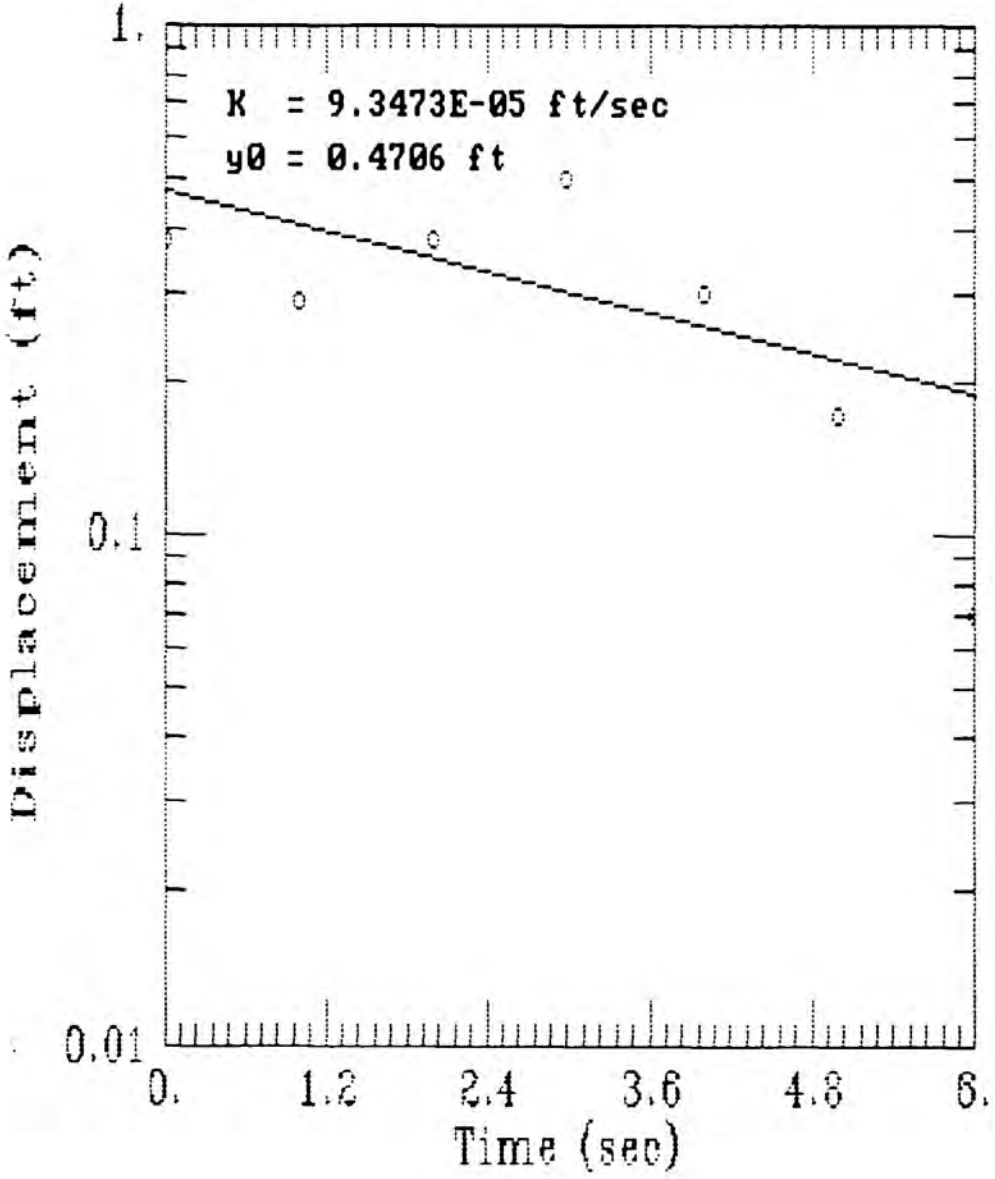
Notice the "double straight line effect" from time 2 to 4 seconds and again from 4 to 5 seconds. The data is too coarse to get the points in between these two intervals for correct best fit line interpretation. Without the best fit line, the correct value of K cannot be arrived at.

DATA USED IN PLOT

TIME	DISPACEMENT
1	0.46
2	0.61
3	0.46
4	0.4
5	0.09
6	0
7	0.03
8	0.03
9	0.02
10	0



S-8 SLUG TEST DATA W/TELOG RECORDER



AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

APPENDIX C-2

SLUG TEST DATA

RISING HEAD TEST PZ-100-SS

WELL NO. PZ-100-SS

DATE	7/17/95	
INITIAL DEPTH TO WATER	69.61	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	72.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	96.0	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	26.39	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	23.2	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.30	FEET
MAX. HEAD IN SCREEN?	Y	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1025	0	72.91	0.0	3.30	1.00
1	1026	0	72.9	1.0	3.29	1.00
1	1031	0	72.89	6.0	3.28	0.99
1	1036	0	72.87	11.0	3.26	0.99
1	1041	0	72.85	16.0	3.24	0.98
1	1046	0	72.83	21.0	3.22	0.98
1	1051	0	72.82	26.0	3.21	0.97
1	1056	0	72.81	31.0	3.20	0.97
1	1131	0	72.78	66.0	3.17	0.96
1	1256	0	72.66	151.0	3.05	0.92
1	1405	0	72.58	220.0	2.97	0.90
1	1652	0	72.36	387.0	2.75	0.83
1	1825	0	72.44	480.0	2.83	0.86
2	647	45	71.81	1222.0	2.20	0.67

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-SS

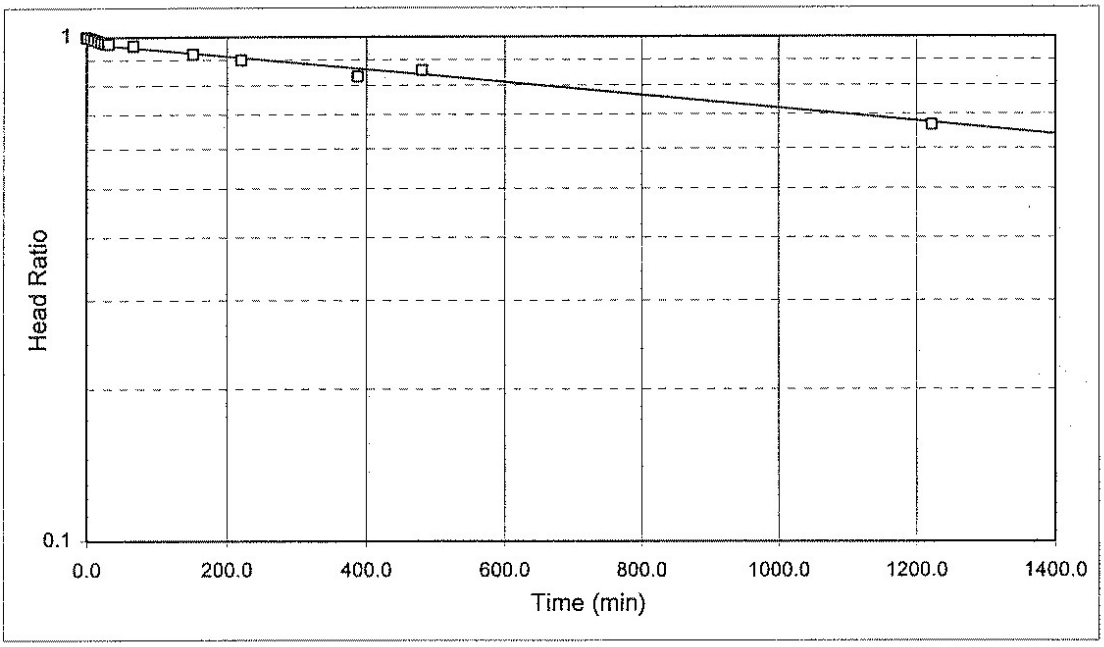
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	23.2
t_1 (min) =	0
t_2 (min) =	1400
h_1/h_0 =	0.97
h_2/h_0 =	0.64

RESULTS

K=	1.02E-07	cm/sec
K=	2.90E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

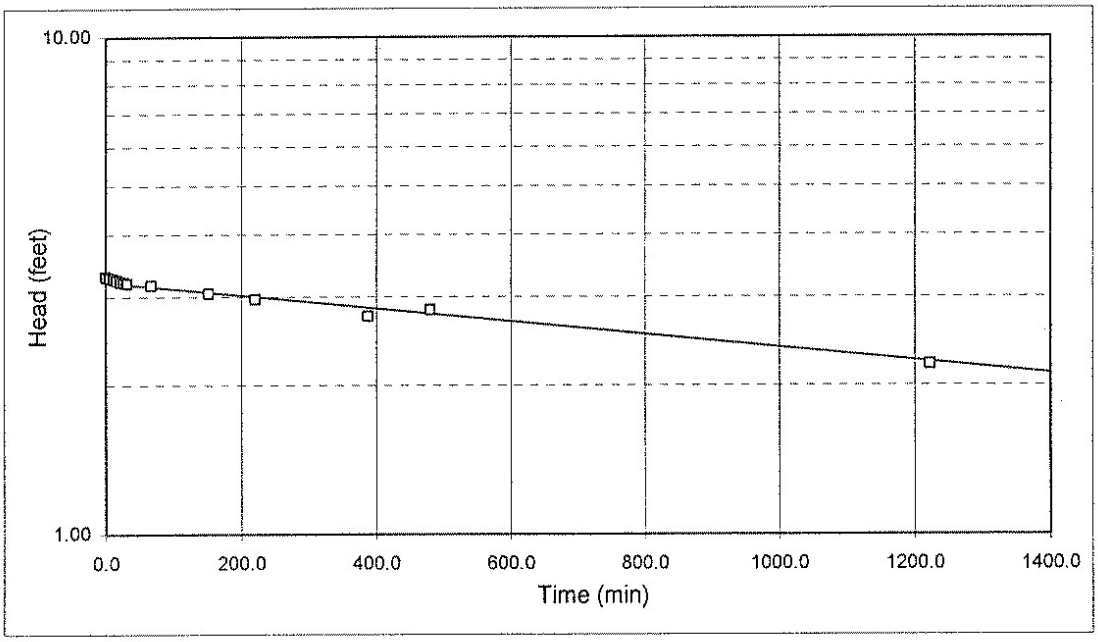
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	23.2
$\ln(R_e/r_w)$	3.04
y_0 =	3.21
y_t =	2.11
t =	1400.0

RESULTS

K=	5.65E-08	cm/sec
K=	1.60E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-100-SD

WELL NO. PZ-100-SD

DATE	7/31/95	
INITIAL DEPTH TO WATER	88.62	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	232.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	247.5	FEET (btoc)
SATURATED THICKNESS	160	FEET
WATER TABLE TO BOTTOM OF SCREEN	158.88	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.95	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	733	0	90.57	0.0	1.95	1.00
1	734	0	90.57	1.0	1.95	1.00
1	735	0	90.56	2.0	1.94	0.99
1	740	0	90.53	7.0	1.91	0.98
1	745	0	90.51	12.0	1.89	0.97
1	750	0	90.44	17.0	1.82	0.93
1	907	0	90.2	94.0	1.58	0.81
1	1007	30	90.04	154.5	1.42	0.73
1	1150	30	89.78	257.5	1.16	0.59
1	1400	0	89.53	387.0	0.91	0.47
1	1553	0	89.33	500.0	0.71	0.36

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-SD

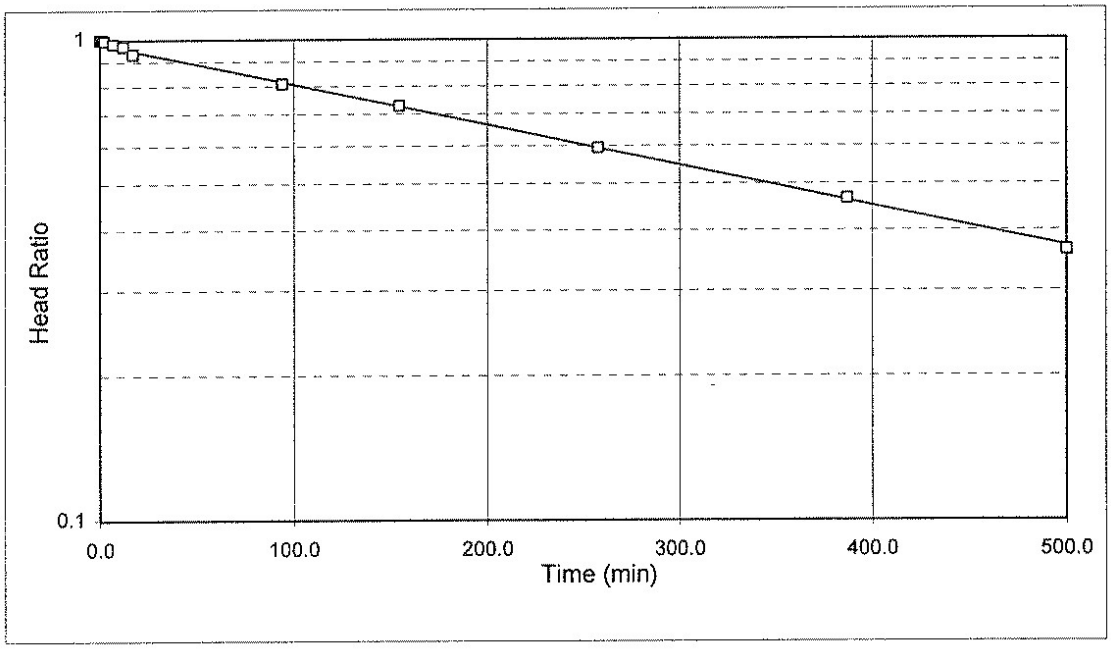
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	15.5
t_1 (min) =	0
t_2 (min) =	500
h_1/h_0 =	0.98
h_2/h_0 =	0.37

RESULTS

K=	9.11E-07	cm/sec
K=	2.58E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/31/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/19/96

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-SD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

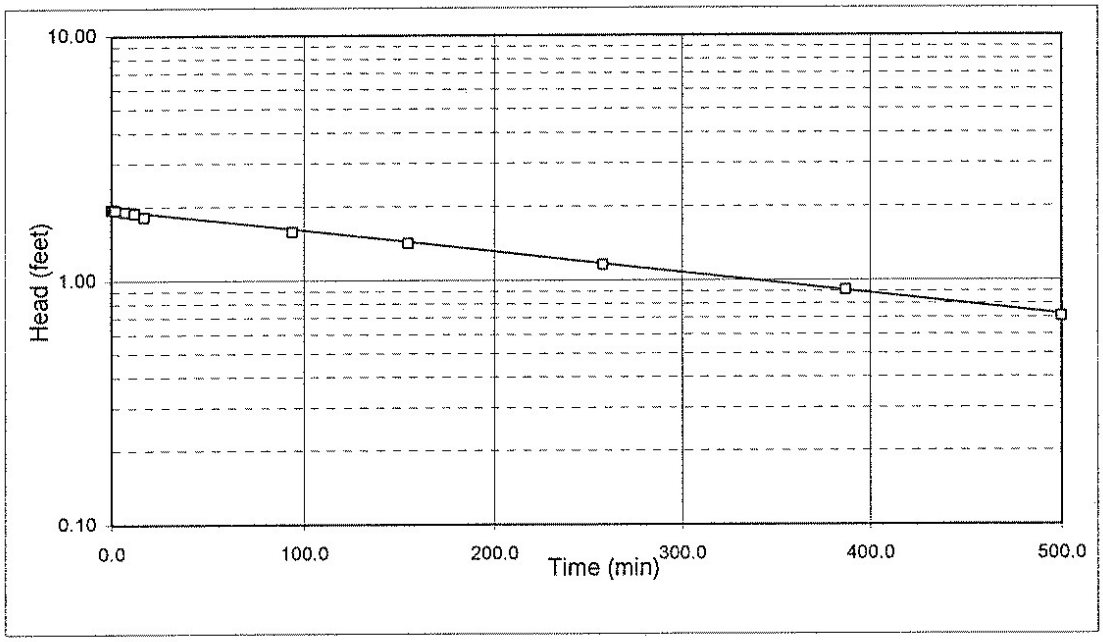
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	15.5
$\ln(R_e/r_w)$	4.20
y_0 =	1.95
y_t =	0.72
t =	500.0

RESULTS

K=	6.36E-07	cm/sec
K=	1.80E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/31/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/19/96

RISING HEAD TEST PZ-100-KS

WELL NO PZ-100-KS

DATE	6/20/95	
INITIAL DEPTH TO WATER	48.1	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	368.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	387.9	FEET (btoc)
BOTTOM OF AQUIFER	519	FEET (btoc)
SATURATED THICKNESS	150	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	19	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.77	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (SEC)	HEAD (FEET)	HEAD RATIO
1	741	0	51.87	0.0	3.77	1.00
1	742	0	51.8	60.0	3.70	0.98
1	749	0	51.7	480.0	3.60	0.95
1	755	23	51.6	863.0	3.50	0.93
1	801	45	51.5	1245.0	3.40	0.90
1	808	15	51.4	1635.0	3.30	0.88
1	816	20	51.3	2120.0	3.20	0.85
1	825	15	51.2	2655.0	3.10	0.82
1	1039	42	50.02	10722.0	1.92	0.51
1	1140	30	49.63	14370.0	1.53	0.41
1	1300	0	49.28	19140.0	1.18	0.31
1	1347	30	49.16	21990.0	1.06	0.28
1	1352	30	49.13	22290.0	1.03	0.27
1	1357	30	49.12	22590.0	1.02	0.27
1	1402	30	49.1	22890.0	1.00	0.27
1	1407	30	49.09	23190.0	0.99	0.26
1	1412	30	49.07	23490.0	0.97	0.26
1	1417	30	49.06	23790.0	0.96	0.25
1	1422	30	49.03	24090.0	0.93	0.25
1	1427	30	49.01	24390.0	0.91	0.24
1	1432	30	49	24690.0	0.90	0.24
1	1520	30	48.86	27570.0	0.76	0.20
1	1525	30	48.84	27870.0	0.74	0.20
1	1530	30	48.83	28170.0	0.73	0.19
1	1535	30	48.8	28470.0	0.70	0.19

COOPER-PAPADOPULOS SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-KS

$$K = \frac{r_c^{\,2}\beta}{tb} \qquad \text{and} \qquad S = \frac{r_c^{\,2}\alpha}{r_{ew}^{\,2}}$$

where:

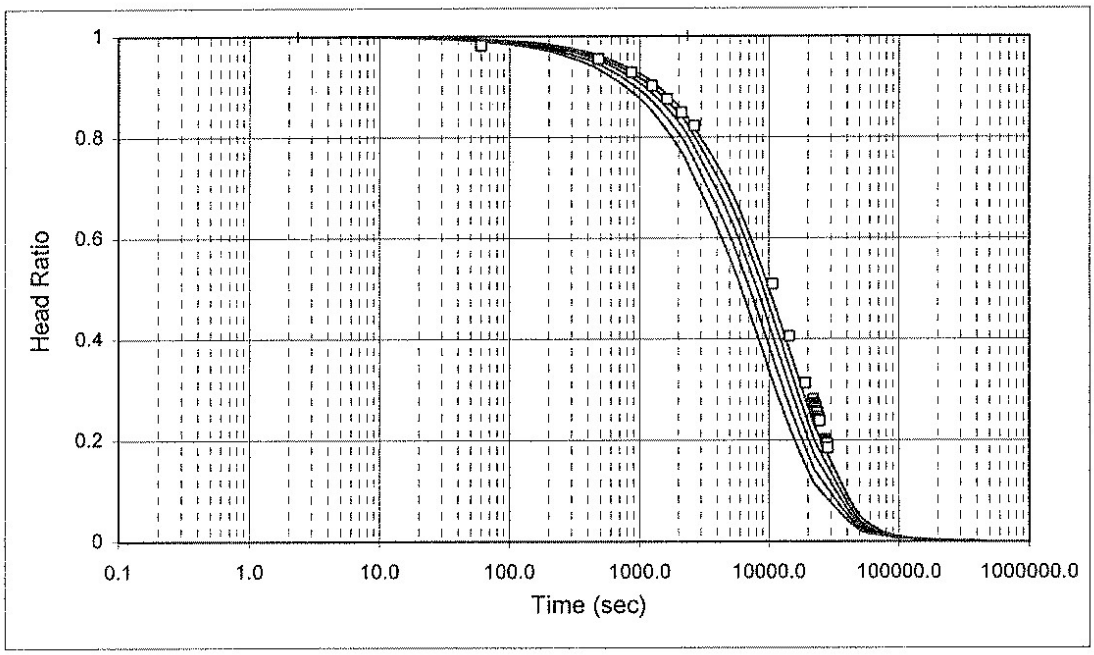
r_c = casing radius (feet)
r_{ew} = effective radius of screen (feet)
t = time (seconds)
K = Hydraulic conductivity (ft/sec)
$h_t/h_0 = F(\alpha,B)$

S = Storativity (dim)
h_t = Head at time t (feet)
b = Aquifer thickness (feet)

INPUT PARAMETERS	
r_c =	0.08
r_{ew} =	0.25
t =	2344.2
α =	1
B =	1E-09
b =	150.00

RESULTS

K=	6.02E-07	cm/sec
K=	0.002	ft/day
S =	1.11E-10	



Project Name: LAIDLAW / OU2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-101-SS

WELL NO. PZ-101-SS

DATE	6/20/95	
INITIAL DEPTH TO WATER	84.1	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	127.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	141.8	FEET (btoc)
SATURATED THICKNESS	150	FEET
WATER TABLE TO BOTTOM OF SCREEN	57.7	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.68	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1101	45	88.78	0.0	4.68	1.00
1	1102	45	88.74	1.0	4.64	0.99
1	1103	45	88.73	2.0	4.63	0.99
1	1104	45	88.72	3.0	4.62	0.99
1	1105	45	88.69	4.0	4.59	0.98
1	1110	45	88.64	9.0	4.54	0.97
1	1115	45	88.58	14.0	4.48	0.96
1	1120	45	88.55	19.0	4.45	0.95
1	1125	45	88.5	24.0	4.40	0.94
1	1130	45	88.47	29.0	4.37	0.93
1	1150	0	88.3	48.3	4.20	0.90
1	1155	0	88.28	53.3	4.18	0.89
1	1200	0	88.22	58.3	4.12	0.88
1	1205	0	88.19	63.3	4.09	0.87
1	1210	0	88.16	68.3	4.06	0.87
1	1215	0	88.11	73.3	4.01	0.86
1	1220	0	88.07	78.2	3.97	0.85
1	1225	0	88.05	83.3	3.95	0.84
1	1230	0	88.01	88.3	3.91	0.84
1	1235	0	87.99	93.3	3.89	0.83
1	1240	0	87.95	98.3	3.85	0.82
1	1245	0	87.91	103.3	3.81	0.81
1	1316	30	87.67	134.8	3.57	0.76
1	1321	30	87.65	139.8	3.55	0.76
1	1438	30	87.38	216.8	3.28	0.70
1	1443	30	87.33	221.8	3.23	0.69
1	1448	30	87.32	226.8	3.22	0.69
1	1453	30	87.3	231.8	3.20	0.68
1	1458	30	87.28	236.8	3.18	0.68
1	1503	30	87.25	241.8	3.15	0.67

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-101-SS

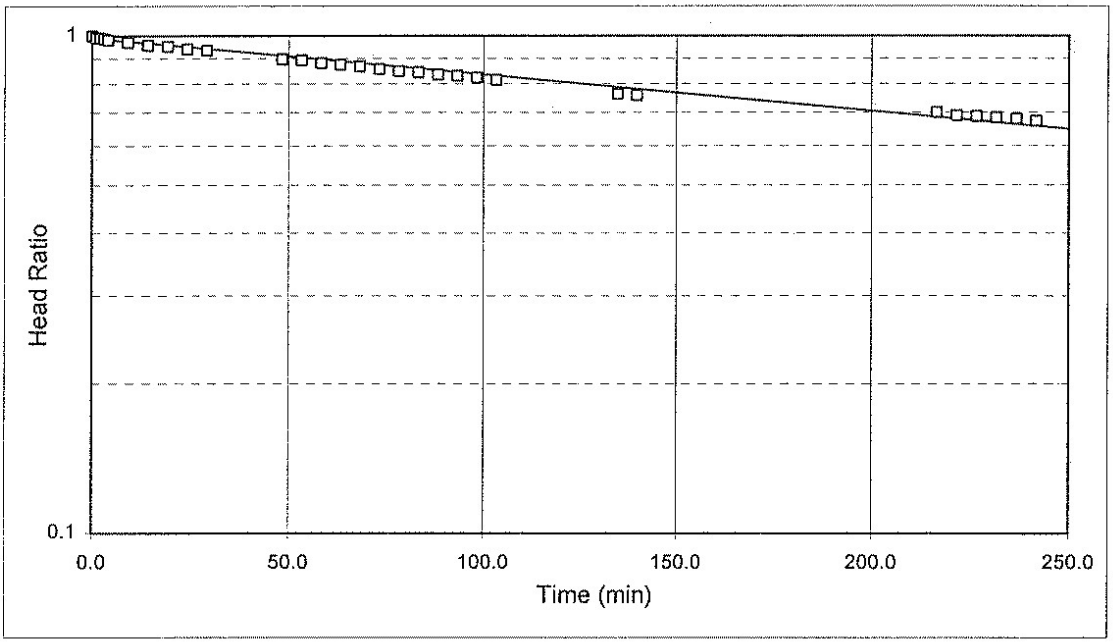
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14
t_1 (min) =	0
t_2 (min) =	250
h_1/h_0 =	0.99
h_2/h_0 =	0.65

RESULTS

K=	8.58E-07	cm/sec
K=	2.43E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-101-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

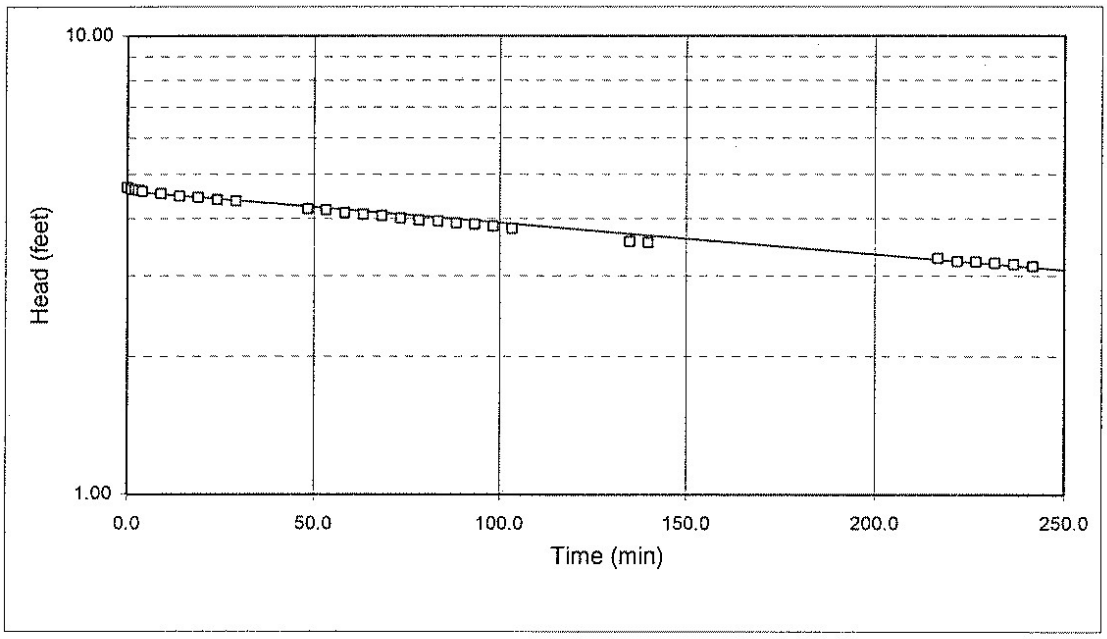
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	14
$\ln(R_e/r_w)$	3.21
y_0 =	4.59
y_t =	3.09
t =	250.0

RESULTS

K=	5.10E-07	cm/sec
K=	1.45E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-102R-SS

WELL NO. PZ-102R-SS

DATE	7/24/95	
INITIAL DEPTH TO WATER	61.28	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	76.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	91.4	FEET (btoc)
SATURATED THICKNESS	180	FEET
WATER TABLE TO BOTTOM OF SCREEN	30.12	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.3	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.74	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	803	30	65.02	0.0	3.74	1.00
1	805	0	65.02	1.5	3.74	1.00
1	810	0	64.97	6.5	3.69	0.99
1	815	0	64.96	11.5	3.68	0.98
1	820	0	64.96	16.5	3.68	0.98
1	825	0	64.94	21.5	3.66	0.98
1	835	0	64.88	31.5	3.60	0.96
1	1100	30	64.9	177.0	3.62	0.97
1	1432	0	64.84	388.5	3.56	0.95
2	719	0	64.55	1395.5	3.27	0.87
2	1205	0	64.46	1681.5	3.18	0.85
2	1512	0	64.38	1868.5	3.10	0.83
2	1756	0	64.34	2032.5	3.06	0.82
3	1314	0	64.46	3190.5	3.18	0.85
3	1639	0	63.86	3395.5	2.58	0.69
4	727	0	63.62	4283.5	2.34	0.63

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-102R-SS

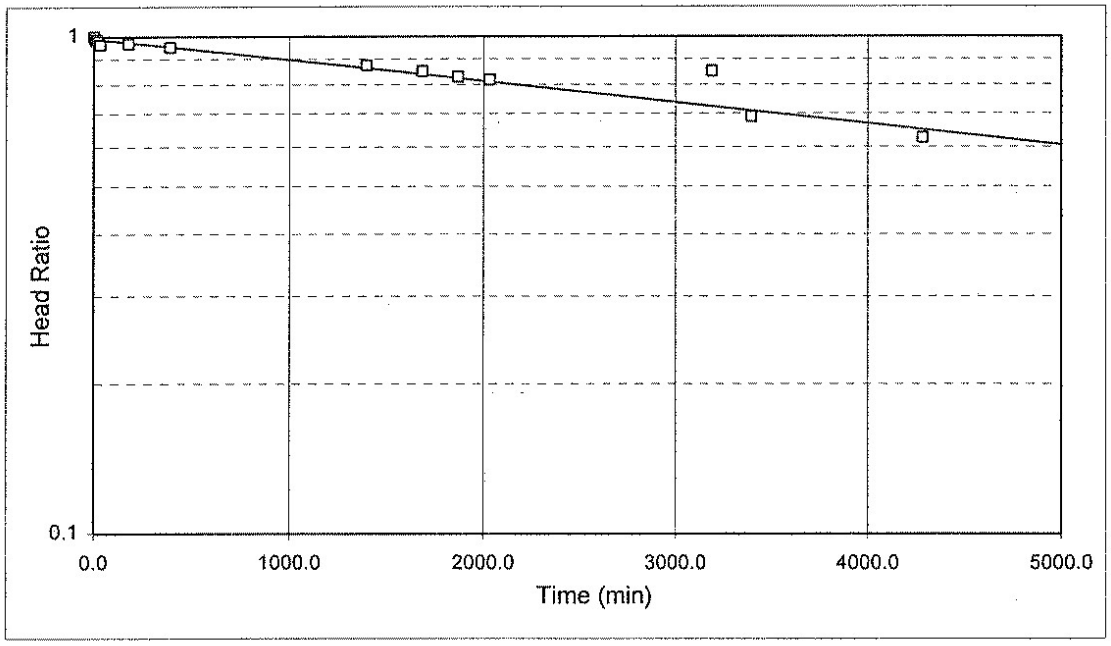
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	15.3
t_1 (min) =	0
t_2 (min) =	5000
h_1/h_0 =	0.99
h_2/h_0 =	0.61

RESULTS

K=	4.67E-08	cm/sec
K=	1.32E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

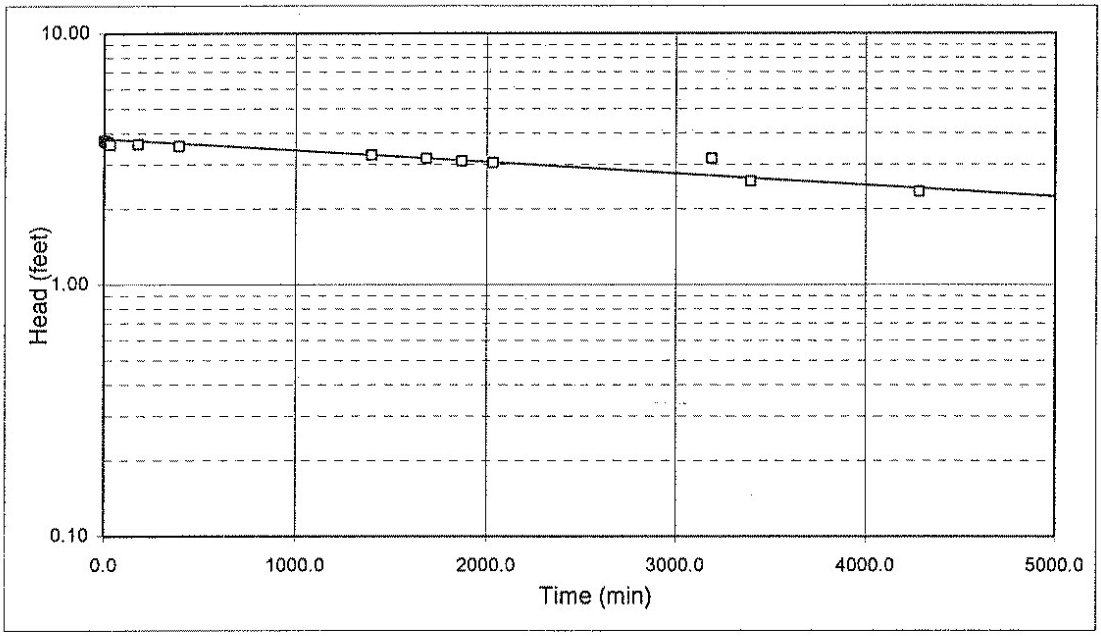
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-102R-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15.3	K=	3.01E-08	cm/sec
$\ln(R_e/r_w)$	2.95	K=	8.55E-05	ft/day
y_0 =	3.80			
y_t =	2.24			
t =	5000.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-103-SS

WELL NO. PZ-103-SS

DATE	7/17/95	
INITIAL DEPTH TO WATER	133.73	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	133.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	147.9	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	14.17	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.17	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	4.09	FEET
MAX. HEAD IN SCREEN?	Y	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1208	30	137.82	0.0	4.09	1.00
1	1209	30	137.78	1.0	4.05	0.99
1	1214	30	137.65	6.0	3.92	0.96
1	1219	30	137.58	11.0	3.85	0.94
1	1224	30	137.51	16.0	3.78	0.92
1	1229	30	137.48	21.0	3.75	0.92
1	1234	30	137.45	26.0	3.72	0.91
1	1239	30	137.41	31.0	3.68	0.90
1	1244	30	137.38	36.0	3.65	0.89
1	1410	30	136.98	122.0	3.25	0.79
1	1520	0	136.71	191.5	2.98	0.73
1	1644	0	136.05	275.5	2.32	0.57
1	1821	0	135.83	372.5	2.10	0.51

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-103-SS

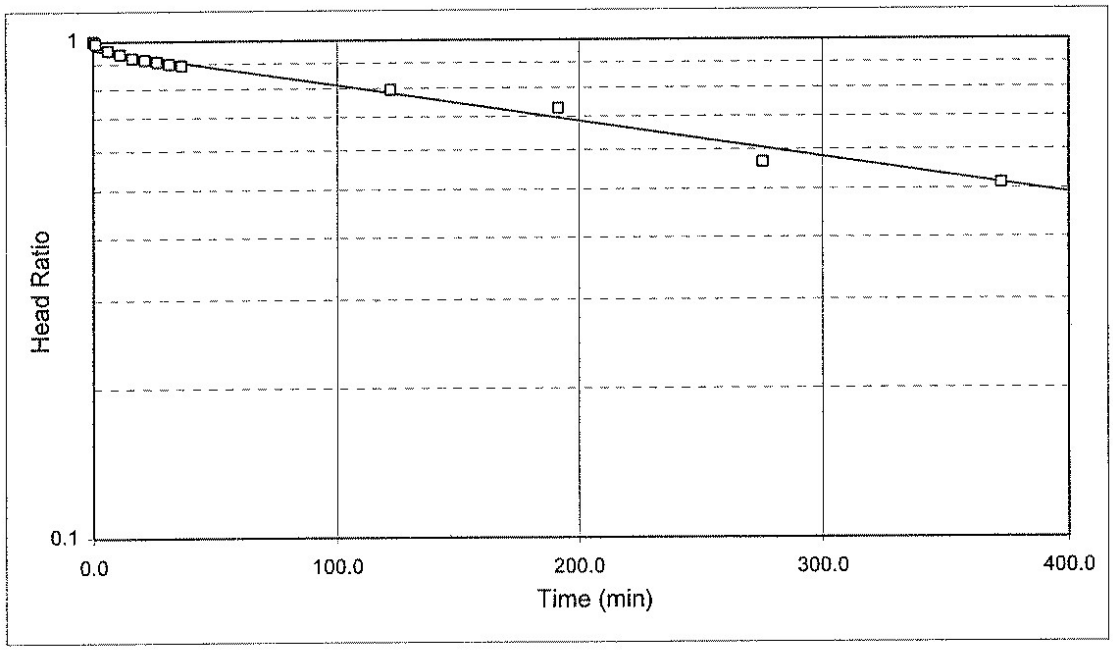
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- y_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14.17
t_1 (min) =	0
t_2 (min) =	400
h_1/h_0 =	0.96
h_2/h_0 =	0.49

RESULTS

K=	8.43E-07	cm/sec
K=	2.39E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

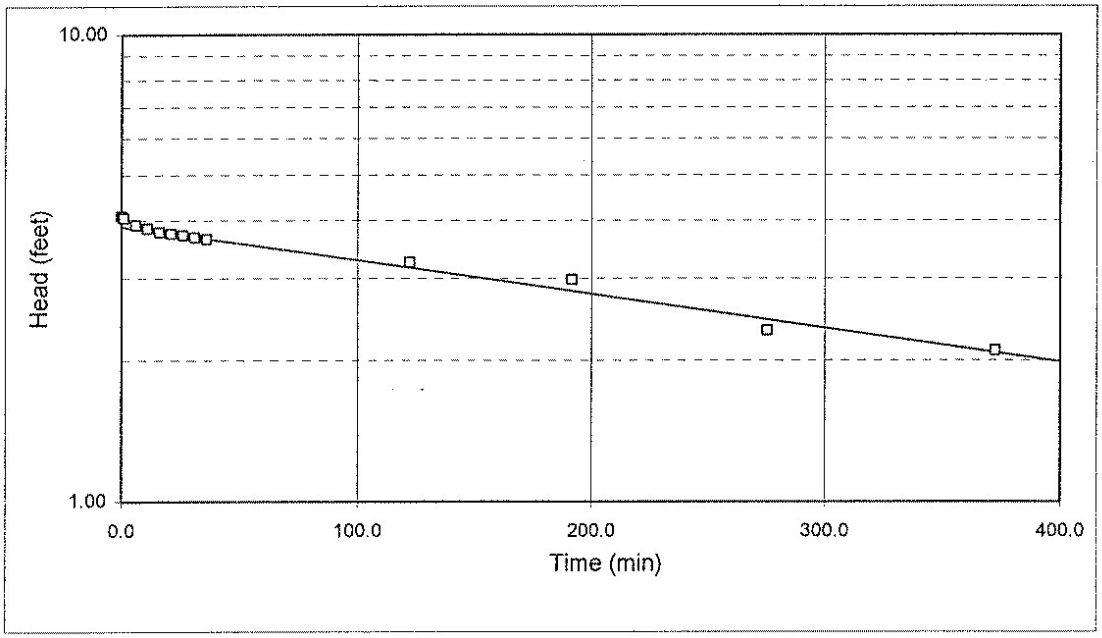
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-103-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_o}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	14.17	K=	1.66E-06	cm/sec
$\ln(R_e/r_w)$	2.61	K=	4.72E-03	ft/day
y_0 =	3.88			
y_t =	1.99			
t =	400.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-104-SS

WELL NO. PZ-104-SS

DATE	7/19/95	
INITIAL DEPTH TO WATER	132.18	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	132.6	FEET (btoc)
BOTTOM OF OPEN INTERVAL	147.1	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	14.92	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.24	FEET
MAX. HEAD IN SCREEN?	Y	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1237	0	135.42	0.0	3.24	1.00
1	1238	0	135.38	1.0	3.20	0.99
1	1243	0	135.3	6.0	3.12	0.96
1	1248	0	135.21	11.0	3.03	0.94
1	1253	0	135.17	16.0	2.99	0.92
1	1258	0	135.1	21.0	2.92	0.90
1	1439	0	134.73	122.0	2.55	0.79
1	1537	0	134.61	180.0	2.43	0.75
1	1637	0	134.48	240.0	2.30	0.71

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-SS

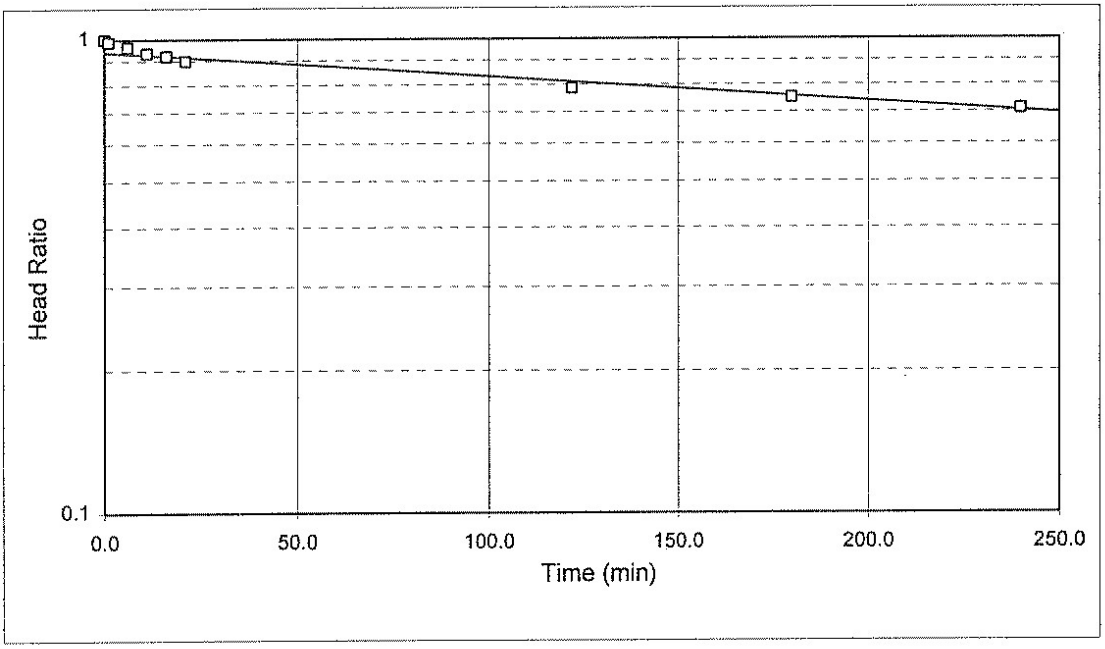
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14.5
t_1 (min) =	0
t_2 (min) =	250
h_1/h_0 =	0.94
h_2/h_0 =	0.70

RESULTS

K=	5.97E-07	cm/sec
K=	1.69E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

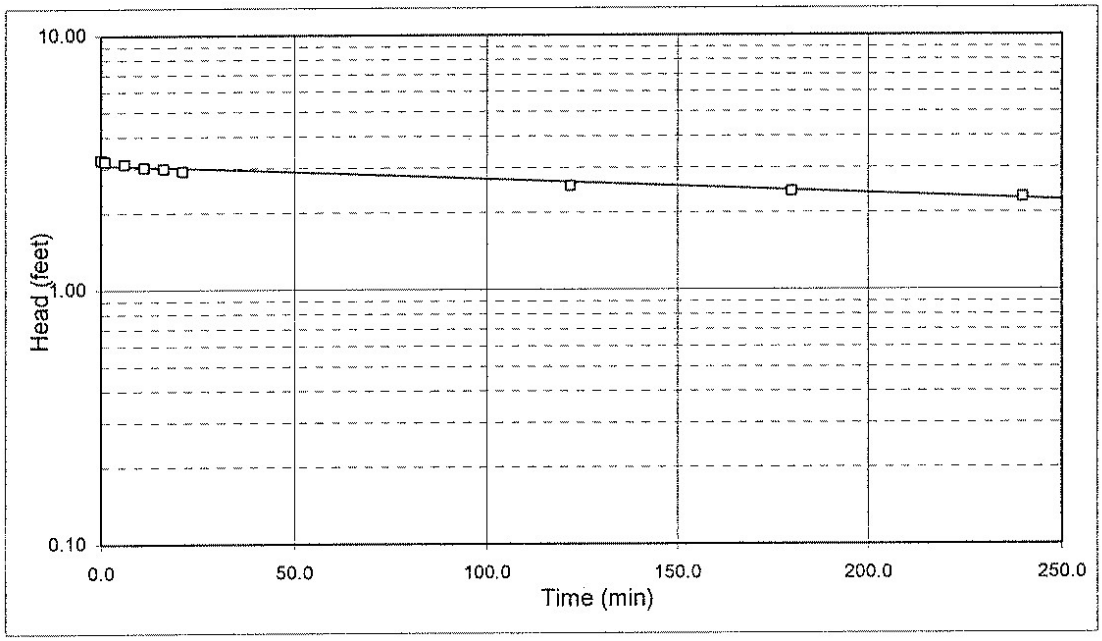
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	14.5	K=	1.26E-06	cm/sec
$\ln(R_e/r_w)$	2.64	K=	3.57E-03	ft/day
y_0 =	3.09			
y_t =	2.24			
t =	250.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-104-SD

WELL NO. PZ-104-SD

DATE	7/20/95	
INITIAL DEPTH TO WATER	126.54	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	232.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	248.6	FEET (btoc)
SATURATED THICKNESS	125	FEET
WATER TABLE TO BOTTOM OF SCREEN	122.06	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	16.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.91	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	852	0	129.45	0.0	2.91	1.00
1	854	0	129.26	2.0	2.72	0.93
1	855	0	129.17	3.0	2.63	0.90
1	857	0	128.96	5.0	2.42	0.83
1	858	0	128.84	6.0	2.30	0.79
1	859	0	128.77	7.0	2.23	0.77
1	900	0	128.69	8.0	2.15	0.74
1	905	0	128.3	13.0	1.76	0.60
1	910	0	127.99	18.0	1.45	0.50
1	915	0	127.73	23.0	1.19	0.41
1	920	0	127.49	28.0	0.95	0.33
1	927	0	126.96	35.0	0.42	0.14
1	932	0	126.72	40.0	0.18	0.06
1	937	0	126.62	45.0	0.08	0.03
1	942	0	126.62	50.0	0.08	0.03

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-SD

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

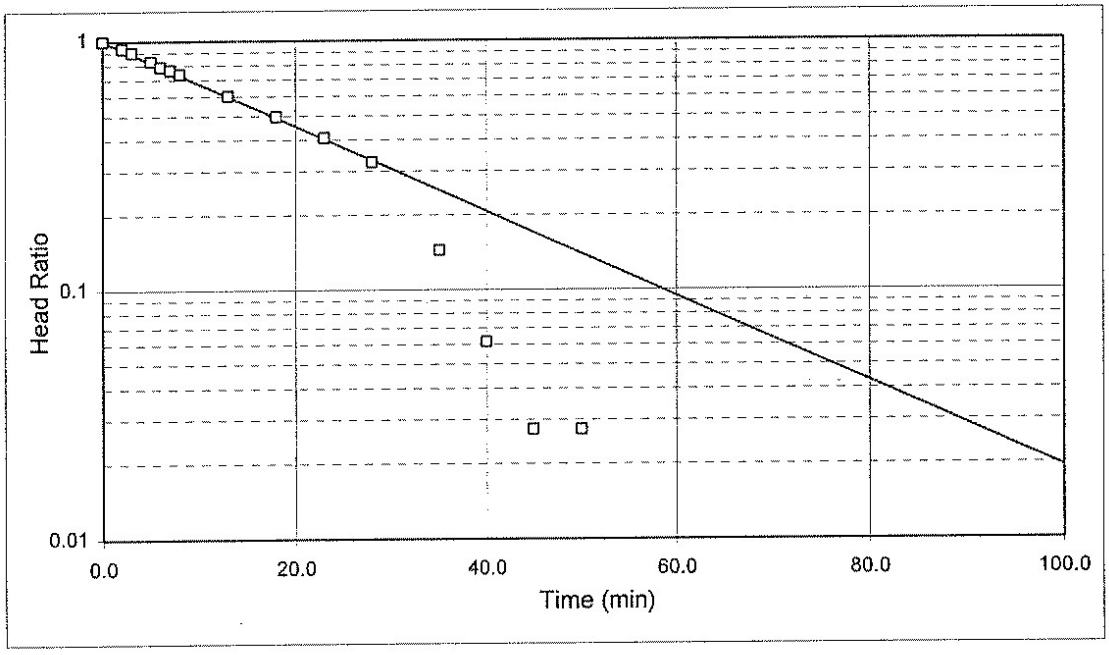
125

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	16.5
t_1 (min) =	0
t_2 (min) =	100
h_1/h_0 =	1.00
h_2/h_0 =	0.02

RESULTS

K=	1.76E-05	cm/sec
K=	5.00E-02	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-SD

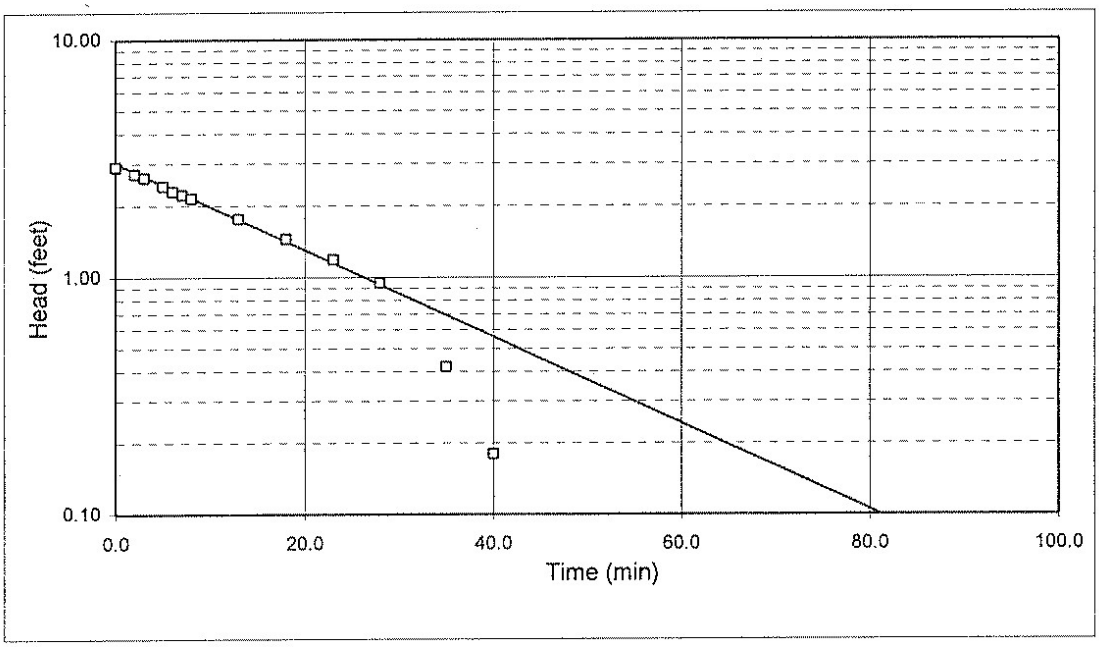
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

125

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	16.5	K=	1.24E-05	cm/sec
$\ln(R_e/r_w)$	3.98	K=	3.52E-02	ft/day
y_0 =	3.02			
y_t =	0.10			
t =	81.1			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-104-KS

WELL NO PZ-104-KS

DATE	7/20/95	
INITIAL DEPTH TO WATER	39.16	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	394.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	409.7	FEET (btoc)
BOTTOM OF AQUIFER	500	FEET (btoc)
SATURATED THICKNESS	370.54	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.36	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (SEC)	HEAD (FEET)	HEAD RATIO
1	757	0	42.52	0.0	3.36	1.00
1	758	0	42.38	60.0	3.22	0.96
1	759	0	42.22	120.0	3.06	0.91
1	800	0	42.08	180.0	2.92	0.87
1	801	0	41.96	240.0	2.80	0.83
1	802	0	41.83	300.0	2.67	0.79
1	803	0	41.72	360.0	2.56	0.76
1	804	0	41.61	420.0	2.45	0.73
1	805	0	41.49	480.0	2.33	0.69
1	810	0	41.04	780.0	1.88	0.56
1	815	0	40.67	1080.0	1.51	0.45
1	820	0	40.37	1380.0	1.21	0.36
1	825	0	40.14	1680.0	0.98	0.29
1	832	0	39.89	2100.0	0.73	0.22
1	837	0	39.74	2400.0	0.58	0.17
1	842	0	39.61	2700.0	0.45	0.13
1	847	0	39.54	3000.0	0.38	0.11
1	856	0	39.4	3540.0	0.24	0.07
1	903	30	39.35	3990.0	0.19	0.06
1	916	0	39.25	4740.0	0.09	0.03

COOPER-PAPADOPULOS SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-KS

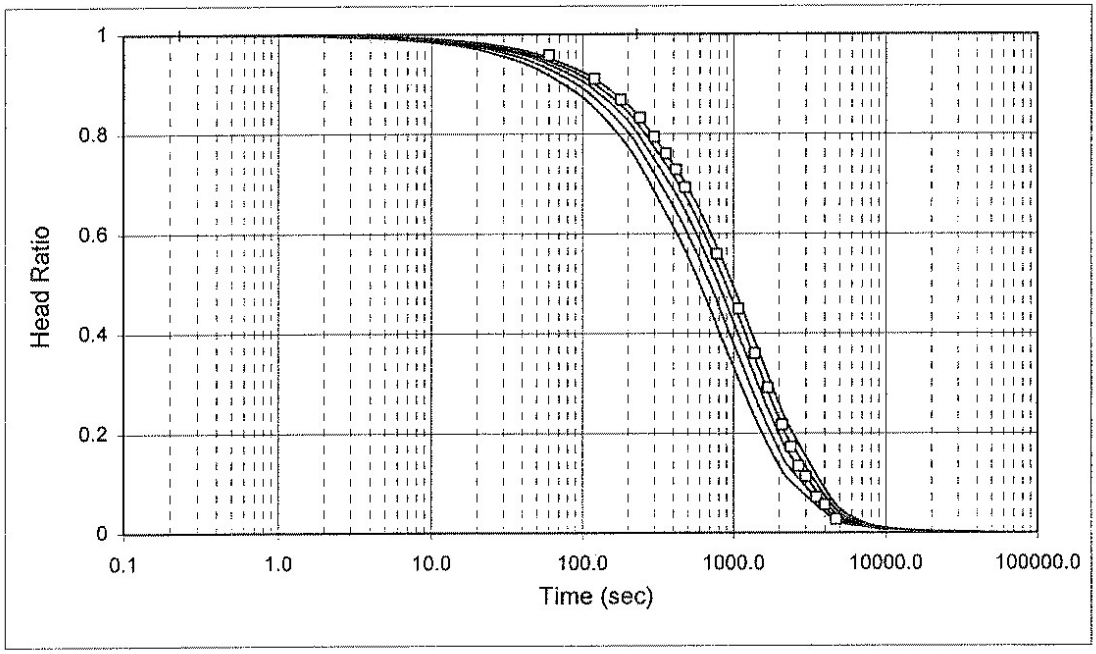
$$K = \frac{r_c^{\,2}\beta}{tb} \qquad \text{and} \qquad S = \frac{r_c^{\,2}\alpha}{r_{ew}^{\,2}}$$

where:

r_c = casing radius (feet)
r_{ew} = effective radius of screen (feet)
t = time (seconds)
K = Hydraulic conductivity (ft/sec)
$h_t/h_0 = F(\alpha,B)$

S = Storativity (dim)
h_t = Head at time t (feet)
b = Aquifer thickness (feet)

INPUT PARAMETERS		RESULTS	
r_c =	0.08		
r_{ew} =	0.25		
t =	229.1	K= 2.49E-06	cm/sec
α =	1	K= 0.007	ft/day
B =	1E-09	S = 1.11E-10	
b =	370.54		



Project Name: LAIDLAW / OU2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-105-SS

WELL NO. PZ-105-SS

DATE	7/20/95	
INITIAL DEPTH TO WATER	144.29	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	137.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	151.4	FEET (btoc)
SATURATED THICKNESS	500	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.11	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	7.11	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.56	FEET
MAX. HEAD IN SCREEN?	Y	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1300	30	145.85	0.0	1.56	1.00
1	1301	30	145.83	1.0	1.54	0.99
1	1302	30	145.8	2.0	1.51	0.97
1	1303	30	145.76	3.0	1.47	0.94
1	1305	0	145.73	4.5	1.44	0.92
1	1310	0	145.7	9.5	1.41	0.90
1	1315	0	145.64	14.5	1.35	0.87
1	1320	0	145.59	19.5	1.30	0.83
1	1325	0	145.53	24.5	1.24	0.79
1	1402	0	145.38	61.5	1.09	0.70
1	1435	0	145.34	94.5	1.05	0.67

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-105-SS

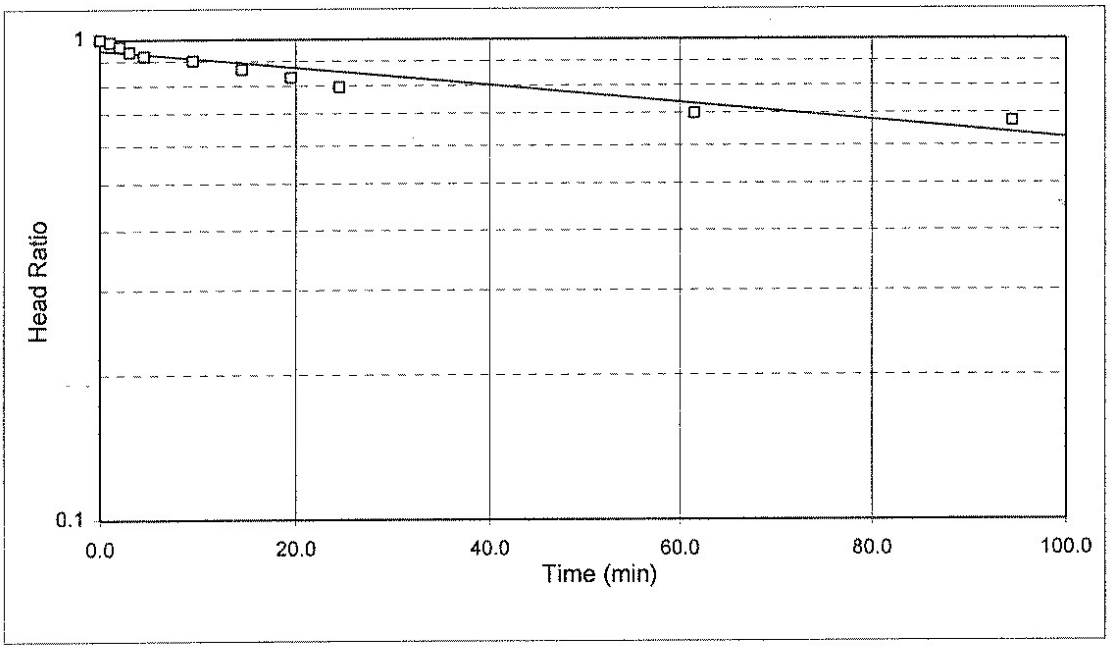
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	7.11
t_1 (min) =	0
t_2 (min) =	100
h_1/h_0 =	0.95
h_2/h_0 =	0.62

RESULTS

K=	3.51E-06	cm/sec
K=	9.96E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

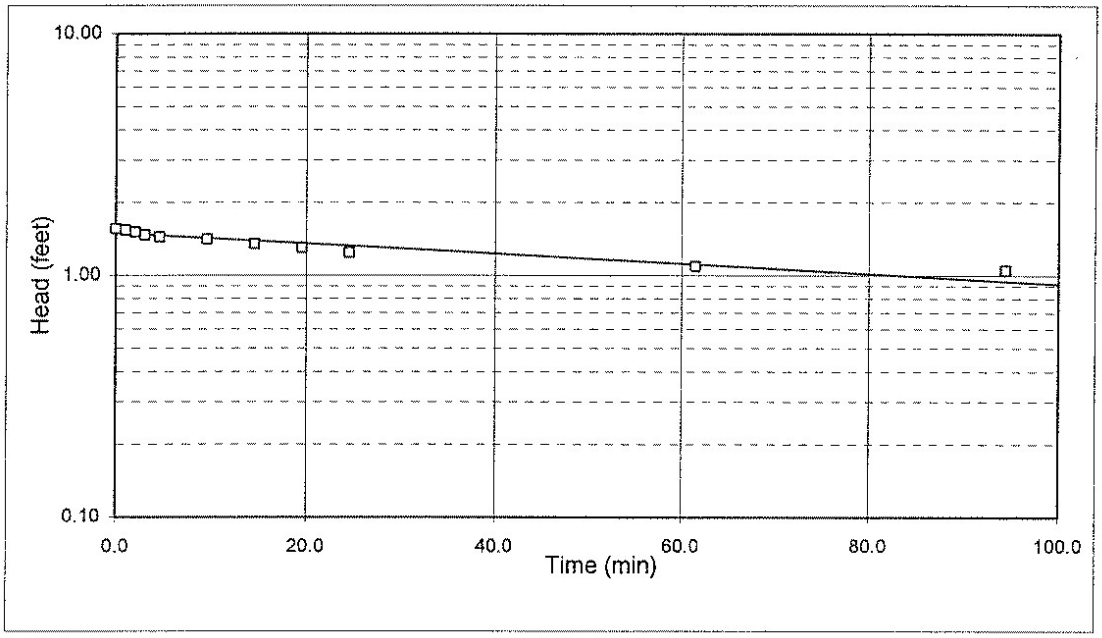
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-105-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	7.11	K=	8.46E-06	cm/sec
$\ln(R_e/r_w)$	2.00	K=	2.40E-02	ft/day
y_0 =	1.49			
y_t =	0.92			
t =	100.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-106-SS

WELL NO. PZ-106-SS

DATE	7/19/95	
INITIAL DEPTH TO WATER	105.11	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	151.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	166.8	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	61.69	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.3	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.63	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	813	30	108.74	0.0	3.63	1.00
1	815	0	108.68	1.5	3.57	0.98
1	820	0	108.53	6.5	3.42	0.94
1	825	0	108.37	11.5	3.26	0.90
1	830	0	108.24	16.5	3.13	0.86
1	835	0	108.1	21.5	2.99	0.82
1	840	0	108	26.5	2.89	0.80
1	845	0	107.85	31.5	2.74	0.75
1	850	0	107.75	36.5	2.64	0.73
1	1045	30	106.12	152.0	1.01	0.28
1	1118	30	105.98	185.0	0.87	0.24
1	1140	0	105.74	206.5	0.63	0.17

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-SS

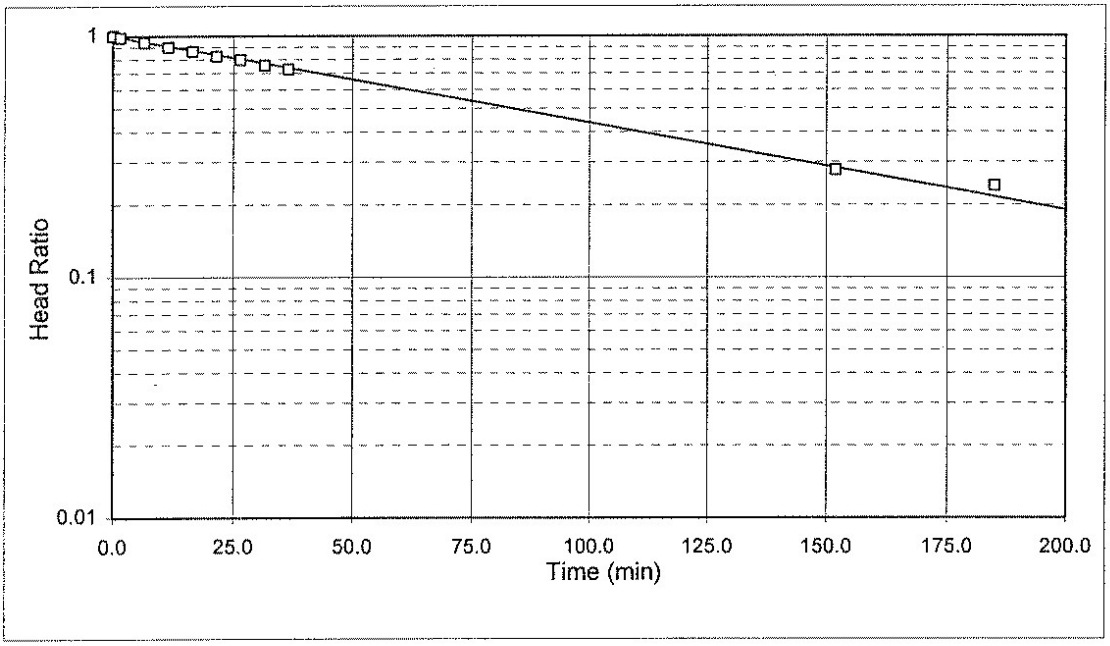
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	15.3
t_1 (min) =	0
t_2 (min) =	200
h_1/h_0 =	1.00
h_2/h_0 =	0.19

RESULTS

K=	3.93E-06	cm/sec
K=	1.11E-02	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

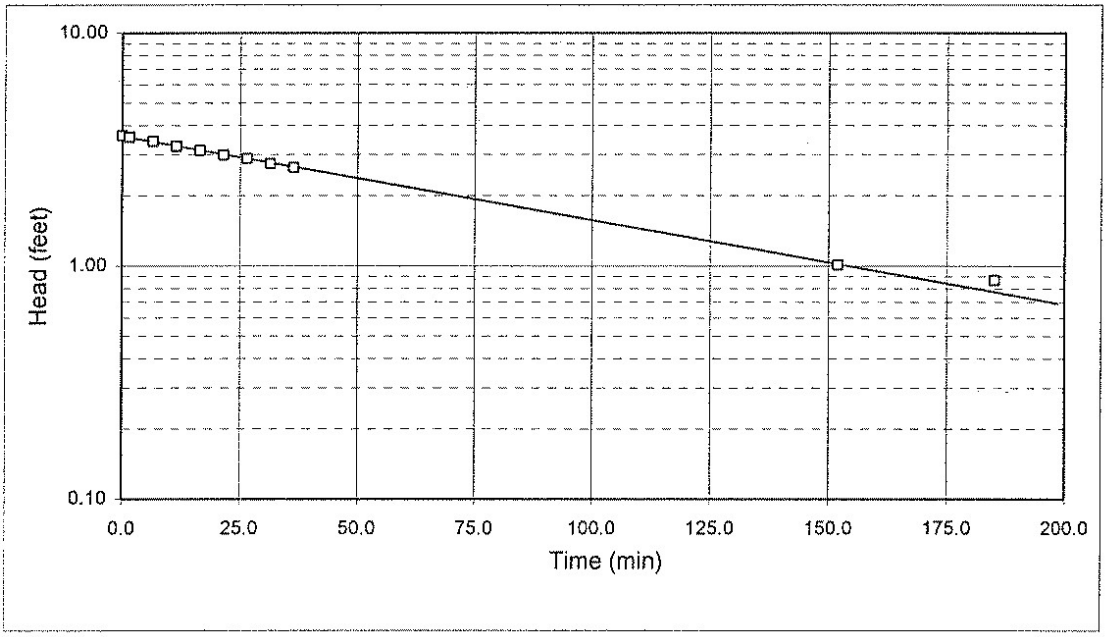
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15.3	K=	2.50E-06	cm/sec
$\ln(R_e/r_w)$	3.39	K=	7.07E-03	ft/day
y_0 =	3.60			
y_t =	0.69			
t =	198.7			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-106-SD

WELL NO. PZ-106-SD

DATE	7/21/95	
INITIAL DEPTH TO WATER	107.17	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	189	FEET (btoc)
BOTTOM OF OPEN INTERVAL	203.1	FEET (btoc)
SATURATED THICKNESS	100	FEET
WATER TABLE TO BOTTOM OF SCREEN	95.93	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.1	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.84	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1205	0	111.01	0.0	3.84	1.00
1	1207	0	110.88	2.0	3.71	0.97
1	1208	0	110.81	3.0	3.64	0.95
1	1209	0	110.76	4.0	3.59	0.93
1	1214	0	110.7	9.0	3.53	0.92
1	1219	0	110.66	14.0	3.49	0.91
1	1224	0	110.62	19.0	3.45	0.90
1	1240	0	110.6	35.0	3.43	0.89
1	1400	0	110.52	115.0	3.35	0.87
1	1421	0	110.5	136.0	3.33	0.87

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-SD

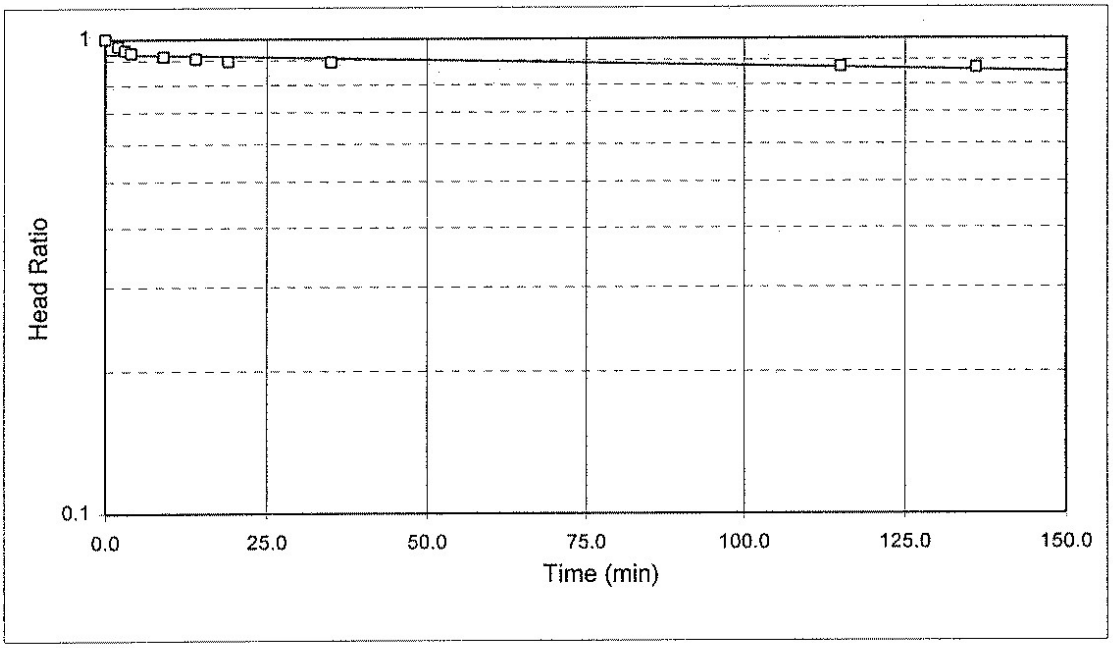
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{y_1}{y_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14.1
t_1 (min) =	0
t_2 (min) =	150
y_1 =	0.93
y_2 =	0.85

RESULTS

K=	2.98E-07	cm/sec
K=	8.45E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 9/24/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-SD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

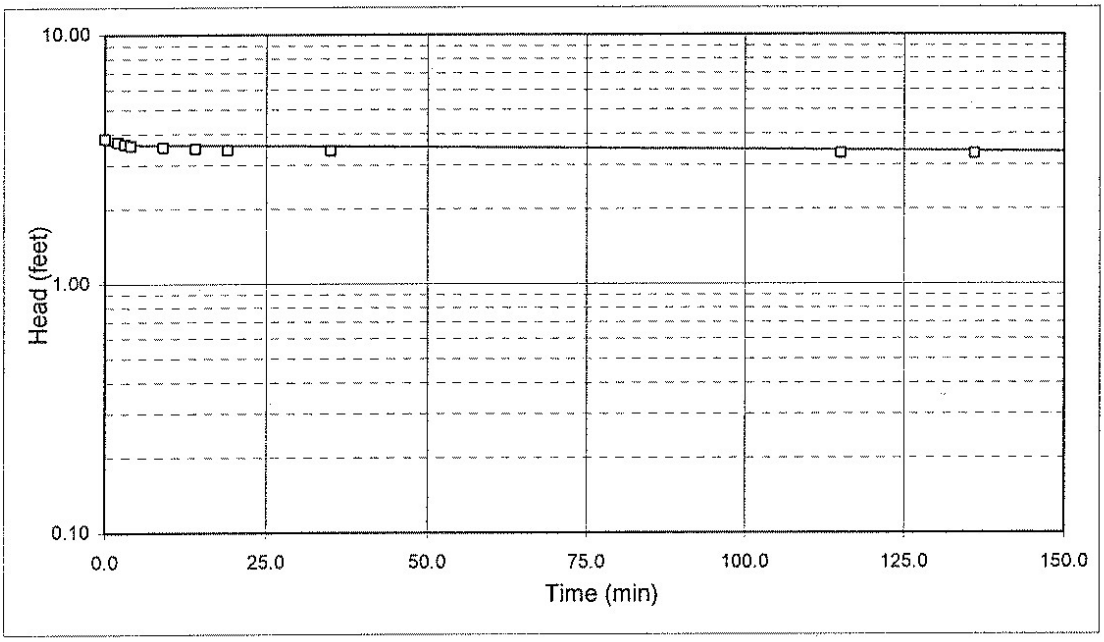
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	14.1
$\ln(R_e/r_w)$ =	3.75
y_0 =	3.63
y_t =	3.39
t =	150.0

RESULTS

K=	1.56E-07	cm/sec
K=	4.42E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 9/24/95

RISING HEAD TEST PZ-106-KS

WELL NO PZ-106-KS

DATE	7/20/95	
INITIAL DEPTH TO WATER	21.64	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	362.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	377.5	FEET (btoc)
BOTTOM OF AQUIFER	500	FEET (btoc)
SATURATED THICKNESS	355.86	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.81	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (SEC)	HEAD (FEET)	HEAD RATIO
1	1123	30	23.45	0.0	1.81	1.00
1	1124	30	23.38	60.0	1.74	0.96
1	1125	30	23.29	120.0	1.65	0.91
1	1126	30	23.21	180.0	1.57	0.87
1	1127	30	23.13	240.0	1.49	0.82
1	1128	30	23.05	300.0	1.41	0.78
1	1129	30	22.99	360.0	1.35	0.75
1	1130	30	22.92	420.0	1.28	0.71
1	1131	30	22.85	480.0	1.21	0.67
1	1136	30	22.6	780.0	0.96	0.53
1	1141	30	22.38	1080.0	0.74	0.41
1	1146	30	22.2	1380.0	0.56	0.31
1	1151	30	22.09	1680.0	0.45	0.25
1	1156	30	22	1980.0	0.36	0.20
1	1201	30	21.91	2280.0	0.27	0.15
1	1210	0	21.82	2790.0	0.18	0.10

COOPER-PAPADOPULOS SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-KS

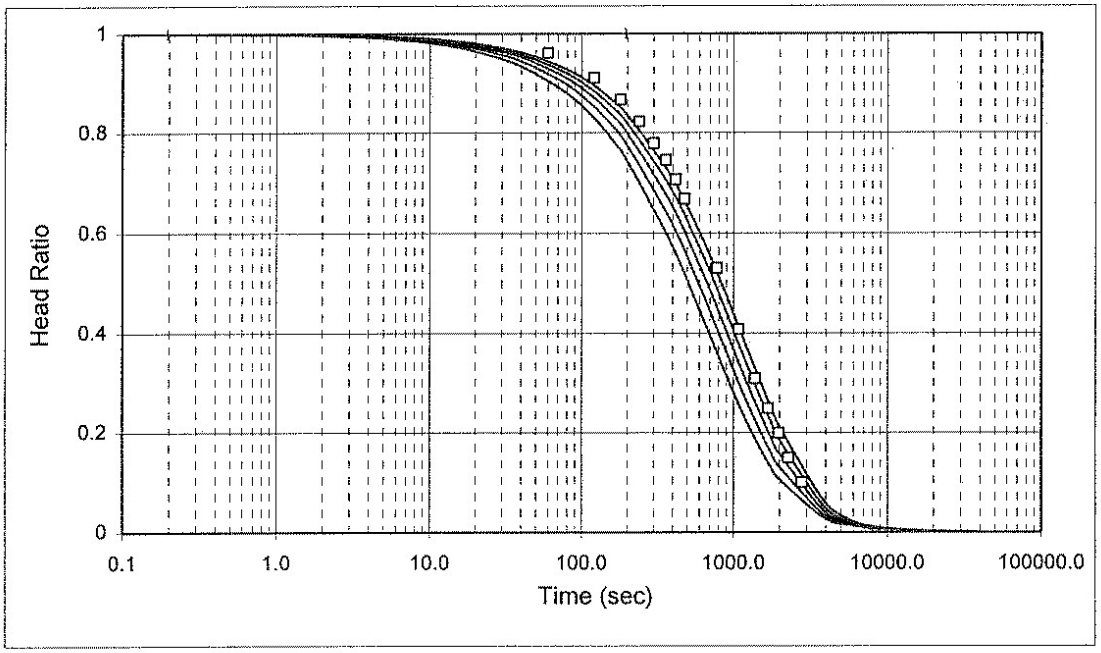
$$K = \frac{r_c^{\,2}\beta}{tb} \qquad \text{and} \qquad S = \frac{r_c^{\,2}\alpha}{r_{ew}^{\,2}}$$

where:

r_c = casing radius (feet)
r_{ew} = effective radius of screen (feet)
t = time (seconds)
K = Hydraulic conductivity (ft/sec)
$h_t/h_0 = F(\alpha,B)$

S = Storativity (dim)
h_t = Head at time t (feet)
b = Aquifer thickness (feet)

INPUT PARAMETERS		RESULTS	
r_c =	0.08		
r_{ew} =	0.25		
t =	195.0	K= 3.05E-06	cm/sec
α =	1	K= 0.009	ft/day
B =	1E-09	S = 1.11E-10	
b =	355.86		



Project Name: LAIDLAW / OU2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 9/24/95

RISING HEAD TEST PZ-107-SS

WELL NO. PZ-107-SS

DATE	7/15/95	
INITIAL DEPTH TO WATER	30.26	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	91.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	105.0	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	74.74	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	7.44	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1143	0	37.7	0.0	7.44	1.00
1	1144	0	37.68	1.0	7.42	1.00
1	1145	0	37.65	2.0	7.39	0.99
1	1150	0	37.51	7.0	7.25	0.97
1	1155	0	37.37	12.0	7.11	0.96
1	1200	0	37.26	17.0	7.00	0.94
1	1205	0	37.15	22.0	6.89	0.93
1	1210	0	37.05	27.0	6.79	0.91
1	1215	0	36.9	32.0	6.64	0.89
1	1220	0	36.79	37.0	6.53	0.88
1	1225	0	36.7	42.0	6.44	0.87
1	1230	0	36.59	47.0	6.33	0.85
1	1235	0	36.49	52.0	6.23	0.84
1	1240	0	36.37	57.0	6.11	0.82
1	1245	0	36.29	62.0	6.03	0.81
1	1250	0	36.17	67.0	5.91	0.79
1	1255	0	36.09	72.0	5.83	0.78
1	1300	0	35.98	77.0	5.72	0.77
1	1325	0	35.52	102.0	5.26	0.71

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-107-SS

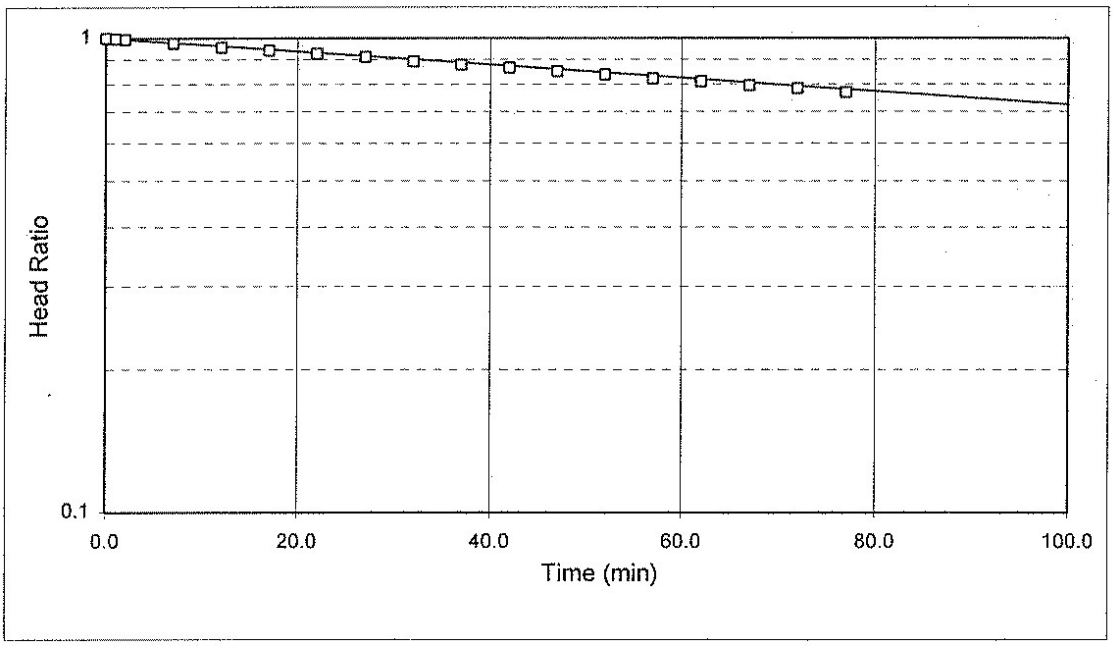
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14
t_1 (min) =	0
t_2 (min) =	100
h_1/h_0 =	1.00
h_2/h_0 =	0.72

RESULTS

K=	1.63E-06	cm/sec
K=	4.63E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/15/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-107-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

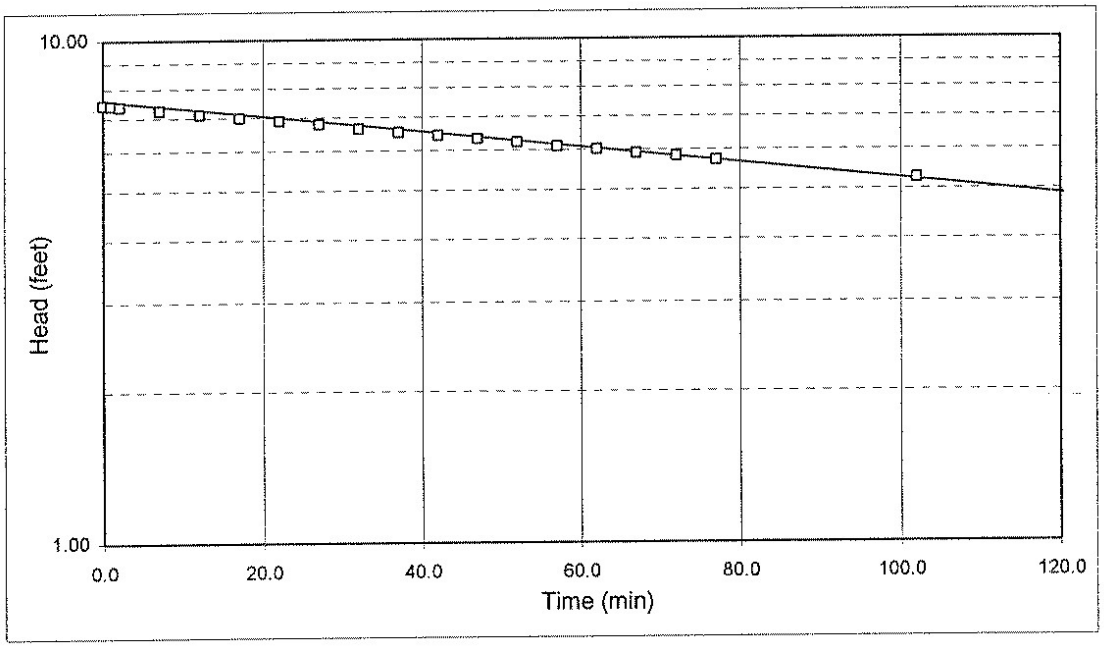
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	14
$\ln(R_e/r_w)$	3.31
y_0 =	7.59
y_t =	4.89
t =	120.4

RESULTS

K=	1.19E-06	cm/sec
K=	3.37E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/15/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-108-SS

WELL NO. PZ-108-SS

DATE	7/21/95	
INITIAL DEPTH TO WATER	87.11	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	132.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	146.0	FEET (btoc)
SATURATED THICKNESS	110	FEET
WATER TABLE TO BOTTOM OF SCREEN	58.89	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	13.9	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.67	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	927	30	90.78	0.0	3.67	1.00
1	928	30	90.74	1.0	3.63	0.99
1	929	30	90.71	2.0	3.60	0.98
1	930	30	90.69	3.0	3.58	0.98
1	935	30	90.66	8.0	3.55	0.97
1	940	30	90.61	13.0	3.50	0.95
1	945	30	90.58	18.0	3.47	0.95
1	955	30	90.54	28.0	3.43	0.93
1	1034	0	90.43	66.5	3.32	0.90
1	1243	30	89.94	196.0	2.83	0.77
1	1332	30	89.89	245.0	2.78	0.76
1	1449	0	89.8	321.5	2.69	0.73

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-108-SS

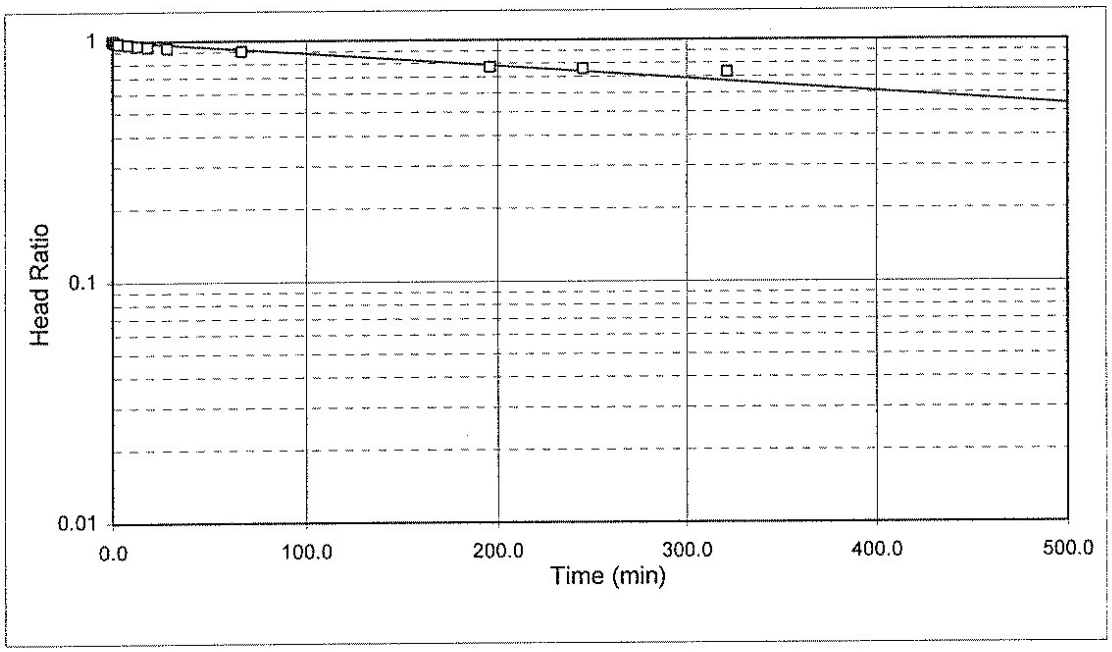
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	13.9
t_1(min) =	0
t_2(min) =	500
h_1/h_0 =	1.00
h_2/h_0 =	0.54

RESULTS

K=	6.34E-07	cm/sec
K=	1.80E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-108-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

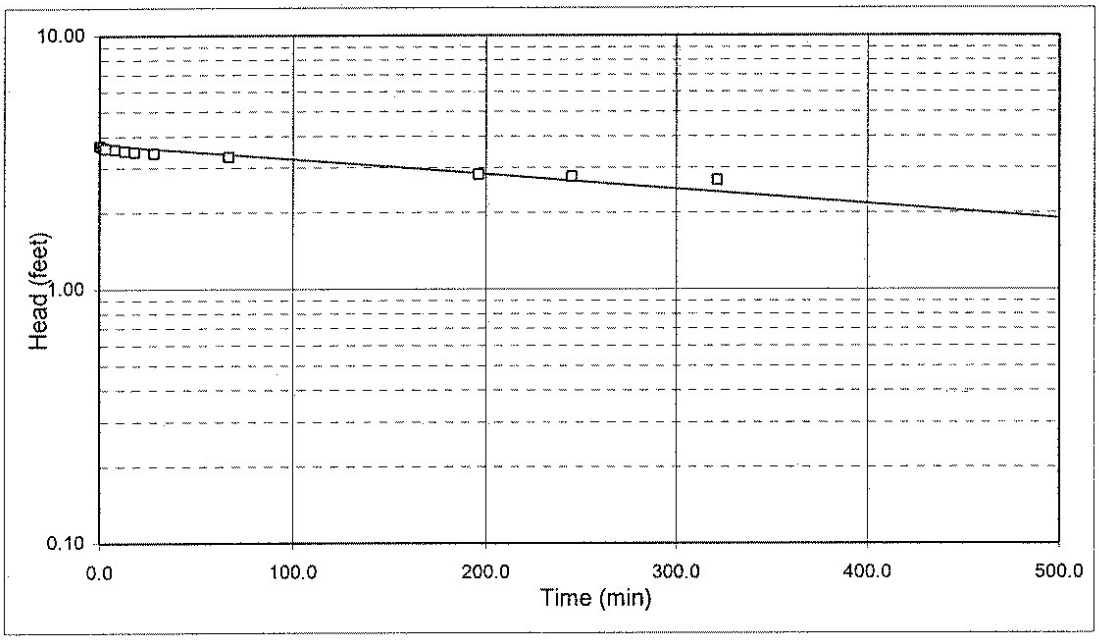
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	13.9
$\ln(R_e/r_w)$	3.27
y_0 =	3.70
y_t =	1.91
t =	500.0

RESULTS

K=	4.33E-07	cm/sec
K=	1.23E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-109-SS

WELL NO. PZ-109-SS

DATE	7/21/95	
INITIAL DEPTH TO WATER	84.41	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	123.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	137.4	FEET (btoc)
SATURATED THICKNESS	110	FEET
WATER TABLE TO BOTTOM OF SCREEN	52.99	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.35	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	850	0	87.76	0.0	3.35	1.00
1	851	0	87.74	1.0	3.33	0.99
1	852	0	87.73	2.0	3.32	0.99
1	853	0	87.72	3.0	3.31	0.99
1	858	0	87.69	8.0	3.28	0.98
1	903	0	87.68	13.0	3.27	0.98
1	910	30	87.67	20.5	3.26	0.97
1	1001	30	87.6	71.5	3.19	0.95
1	1029	30	87.58	99.5	3.17	0.95
1	1254	30	87.4	244.5	2.99	0.89
1	1328	0	87.39	278.0	2.98	0.89
1	1454	30	87.38	364.5	2.97	0.89

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-109-SS

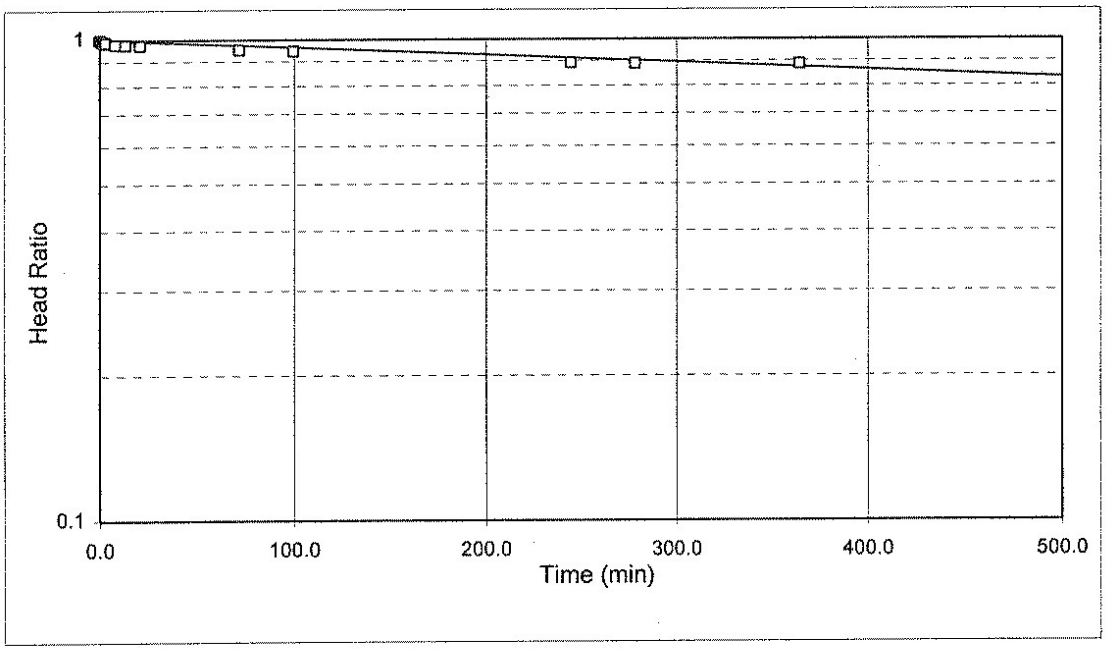
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14.4
t_1 (min) =	0
t_2 (min) =	500
h_1/h_0 =	1.00
h_2/h_0 =	0.83

RESULTS

K=	1.83E-07	cm/sec
K=	5.19E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-109-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

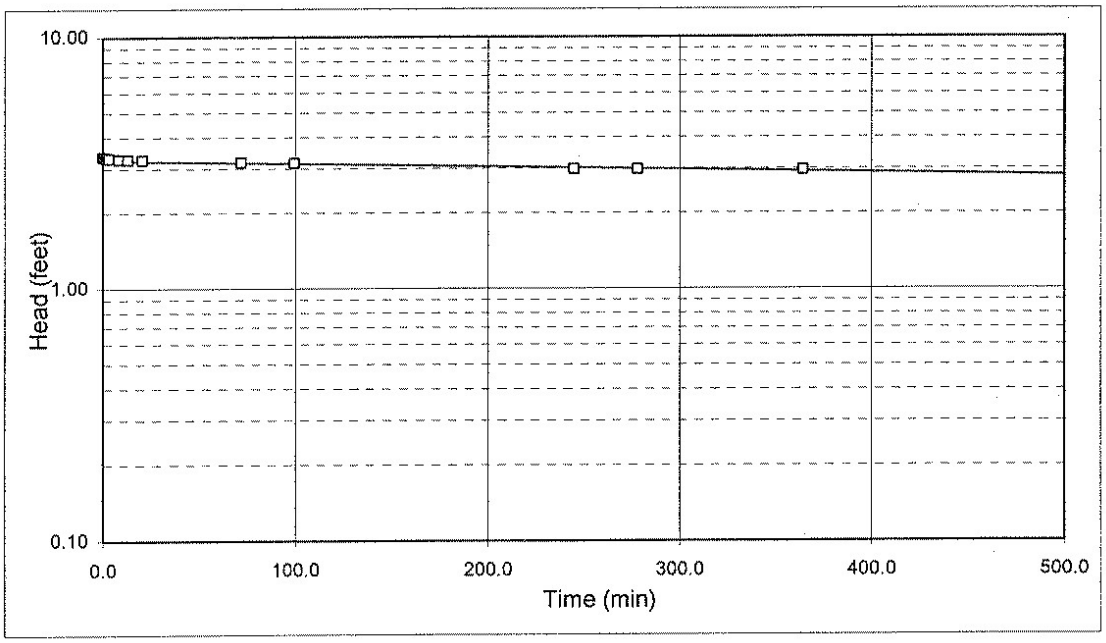
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	14.4
$\ln(R_e/r_w)$	3.24
y_0 =	3.24
y_t =	2.82
t =	500.0

RESULTS

K=	8.67E-08	cm/sec
K=	2.46E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-110-SS

WELL NO. PZ-110-SS

DATE	6/21/95	
INITIAL DEPTH TO WATER	85.75	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	98.6	FEET (btoc)
BOTTOM OF OPEN INTERVAL	113.6	FEET (btoc)
SATURATED THICKNESS	180	FEET
WATER TABLE TO BOTTOM OF SCREEN	27.85	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.77	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1229	0	88.52	0.0	2.77	1.00
1	1230	0	88.5	1.0	2.75	0.99
1	1231	0	88.49	2.0	2.74	0.99
1	1236	0	88.4	7.0	2.65	0.96
1	1241	0	88.36	12.0	2.61	0.94
1	1246	0	88.34	17.0	2.59	0.94
1	1251	0	88.3	22.0	2.55	0.92
1	1256	0	88.27	27.0	2.52	0.91
1	1301	0	88.22	32.0	2.47	0.89
1	1306	0	88.18	37.0	2.43	0.88
1	1311	0	88.14	42.0	2.39	0.86
1	1316	0	88.1	47.0	2.35	0.85
1	1321	0	88.08	52.0	2.33	0.84
1	1326	0	88.03	57.0	2.28	0.82
1	1331	0	88	62.0	2.25	0.81
1	1336	0	87.96	67.0	2.21	0.80
1	1341	0	87.91	72.0	2.16	0.78
1	1346	0	87.88	77.0	2.13	0.77
1	1351	0	87.84	82.0	2.09	0.75
1	1356	0	87.82	87.0	2.07	0.75
1	1401	0	87.79	92.0	2.04	0.74
1	1406	0	87.73	97.0	1.98	0.71
1	1411	0	87.71	102.0	1.96	0.71
1	1416	0	87.69	107.0	1.94	0.70
1	1421	0	87.64	112.0	1.89	0.68

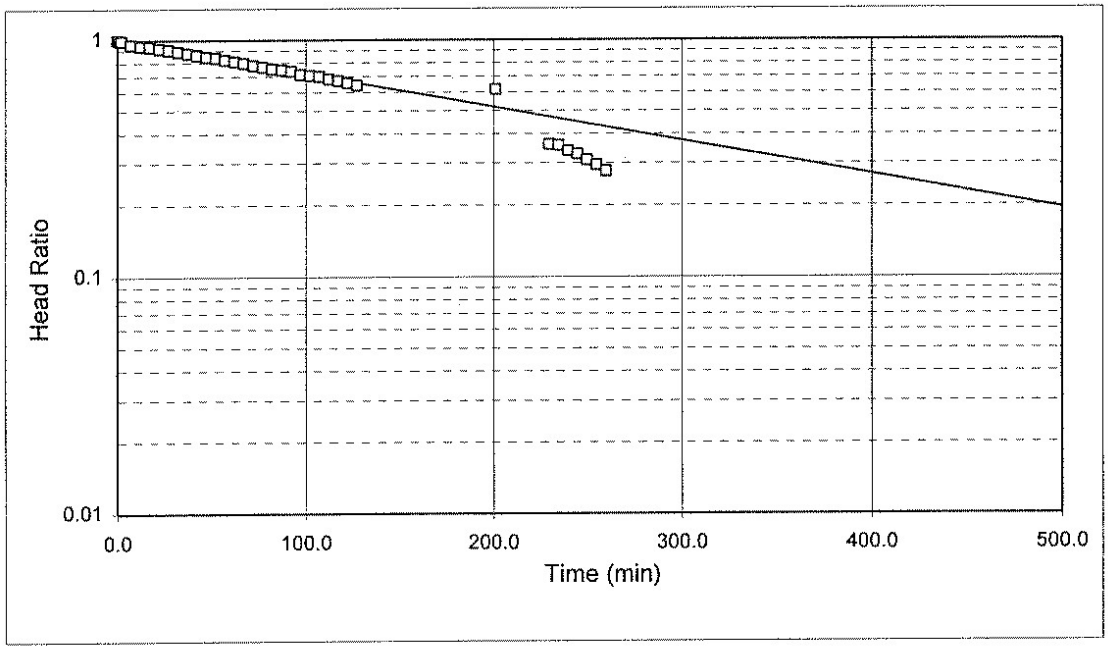
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1426	0	87.61	117.0	1.86	0.67
1	1431	0	87.57	122.0	1.82	0.66
1	1436	0	87.53	127.0	1.78	0.64
1	1550	0	87.46	201.0	1.71	0.62
1	1618	30	86.75	229.5	1.00	0.36
1	1623	30	86.74	234.5	0.99	0.36
1	1628	30	86.69	239.5	0.94	0.34
1	1633	30	86.66	244.5	0.91	0.33
1	1638	30	86.61	249.5	0.86	0.31
1	1643	30	86.57	254.5	0.82	0.30
1	1648	30	86.52	259.5	0.77	0.28

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-110-SS

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15	K=	1.57E-06	cm/sec
t_1 (min) =	0	K=	4.46E-03	ft/day
t_2 (min) =	500			
h_1/h_0 =	1.00			
h_2/h_0 =	0.19			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-110-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

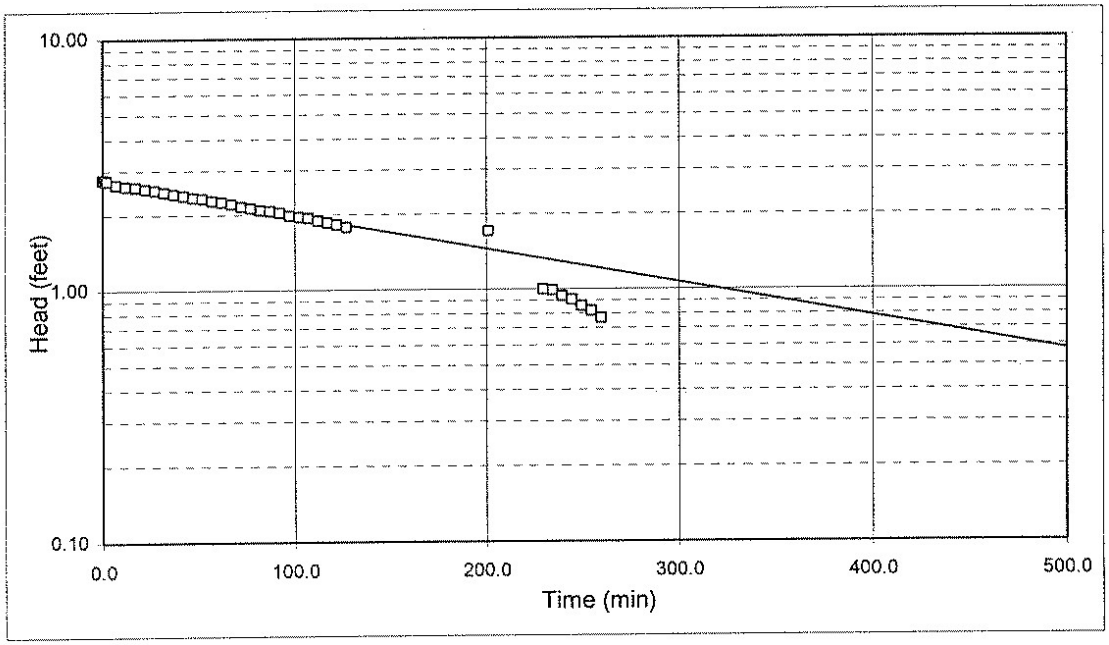
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	15
$\ln(R_e/r_w)$	2.91
y_0 =	2.69
y_t =	0.58
t =	500.0

RESULTS

K=	8.91E-07	cm/sec
K=	2.52E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-111-SD

WELL NO. PZ-111-SD

DATE	7/24/95	
INITIAL DEPTH TO WATER	37.68	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	197.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	212.3	FEET (btoc)
SATURATED THICKNESS	180	FEET
WATER TABLE TO BOTTOM OF SCREEN	174.62	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.3	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.88	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1324	30	41.56	0.0	3.88	1.00
1	1325	30	41.54	1.0	3.86	0.99
1	1327	0	41.53	2.5	3.85	0.99
1	1330	0	41.53	5.5	3.85	0.99
1	1335	0	41.51	10.5	3.83	0.99
1	1340	0	41.5	15.5	3.82	0.98
1	1350	0	41.49	25.5	3.81	0.98
1	1440	0	41.48	75.5	3.80	0.98
2	711	0	40.88	1066.5	3.20	0.82
2	1146	0	40.63	1341.5	2.95	0.76
2	1527	0	40.53	1562.5	2.85	0.73
2	1744	0	40.45	1699.5	2.77	0.71
3	1014	0	39.88	2689.5	2.20	0.57
3	1619	0	39.67	3054.5	1.99	0.51
4	709	0	39.19	3944.5	1.51	0.39
4	1349	0	38.96	4344.5	1.28	0.33

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-111-SD

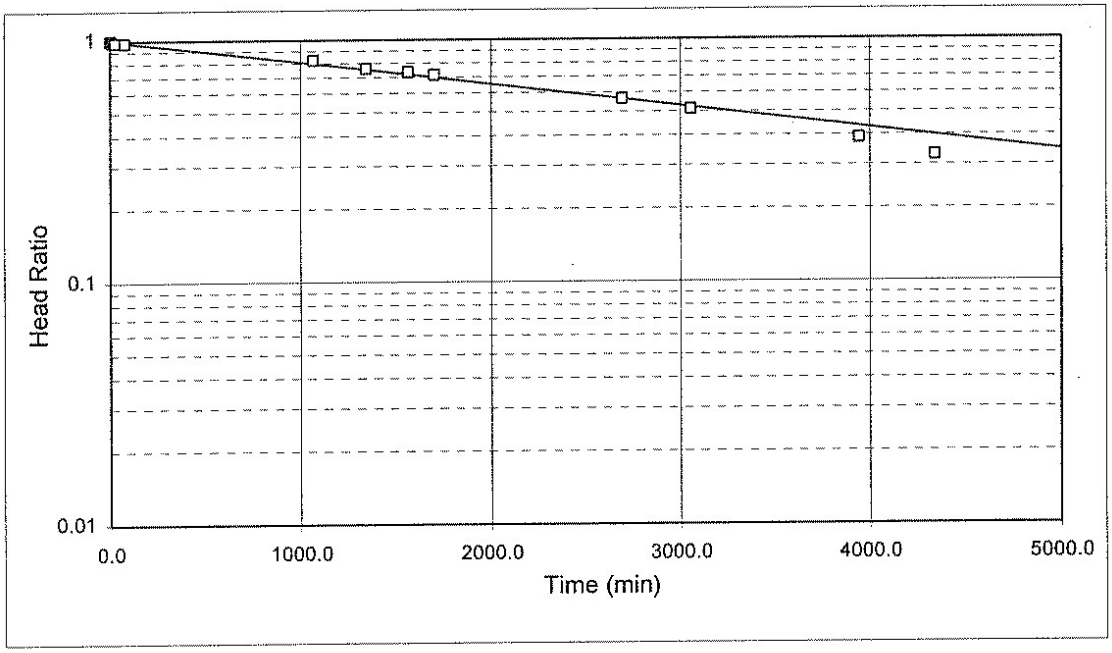
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	15.3
t_1 (min) =	0
t_2 (min) =	5000
h_1/h_0 =	1.00
h_2/h_0 =	0.35

RESULTS

K=	1.00E-07	cm/sec
K=	2.85E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-111-SD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

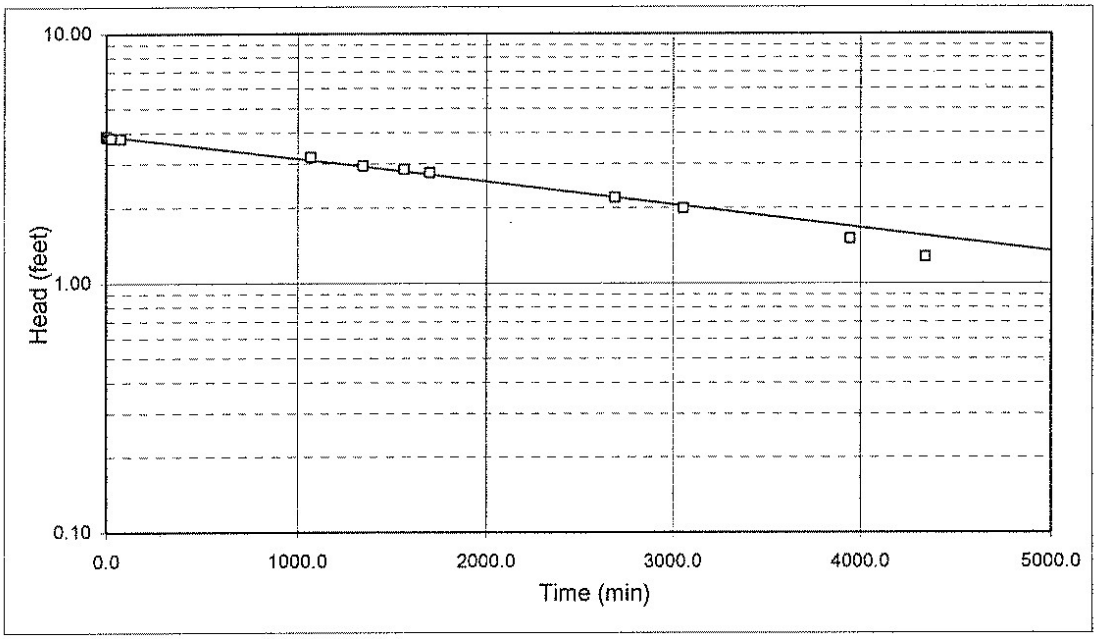
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	15.3
$\ln(R_e/r_w)$	4.01
y_0 =	3.89
y_t =	1.35
t =	5000.0

RESULTS

K=	6.78E-08	cm/sec
K=	1.92E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-111-KS

WELL NO PZ-111-KS

DATE	7/24/95	
INITIAL DEPTH TO WATER	18.89	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	353.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	370.5	FEET (btoc)
BOTTOM OF AQUIFER	500	FEET (btoc)
SATURATED THICKNESS	351.6	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	17.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.51	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (SEC)	HEAD (FEET)	HEAD RATIO
1	1236	30	22.4	0.0	3.51	1.00
1	1237	30	22.19	60.0	3.30	0.94
1	1238	0	22.08	90.0	3.19	0.91
1	1238	30	21.98	120.0	3.09	0.88
1	1239	0	21.88	150.0	2.99	0.85
1	1240	0	21.68	210.0	2.79	0.79
1	1241	0	21.53	270.0	2.64	0.75
1	1242	0	21.36	330.0	2.47	0.70
1	1243	0	21.21	390.0	2.32	0.66
1	1244	0	21.09	450.0	2.20	0.63
1	1245	0	20.96	510.0	2.07	0.59
1	1250	0	20.42	810.0	1.53	0.44
1	1255	0	20.02	1110.0	1.13	0.32
1	1300	0	19.74	1410.0	0.85	0.24
1	1305	0	19.53	1710.0	0.64	0.18
1	1310	0	19.37	2010.0	0.48	0.14
1	1315	0	19.24	2310.0	0.35	0.10
1	1320	0	19.17	2610.0	0.28	0.08
1	1328	0	19.07	3090.0	0.18	0.05
1	1331	0	19.05	3270.0	0.16	0.05

COOPER-PAPADOPULOS SLUG TEST ANALYSIS
RISING HEAD TEST PZ-111-KS

$$K = \frac{r_c^{\,2}\beta}{tb} \qquad \text{and} \qquad S = \frac{r_c^{\,2}\alpha}{r_{ew}^{\,2}}$$

where:

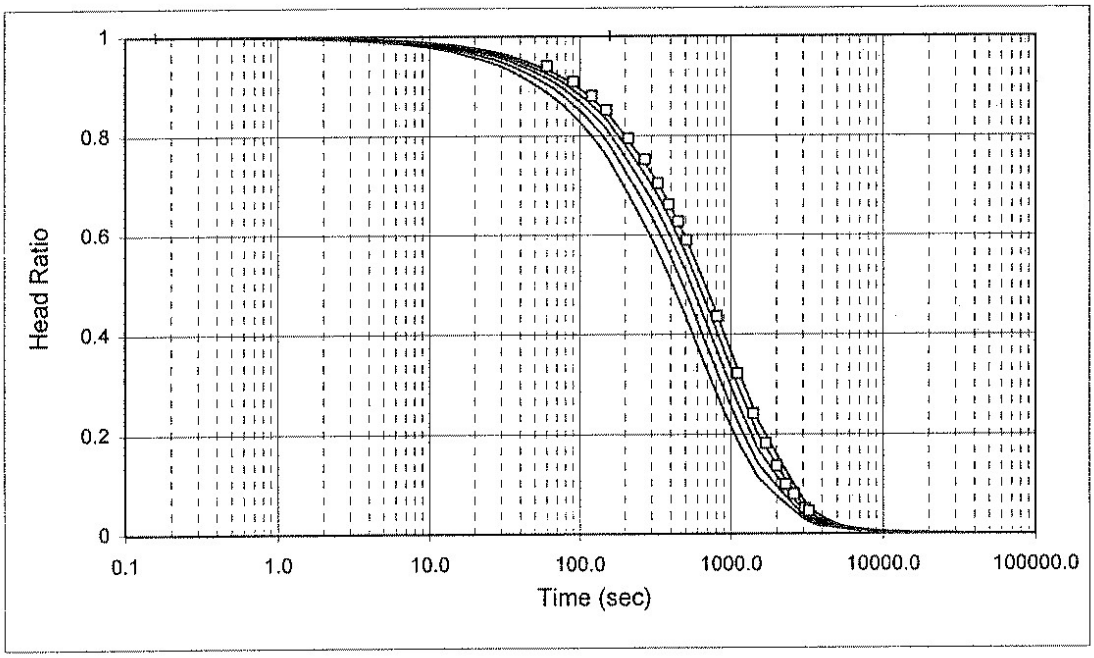
r_c = casing radius (feet)
r_{ew} = effective radius of screen (feet)
t = time (seconds)
K = Hydraulic conductivity (ft/sec)
$h_t/h_0 = F(\alpha,B)$

S = Storativity (dim)
h_t = Head at time t (feet)
b = Aquifer thickness (feet)

INPUT PARAMETERS	
r_c =	0.08
r_{ew} =	0.25
t =	157.8
α =	1
B =	1E-09
b =	351.61

RESULTS

K=	3.82E-06	cm/sec
K=	0.011	ft/day
S =	1.11E-10	



Project Name: LAIDLAW / OU2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-112-AS-FH1

WELL NO. PZ-112-AS-FH1

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	10.19	FEET H_2O
INITIAL DEPTH TO WATER	24.79	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	28.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	37.9	FEET (btoc)
SATURATED THICKNESS	100	FEET
WATER TABLE TO BOTTOM OF SCREEN	13.11	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	9.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.37	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	930	5	12.563	0.00	22.42	2.37	1.00
1995	206	930	6	12.297	0.02	22.68	2.11	0.89
1995	206	930	7	12.132	0.03	22.85	1.94	0.82
1995	206	930	8	11.973	0.05	23.01	1.78	0.75
1995	206	930	9	11.829	0.07	23.15	1.64	0.69
1995	206	930	10	11.698	0.08	23.28	1.51	0.64
1995	206	930	11	11.577	0.10	23.40	1.39	0.58
1995	206	930	12	11.469	0.12	23.51	1.28	0.54
1995	206	930	13	11.366	0.13	23.61	1.18	0.50
1995	206	930	14	11.273	0.15	23.71	1.08	0.46
1995	206	930	15	11.189	0.17	23.79	1.00	0.42
1995	206	930	16	11.111	0.18	23.87	0.92	0.39
1995	206	930	17	11.04	0.20	23.94	0.85	0.36
1995	206	930	18	10.973	0.22	24.01	0.78	0.33
1995	206	930	19	10.913	0.23	24.07	0.72	0.30
1995	206	930	20	10.858	0.25	24.12	0.67	0.28
1995	206	930	21	10.807	0.27	24.17	0.62	0.26
1995	206	930	22	10.76	0.28	24.22	0.57	0.24
1995	206	930	23	10.718	0.30	24.26	0.53	0.22
1995	206	930	24	10.679	0.32	24.30	0.49	0.21
1995	206	930	25	10.643	0.33	24.34	0.45	0.19
1995	206	930	26	10.61	0.35	24.37	0.42	0.18
1995	206	930	27	10.58	0.37	24.40	0.39	0.16
1995	206	930	28	10.55	0.38	24.43	0.36	0.15
1995	206	930	29	10.527	0.40	24.45	0.34	0.14
1995	206	930	30	10.501	0.42	24.48	0.31	0.13
1995	206	930	31	10.48	0.43	24.50	0.29	0.12

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	930	32	10.459	0.45	24.52	0.27	0.11
1995	206	930	33	10.437	0.47	24.54	0.25	0.10
1995	206	930	34	10.419	0.48	24.56	0.23	0.10
1995	206	930	35	10.405	0.50	24.58	0.22	0.09
1995	206	930	36	10.391	0.52	24.59	0.20	0.08
1995	206	930	37	10.376	0.53	24.60	0.19	0.08
1995	206	930	38	10.363	0.55	24.62	0.17	0.07
1995	206	930	39	10.354	0.57	24.63	0.16	0.07
1995	206	930	40	10.341	0.58	24.64	0.15	0.06
1995	206	930	41	10.332	0.60	24.65	0.14	0.06
1995	206	930	42	10.323	0.62	24.66	0.13	0.06
1995	206	930	43	10.316	0.63	24.66	0.13	0.05
1995	206	930	44	10.305	0.65	24.68	0.12	0.05
1995	206	930	45	10.301	0.67	24.68	0.11	0.05
1995	206	930	46	10.292	0.68	24.69	0.10	0.04
1995	206	930	47	10.29	0.70	24.69	0.10	0.04
1995	206	930	48	10.281	0.72	24.70	0.09	0.04
1995	206	930	49	10.277	0.73	24.70	0.09	0.04
1995	206	930	50	10.272	0.75	24.71	0.08	0.03
1995	206	930	51	10.266	0.77	24.71	0.08	0.03
1995	206	930	52	10.264	0.78	24.72	0.07	0.03
1995	206	930	53	10.258	0.80	24.72	0.07	0.03
1995	206	930	54	10.255	0.82	24.73	0.07	0.03
1995	206	930	55	10.252	0.83	24.73	0.06	0.03
1995	206	930	56	10.247	0.85	24.73	0.06	0.02
1995	206	930	57	10.245	0.87	24.74	0.05	0.02
1995	206	930	58	10.243	0.88	24.74	0.05	0.02
1995	206	930	59	10.24	0.90	24.74	0.05	0.02
1995	206	931	0	10.236	0.92	24.74	0.05	0.02
1995	206	931	1	10.237	0.93	24.74	0.05	0.02
1995	206	931	2	10.234	0.95	24.75	0.04	0.02

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-112-AS-FH1

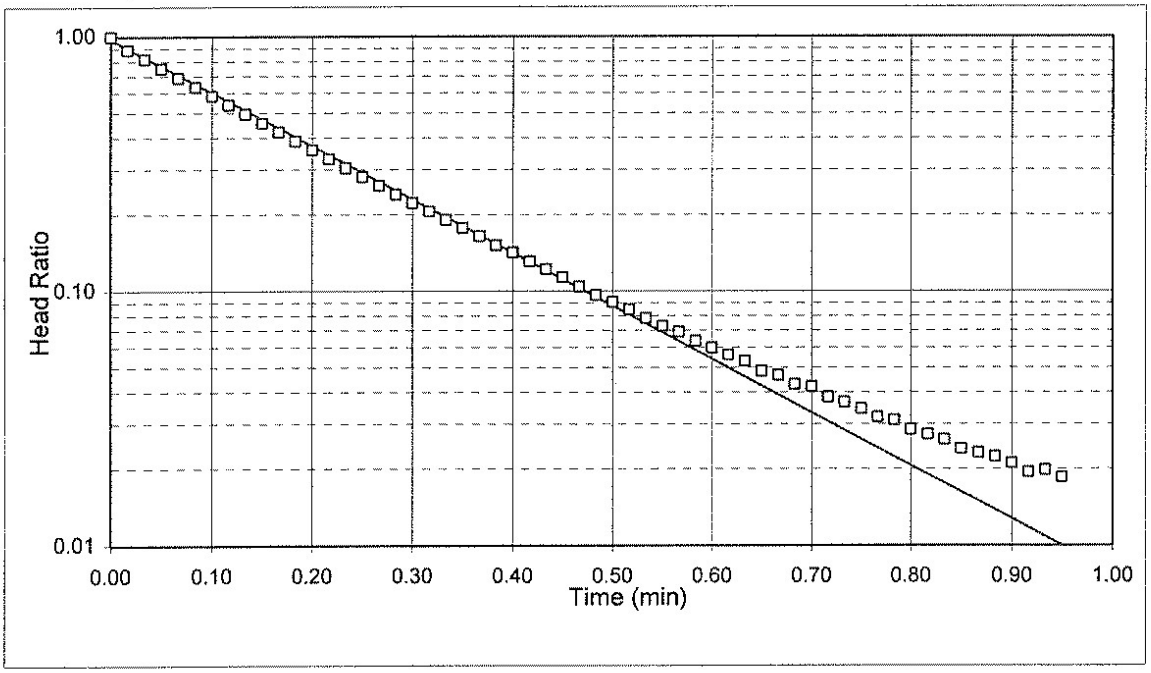
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
Re =	0.34
L_e =	9.4
t_1 (min) =	0
t_2 (min) =	0.95
h_1/h_0 =	0.98
h_2/h_0 =	0.01

RESULTS

K=	2.99E-03	cm/sec
K=	8.49E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-112-AS-FH1

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

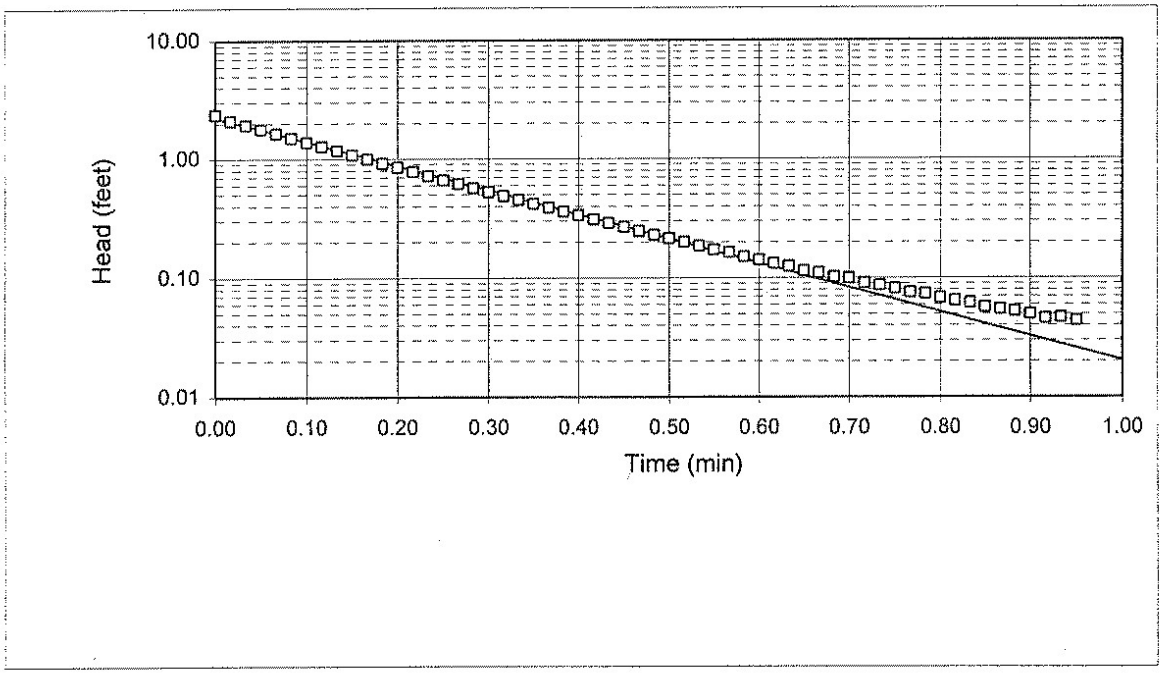
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	9.4
$\ln(R_e/r_w)$	1.91
y_0 =	2.24
y_t =	0.02
t =	1.00

RESULTS

K=	1.69E-03	cm/sec
K=	4.78E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-112-AS-RH1

WELL NO. PZ-112-AS-RH1

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	10.19	FEET H_2O
INITIAL DEPTH TO WATER	24.79	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	28.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	37.9	FEET (btoc)
SATURATED THICKNESS	100	FEET
WATER TABLE TO BOTTOM OF SCREEN	13.11	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	9.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.11	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	927	3	8.0808	0.00	26.90	2.11	1.00
305	206	927	4	8.3167	0.02	26.66	1.87	0.89
305	206	927	5	8.4263	0.03	26.55	1.76	0.84
305	206	927	6	8.5257	0.05	26.45	1.66	0.79
305	206	927	7	8.6166	0.07	26.36	1.57	0.75
305	206	927	8	8.6893	0.08	26.29	1.50	0.71
305	206	927	9	8.777	0.10	26.20	1.41	0.67
305	206	927	10	8.8401	0.12	26.14	1.35	0.64
305	206	927	11	8.9063	0.13	26.07	1.28	0.61
305	206	927	12	8.9705	0.15	26.01	1.22	0.58
305	206	927	13	9.0322	0.17	25.95	1.16	0.55
305	206	927	14	9.0879	0.18	25.89	1.10	0.52
305	206	927	15	9.1451	0.20	25.83	1.04	0.50
305	206	927	16	9.1968	0.22	25.78	0.99	0.47
305	206	927	17	9.2457	0.23	25.73	0.94	0.45
305	206	927	18	9.2924	0.25	25.69	0.90	0.43
305	206	927	19	9.331	0.27	25.65	0.86	0.41
305	206	927	20	9.3731	0.28	25.61	0.82	0.39
305	206	927	21	9.4275	0.30	25.55	0.76	0.36
305	206	927	22	9.464	0.32	25.52	0.73	0.34
305	206	927	23	9.4971	0.33	25.48	0.69	0.33
305	206	927	24	9.5336	0.35	25.45	0.66	0.31
305	206	927	25	9.5627	0.37	25.42	0.63	0.30
305	206	927	26	9.5944	0.38	25.39	0.60	0.28
305	206	927	27	9.6222	0.40	25.36	0.57	0.27
305	206	927	28	9.6506	0.42	25.33	0.54	0.26
305	206	927	29	9.677	0.43	25.30	0.51	0.24

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	927	30	9.702	0.45	25.28	0.49	0.23
305	206	927	31	9.7254	0.47	25.25	0.46	0.22
305	206	927	32	9.7484	0.48	25.23	0.44	0.21
305	206	927	33	9.7687	0.50	25.21	0.42	0.20
305	206	927	34	9.7907	0.52	25.19	0.40	0.19
305	206	927	35	9.8072	0.53	25.17	0.38	0.18
305	206	927	36	9.8284	0.55	25.15	0.36	0.17
305	206	927	37	9.8434	0.57	25.14	0.35	0.16
305	206	927	38	9.8597	0.58	25.12	0.33	0.16
305	206	927	39	9.8793	0.60	25.10	0.31	0.15
305	206	927	40	9.8906	0.62	25.09	0.30	0.14
305	206	927	41	9.9077	0.63	25.07	0.28	0.13
305	206	927	42	9.9219	0.65	25.06	0.27	0.13
305	206	927	43	9.9343	0.67	25.05	0.26	0.12
305	206	927	44	9.9423	0.68	25.04	0.25	0.12
305	206	927	45	9.9571	0.70	25.02	0.23	0.11
305	206	927	46	9.9673	0.72	25.01	0.22	0.11
305	206	927	47	9.9784	0.73	25.00	0.21	0.10
305	206	927	48	9.9858	0.75	24.99	0.20	0.10
305	206	927	49	9.9954	0.77	24.98	0.19	0.09
305	206	927	50	10.01	0.78	24.97	0.18	0.09
305	206	927	51	10.015	0.80	24.97	0.17	0.08
305	206	927	52	10.024	0.82	24.96	0.17	0.08
305	206	927	53	10.031	0.83	24.95	0.16	0.08
305	206	927	54	10.037	0.85	24.94	0.15	0.07
305	206	927	55	10.048	0.87	24.93	0.14	0.07
305	206	927	56	10.052	0.88	24.93	0.14	0.07
305	206	927	57	10.062	0.90	24.92	0.13	0.06
305	206	927	58	10.065	0.92	24.92	0.13	0.06
305	206	927	59	10.074	0.93	24.91	0.12	0.05
305	206	928	0	10.078	0.95	24.90	0.11	0.05
305	206	928	1	10.084	0.97	24.90	0.11	0.05
305	206	928	2	10.089	0.98	24.89	0.10	0.05
305	206	928	3	10.094	1.00	24.89	0.10	0.05
305	206	928	4	10.098	1.02	24.88	0.09	0.04
305	206	928	5	10.101	1.03	24.88	0.09	0.04
305	206	928	6	10.109	1.05	24.87	0.08	0.04
305	206	928	7	10.112	1.07	24.87	0.08	0.04
305	206	928	8	10.116	1.08	24.86	0.07	0.04
305	206	928	9	10.119	1.10	24.86	0.07	0.03
305	206	928	10	10.122	1.12	24.86	0.07	0.03
305	206	928	11	10.127	1.13	24.85	0.06	0.03
305	206	928	12	10.126	1.15	24.85	0.06	0.03
305	206	928	13	10.136	1.17	24.84	0.05	0.03
305	206	928	14	10.136	1.18	24.84	0.05	0.03

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	928	15	10.138	1.20	24.84	0.05	0.02
305	206	928	16	10.141	1.22	24.84	0.05	0.02
305	206	928	17	10.147	1.23	24.83	0.04	0.02
305	206	928	18	10.155	1.25	24.83	0.04	0.02
305	206	928	19	10.157	1.27	24.82	0.03	0.02
305	206	928	20	10.154	1.28	24.83	0.04	0.02
305	206	928	21	10.152	1.30	24.83	0.04	0.02
305	206	928	22	10.164	1.32	24.82	0.03	0.01
305	206	928	23	10.163	1.33	24.82	0.03	0.01
305	206	928	24	10.166	1.35	24.81	0.02	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-112-AS-RH1

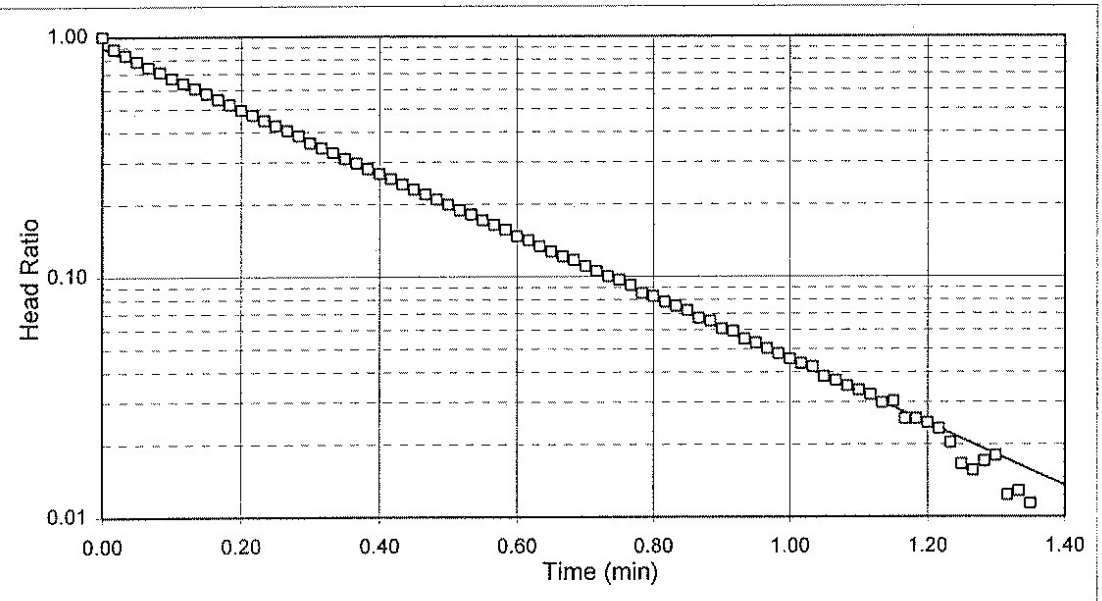
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = equivalent radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	9.4
t_1 (min) =	0
t_2 (min) =	1.40
h_1/h_0 =	0.90
h_2/h_0 =	0.01

RESULTS

K=	1.86E-03	cm/sec
K=	5.28E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-112-AS-RH1

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

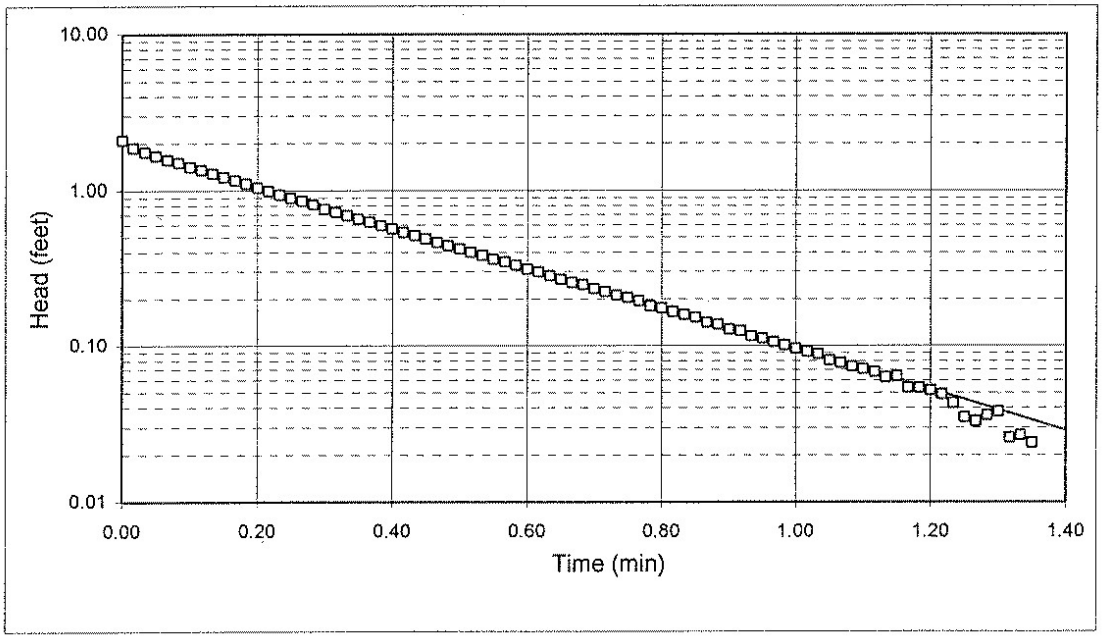
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	9.4
$\ln(R_e/r_w)$	1.91
y_0 =	2.00
y_t =	0.03
t =	1.40

RESULTS

K=	1.09E-03	cm/sec
K=	3.08E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-113-AS

WELL NO. PZ-113-AS

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	9.9	FEET H_2O
INITIAL DEPTH TO WATER	26.27	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	26.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	41.5	FEET (btoc)
SATURATED THICKNESS	80	FEET
WATER TABLE TO BOTTOM OF SCREEN	15.23	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	0.98	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1447	2	10.881	0.00	25.29	0.98	1.000
1995	206	1447	3	10.804	0.02	25.37	0.90	0.922
1995	206	1447	4	10.62	0.03	25.55	0.72	0.734
1995	206	1447	5	10.323	0.05	25.85	0.42	0.431
1995	206	1447	6	10.174	0.07	26.00	0.27	0.279
1995	206	1447	7	10.027	0.08	26.14	0.13	0.129
1995	206	1447	8	9.856	0.10	26.23	0.04	0.045
1995	206	1447	10	9.8452	0.13	26.22	0.05	0.056
1995	206	1447	11	9.9191	0.15	26.25	0.02	0.019
1995	206	1447	12	9.8198	0.17	26.19	0.08	0.082
1995	206	1447	13	9.8705	0.18	26.24	0.03	0.030
1995	206	1447	15	9.906	0.22	26.26	0.01	0.006
1995	206	1447	16	9.9122	0.23	26.26	0.01	0.012
1995	206	1447	17	9.9082	0.25	26.26	0.01	0.008
1995	206	1447	18	9.9086	0.27	26.26	0.01	0.009
1995	206	1447	19	9.9071	0.28	26.26	0.01	0.007
1995	206	1447	20	9.9054	0.30	26.26	0.01	0.006

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AS

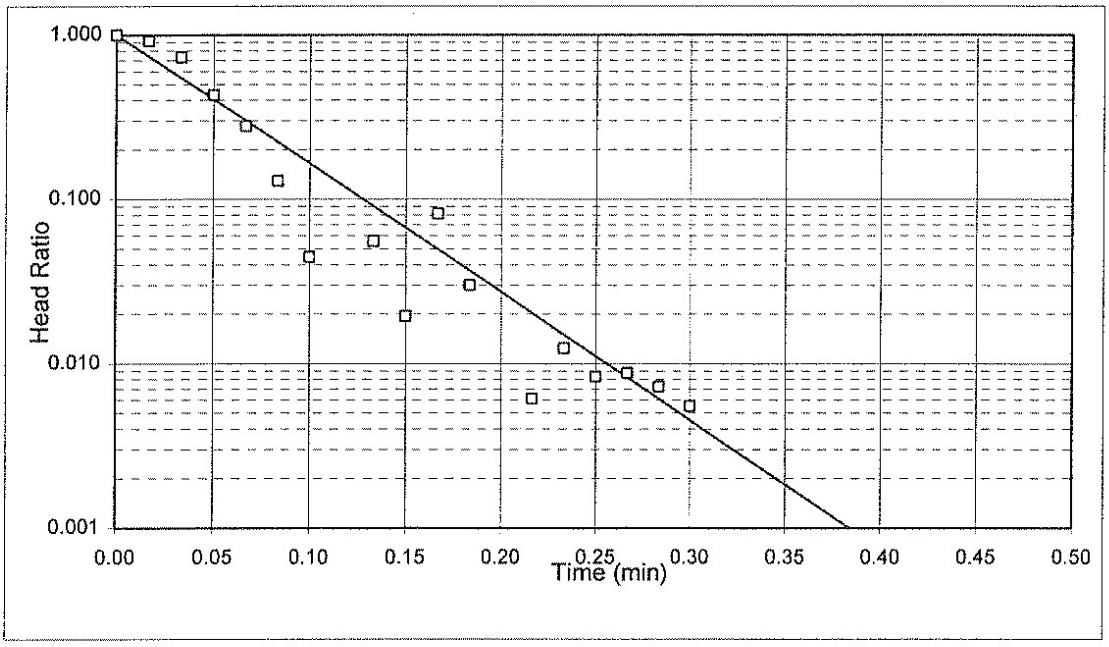
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	15
t_1 (min) =	0
t_2 (min) =	0.38
h_1/h_0 =	1.00
h_2/h_0 =	0.00

RESULTS

K=	7.99E-03	cm/sec
K=	2.26E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

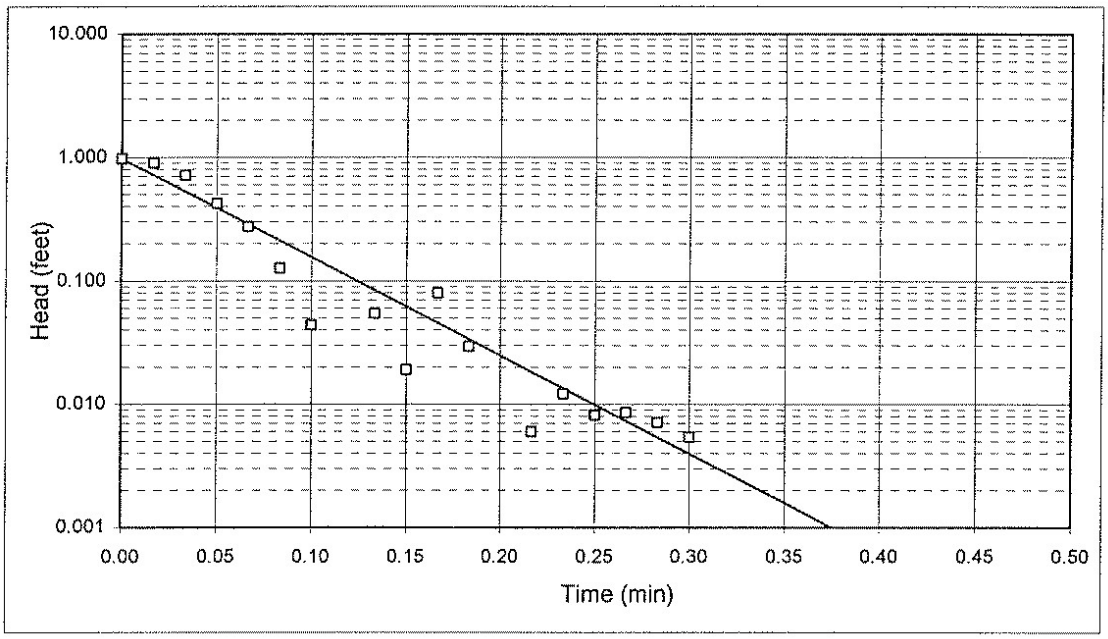
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	15
$\ln(R_e/r_w)$	2.35
y_0 =	0.98
y_t =	0.00
t =	0.38

RESULTS

K=	5.08E-03	cm/sec
K=	1.44E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-113-AS

WELL NO. PZ-113-AS

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	9.9	FEET H_2O
INITIAL DEPTH TO WATER	26.27	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	26.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	41.5	FEET (btoc)
SATURATED THICKNESS	80	FEET
WATER TABLE TO BOTTOM OF SCREEN	15.23	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.53	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1449	2	8.3689	0.00	27.80	1.53	1.00
1995	206	1449	3	9.045	0.02	27.13	0.86	0.56
1995	206	1449	4	9.4283	0.03	26.74	0.47	0.31
1995	206	1449	5	9.6252	0.05	26.54	0.27	0.18
1995	206	1449	6	9.732	0.07	26.44	0.17	0.11
1995	206	1449	7	9.7835	0.08	26.39	0.12	0.08
1995	206	1449	8	9.8142	0.10	26.36	0.09	0.06
1995	206	1449	9	9.8263	0.12	26.34	0.07	0.05

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-113-AS

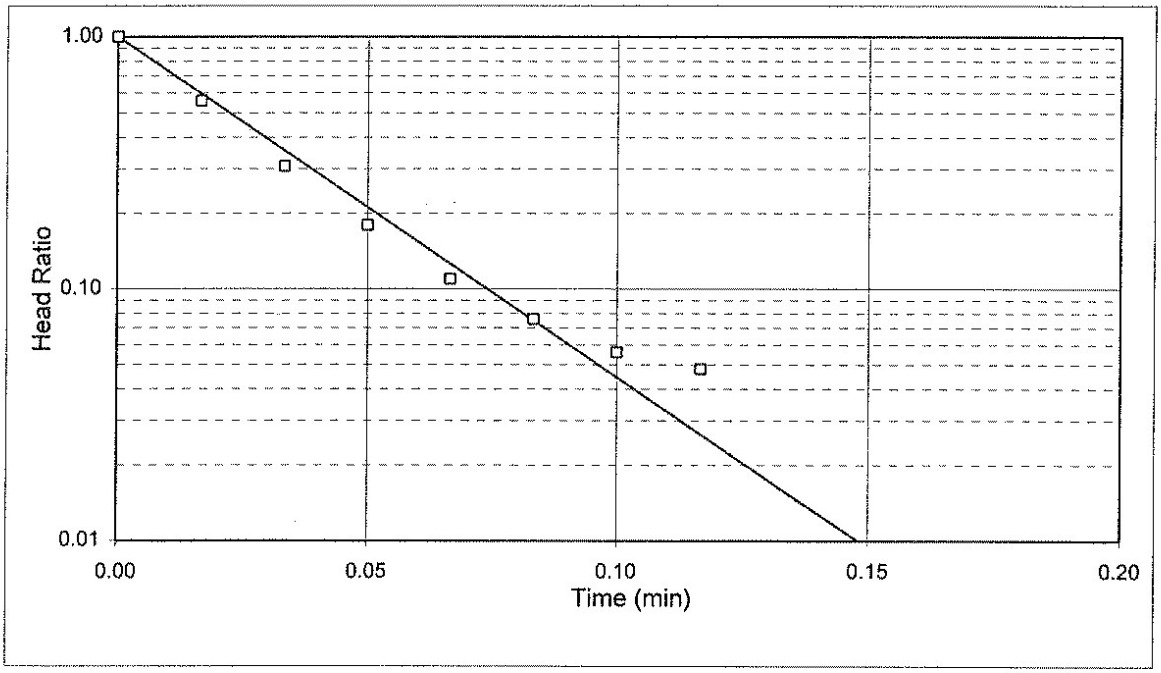
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	15
t_1 (min) =	0
t_2 (min) =	0.15
h_1/h_0 =	1.00
h_2/h_0 =	0.01

RESULTS

K=	1.38E-02	cm/sec
K=	3.91E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

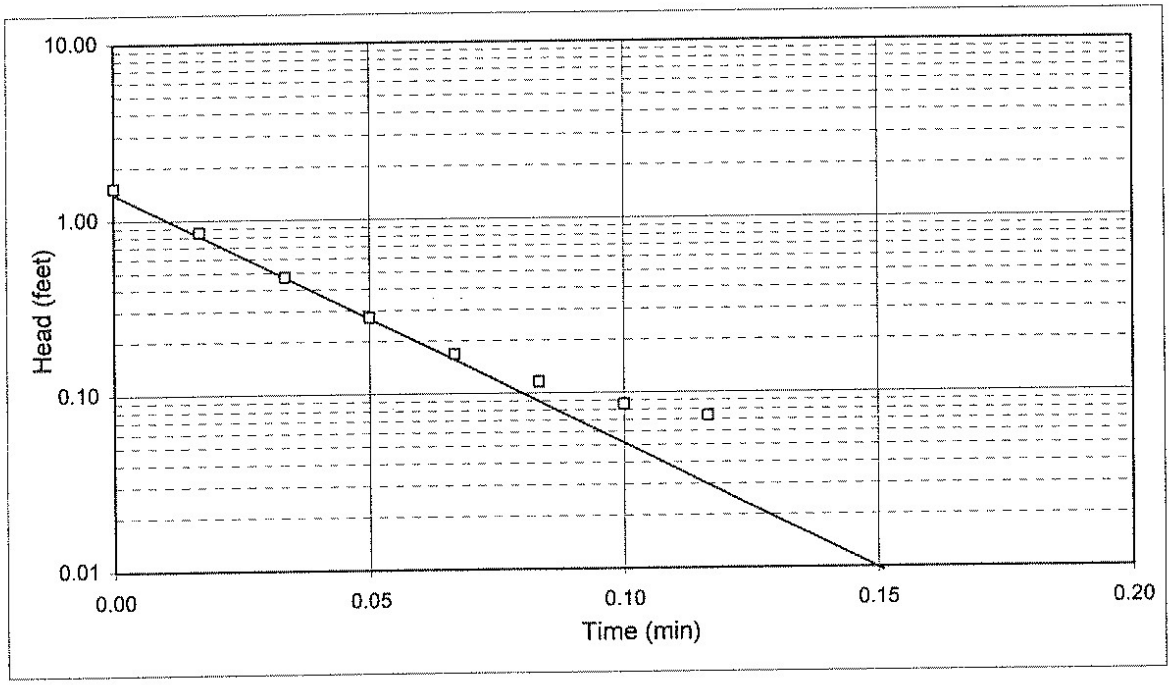
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-113-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS	
r_c =	0.20		
r_w =	0.34		
L_e =	15	K=	5.31E-02 cm/sec
$\ln(R_e/r_w)$	2.35	K=	1.51E+02 ft/day
y_0 =	1.41		
y_t =	0.01		
t =	0.15		



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-113-AD (TEST 1)

WELL NO.	PZ-113-AD (TEST 1)	
DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	15.28	FEET H_2O
INITIAL DEPTH TO WATER	26.33	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	90.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	110.3	FEET (btoc)
SATURATED THICKNESS	85	FEET
WATER TABLE TO BOTTOM OF SCREEN	83.97	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	19.6	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.37	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1404	2	16.649	0.00	24.96	1.37	1.00
1995	206	1404	3	15.649	0.02	25.96	0.37	0.27
1995	206	1404	4	15.688	0.03	25.92	0.41	0.30
1995	206	1404	5	14.46	0.05	25.51	0.82	0.60
1995	206	1404	6	14.767	0.07	25.82	0.51	0.37
1995	206	1404	7	14.47	0.08	25.52	0.81	0.59
1995	206	1404	8	14.736	0.10	25.79	0.54	0.40
1995	206	1404	9	15.135	0.12	26.19	0.15	0.11
1995	206	1404	10	15.514	0.13	26.10	0.23	0.17
1995	206	1404	11	15.75	0.15	25.86	0.47	0.34
1995	206	1404	12	15.801	0.17	25.81	0.52	0.38
1995	206	1404	13	15.681	0.18	25.93	0.40	0.29
1995	206	1404	14	15.451	0.20	26.16	0.17	0.12
1995	206	1404	15	15.204	0.22	26.25	0.08	0.06
1995	206	1404	16	15.007	0.23	26.06	0.27	0.20
1995	206	1404	17	14.941	0.25	25.99	0.34	0.25
1995	206	1404	18	14.985	0.27	26.04	0.30	0.22
1995	206	1404	19	15.126	0.28	26.18	0.15	0.11
1995	206	1404	21	15.422	0.32	26.19	0.14	0.10
1995	206	1404	22	15.5	0.33	26.11	0.22	0.16
1995	206	1404	23	15.494	0.35	26.12	0.21	0.16
1995	206	1404	24	15.417	0.37	26.19	0.14	0.10
1995	206	1404	27	15.147	0.42	26.20	0.13	0.10
1995	206	1404	28	15.136	0.43	26.19	0.14	0.11
1995	206	1404	29	15.17	0.45	26.22	0.11	0.08
1995	206	1404	30	15.237	0.47	26.29	0.04	0.03

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1404	31	15.305	0.48	26.31	0.02	0.02
1995	206	1404	32	15.356	0.50	26.25	0.08	0.06
1995	206	1404	33	15.372	0.52	26.24	0.09	0.07
1995	206	1404	34	15.358	0.53	26.25	0.08	0.06
1995	206	1404	35	15.317	0.55	26.29	0.04	0.03
1995	206	1404	36	15.272	0.57	26.32	0.01	0.01
1995	206	1404	37	15.235	0.58	26.29	0.05	0.03
1995	206	1404	38	15.215	0.60	26.27	0.06	0.05
1995	206	1404	39	15.219	0.62	26.27	0.06	0.04
1995	206	1404	40	15.239	0.63	26.29	0.04	0.03
1995	206	1404	41	15.269	0.65	26.32	0.01	0.01
1995	206	1404	42	15.298	0.67	26.31	0.02	0.01
1995	206	1404	43	15.314	0.68	26.30	0.03	0.02
1995	206	1404	44	15.318	0.70	26.29	0.04	0.03
1995	206	1404	45	15.305	0.72	26.31	0.02	0.02
1995	206	1404	46	15.285	0.73	26.33	0.01	0.00

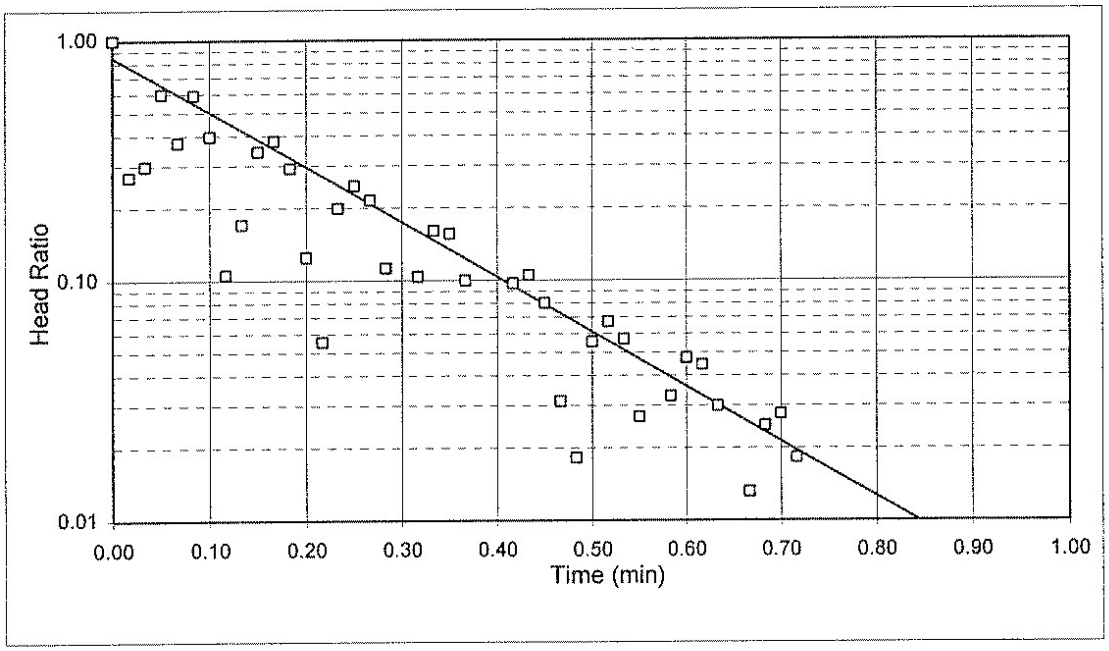
HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AD (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

85

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.43			
L_e =	19.6	K=	1.81E-03	cm/sec
t_1 (min) =	0	K=	5.14E+00	ft/day
t_2 (min) =	0.84			
h_1/h_0 =	0.85			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AD (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

85

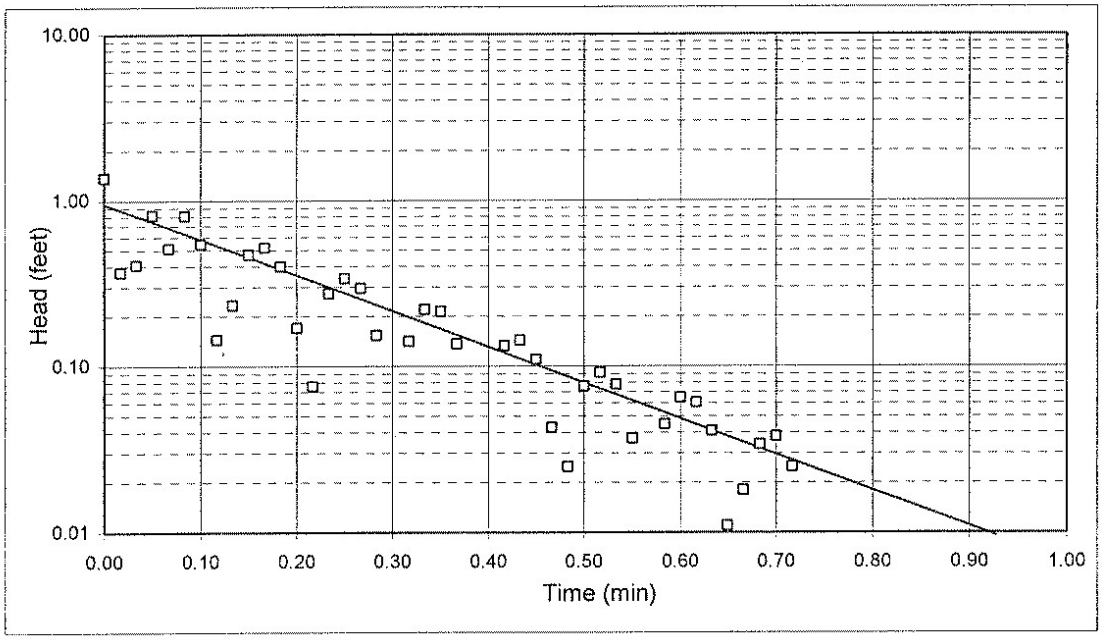
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.43
L_e =	19.6
$\ln(R_e/r_w)$	3.35
y_0 =	0.95
y_t =	0.01
t =	0.93

RESULTS

K=	1.49E-03	cm/sec
K=	4.24E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-113-AD (TEST 2)

WELL NO.	PZ-113-AD (TEST 2)	
DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	15.28	FEET H_2O
INITIAL DEPTH TO WATER	26.33	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	90.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	110.3	FEET (btoc)
SATURATED THICKNESS	80	FEET
WATER TABLE TO BOTTOM OF SCREEN	83.97	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	19.6	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.20	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	1407	5	16.477	0.00	25.13	1.20	1.00
305	206	1407	6	16.289	0.02	25.32	1.01	0.84
305	206	1407	7	15.788	0.03	25.82	0.51	0.42
305	206	1407	8	15.155	0.05	26.21	0.13	0.10
305	206	1407	9	14.646	0.07	25.70	0.63	0.53
305	206	1407	10	14.418	0.08	25.47	0.86	0.72
305	206	1407	11	14.524	0.10	25.57	0.76	0.63
305	206	1407	12	14.877	0.12	25.93	0.40	0.34
305	206	1407	13	15.313	0.13	26.30	0.03	0.03
305	206	1407	14	15.668	0.15	25.94	0.39	0.32
305	206	1407	15	15.832	0.17	25.78	0.55	0.46
305	206	1407	16	15.777	0.18	25.83	0.50	0.42
305	206	1407	17	15.553	0.20	26.06	0.27	0.23
305	206	1407	18	15.25	0.22	26.30	0.03	0.03
305	206	1407	19	14.993	0.23	26.04	0.29	0.24
305	206	1407	20	14.86	0.25	25.91	0.42	0.35
305	206	1407	21	14.884	0.27	25.93	0.40	0.33
305	206	1407	22	15.032	0.28	26.08	0.25	0.21
305	206	1407	23	15.241	0.30	26.29	0.04	0.03
305	206	1407	24	15.427	0.32	26.18	0.15	0.12
305	206	1407	25	15.531	0.33	26.08	0.25	0.21
305	206	1407	26	15.526	0.35	26.08	0.25	0.21
305	206	1407	27	15.43	0.37	26.18	0.15	0.13
305	206	1407	28	15.287	0.38	26.32	0.01	0.01
305	206	1407	29	15.152	0.40	26.20	0.13	0.11
305	206	1407	30	15.073	0.42	26.12	0.21	0.17

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	1407	31	15.065	0.43	26.12	0.22	0.18
305	206	1407	32	15.126	0.45	26.18	0.15	0.13
305	206	1407	33	15.226	0.47	26.28	0.05	0.05
305	206	1407	34	15.324	0.48	26.29	0.04	0.04
305	206	1407	35	15.379	0.50	26.23	0.10	0.08
305	206	1407	36	15.386	0.52	26.22	0.11	0.09
305	206	1407	37	15.346	0.53	26.26	0.07	0.06

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AD (TEST 2)

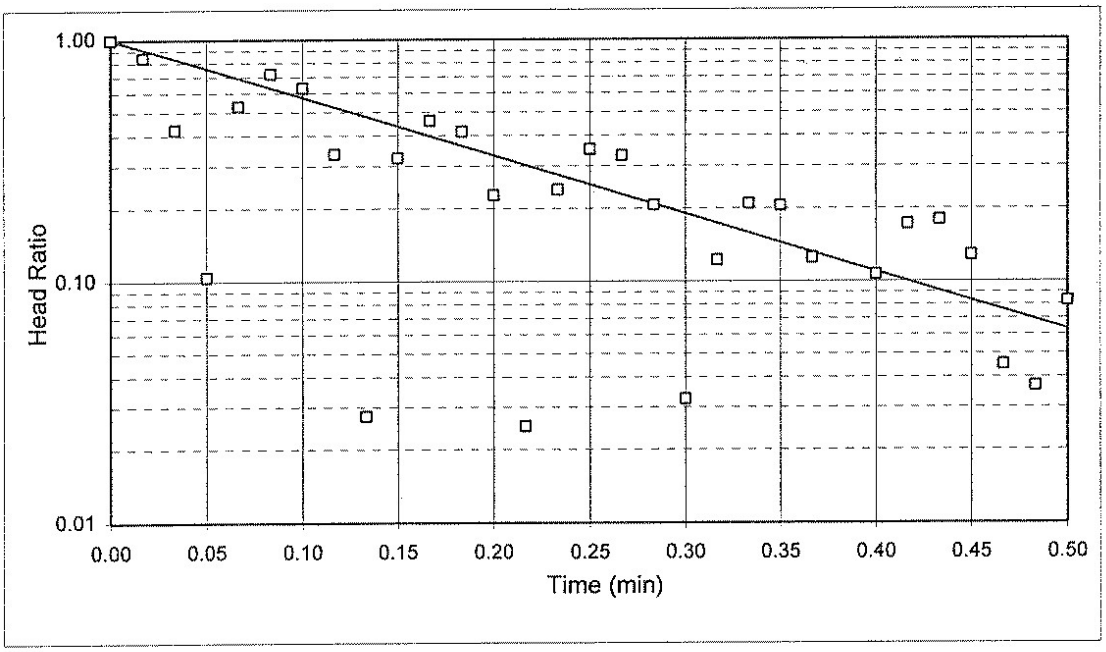
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.43
L_e =	19.6
t_1 (min) =	0
t_2 (min) =	0.50
h_1/h_0 =	1.00
h_2/h_0 =	0.06

RESULTS

K=	1.90E-03	cm/sec
K=	5.39E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AD (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

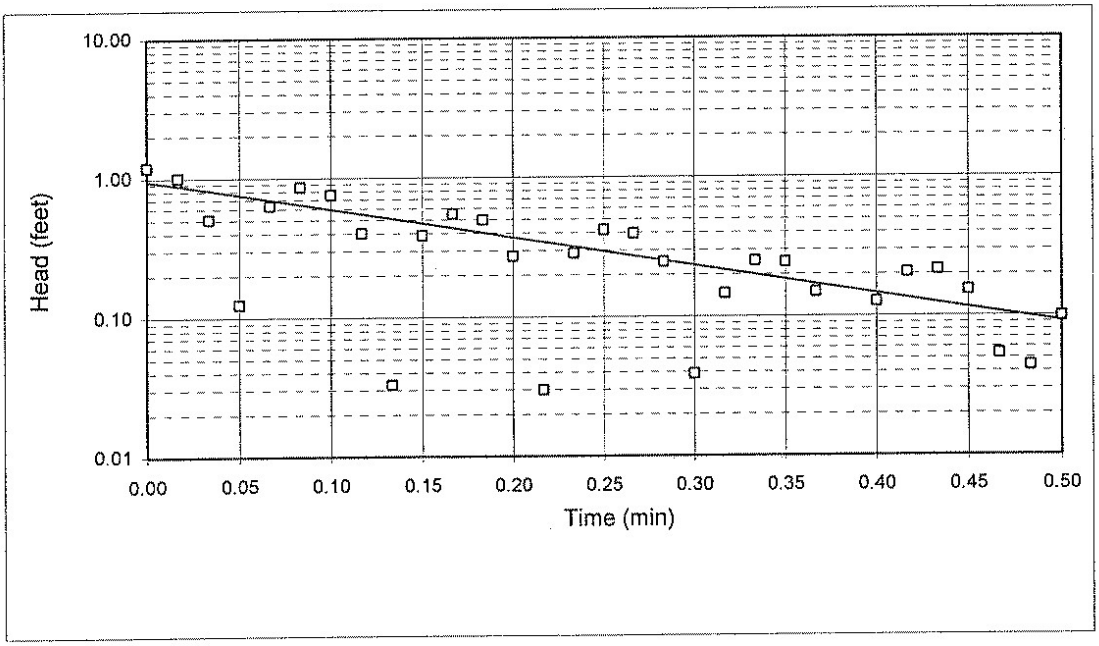
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.43
L_e =	19.6
$\ln(R_e/r_w)$	#N/A
y_0 =	0.95
y_t =	0.09
t =	0.50

RESULTS

K=	#N/A	cm/sec
K=	#N/A	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-113-SS

WELL NO. PZ-113-SS

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	15.008	FEET H_2O
INITIAL DEPTH TO WATER	26.61	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	146.3	FEET (btoc)
BOTTOM OF OPEN INTERVAL	160.8	FEET (btoc)
SATURATED THICKNESS	190	FEET
WATER TABLE TO BOTTOM OF SCREEN	134.19	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.83	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1117	35	18.834	0.00	22.78	3.83	1.00
1995	206	1117	37	18.248	0.03	23.37	3.24	0.85
1995	206	1117	39	18.23	0.07	23.39	3.22	0.84
1995	206	1117	41	18.226	0.10	23.39	3.22	0.84
1995	206	1117	43	18.225	0.13	23.39	3.22	0.84
1995	206	1117	45	18.226	0.17	23.39	3.22	0.84
1995	206	1117	47	18.228	0.20	23.39	3.22	0.84
1995	206	1117	49	18.224	0.23	23.39	3.22	0.84
1995	206	1117	51	18.223	0.27	23.40	3.22	0.84
1995	206	1117	53	18.224	0.30	23.39	3.22	0.84
1995	206	1117	55	18.225	0.33	23.39	3.22	0.84
1995	206	1117	57	18.224	0.37	23.39	3.22	0.84
1995	206	1117	59	18.224	0.40	23.39	3.22	0.84
1995	206	1118	1	18.223	0.43	23.40	3.22	0.84
1995	206	1118	3	18.224	0.47	23.39	3.22	0.84
1995	206	1118	5	18.224	0.50	23.39	3.22	0.84
1995	206	1118	8	18.223	0.55	23.40	3.22	0.84
1995	206	1118	10	18.222	0.58	23.40	3.21	0.84
1995	206	1118	12	18.223	0.62	23.40	3.22	0.84
1995	206	1118	14	18.223	0.65	23.40	3.22	0.84
1995	206	1118	16	18.224	0.68	23.39	3.22	0.84
1995	206	1118	18	18.222	0.72	23.40	3.21	0.84
1995	206	1118	20	18.222	0.75	23.40	3.21	0.84
1995	206	1118	22	18.222	0.78	23.40	3.21	0.84
1995	206	1118	24	18.221	0.82	23.40	3.21	0.84
1995	206	1118	26	18.222	0.85	23.40	3.21	0.84
1995	206	1118	28	18.221	0.88	23.40	3.21	0.84
1995	206	1118	30	18.219	0.92	23.40	3.21	0.84
1995	206	1118	32	18.221	0.95	23.40	3.21	0.84
1995	206	1118	34	18.22	0.98	23.40	3.21	0.84
1995	206	1118	36	18.221	1.02	23.40	3.21	0.84
1995	206	1118	38	18.219	1.05	23.40	3.21	0.84
1995	206	1118	40	18.218	1.08	23.40	3.21	0.84
1995	206	1118	42	18.219	1.12	23.40	3.21	0.84

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1118	44	18.22	1.15	23.40	3.21	0.84
1995	206	1118	46	18.218	1.18	23.40	3.21	0.84
1995	206	1118	48	18.219	1.22	23.40	3.21	0.84
1995	206	1118	50	18.216	1.25	23.40	3.21	0.84
1995	206	1118	52	18.219	1.28	23.40	3.21	0.84
1995	206	1118	54	18.219	1.32	23.40	3.21	0.84
1995	206	1118	56	18.222	1.35	23.40	3.21	0.84
1995	206	1118	58	18.219	1.38	23.40	3.21	0.84
1995	206	1119	0	18.217	1.42	23.40	3.21	0.84
1995	206	1119	10	18.215	1.58	23.40	3.21	0.84
1995	206	1119	20	18.213	1.75	23.41	3.21	0.84
1995	206	1119	30	18.211	1.92	23.41	3.20	0.84
1995	206	1119	40	18.21	2.08	23.41	3.20	0.84
1995	206	1119	50	18.205	2.25	23.41	3.20	0.84
1995	206	1120	0	18.202	2.42	23.42	3.19	0.83
1995	206	1120	10	18.202	2.58	23.42	3.19	0.83
1995	206	1120	20	18.197	2.75	23.42	3.19	0.83
1995	206	1120	30	18.196	2.92	23.42	3.19	0.83
1995	206	1120	40	18.189	3.08	23.43	3.18	0.83
1995	206	1120	50	18.184	3.25	23.43	3.18	0.83
1995	206	1121	0	18.184	3.42	23.43	3.18	0.83
1995	206	1121	10	18.181	3.58	23.44	3.17	0.83
1995	206	1121	20	18.173	3.75	23.45	3.17	0.83
1995	206	1121	30	18.168	3.92	23.45	3.16	0.83
1995	206	1122	0	18.159	4.42	23.46	3.15	0.82
1995	206	1123	0	18.127	5.42	23.49	3.12	0.82
1995	206	1124	0	18.092	6.42	23.53	3.08	0.81
1995	206	1125	0	18.055	7.42	23.56	3.05	0.80
1995	206	1126	0	18.046	8.42	23.57	3.04	0.79
1995	206	1127	0	18.011	9.42	23.61	3.00	0.78
1995	206	1128	0	17.981	10.42	23.64	2.97	0.78
1995	206	1129	0	17.946	11.42	23.67	2.94	0.77
1995	206	1130	0	17.913	12.42	23.71	2.91	0.76
1995	206	1131	0	17.884	13.42	23.73	2.88	0.75
1995	206	1132	0	17.848	14.42	23.77	2.84	0.74
1995	206	1133	0	17.817	15.42	23.80	2.81	0.73
1995	206	1134	0	17.786	16.42	23.83	2.78	0.73
1995	206	1135	0	17.754	17.42	23.86	2.75	0.72
1995	206	1136	0	17.725	18.42	23.89	2.72	0.71
1995	206	1137	0	17.695	19.42	23.92	2.69	0.70
1995	206	1138	0	17.66	20.42	23.96	2.65	0.69
1995	206	1139	0	17.634	21.42	23.98	2.63	0.69
1995	206	1140	0	17.603	22.42	24.02	2.60	0.68
1995	206	1141	0	17.574	23.42	24.04	2.57	0.67
1995	206	1142	0	17.546	24.42	24.07	2.54	0.66
1995	206	1143	0	17.515	25.42	24.10	2.51	0.66
1995	206	1144	0	17.488	26.42	24.13	2.48	0.65
1995	206	1145	0	17.462	27.42	24.16	2.45	0.64
1995	206	1146	0	17.433	28.42	24.19	2.43	0.63
1995	206	1147	0	17.406	29.42	24.21	2.40	0.63
1995	206	1148	0	17.378	30.42	24.24	2.37	0.62
1995	206	1149	0	17.35	31.42	24.27	2.34	0.61
1995	206	1150	0	17.322	32.42	24.30	2.31	0.60

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1151	0	17.298	33.42	24.32	2.29	0.60
1995	206	1152	0	17.273	34.42	24.35	2.27	0.59
1995	206	1153	0	17.244	35.42	24.37	2.24	0.58
1995	206	1154	0	17.217	36.42	24.40	2.21	0.58
1995	206	1155	0	17.194	37.42	24.42	2.19	0.57
1995	206	1156	0	17.168	38.42	24.45	2.16	0.56
1995	206	1157	0	17.144	39.42	24.47	2.14	0.56
1995	206	1158	0	17.123	40.42	24.50	2.12	0.55
1995	206	1159	0	17.099	41.42	24.52	2.09	0.55
1995	206	1200	0	17.074	42.42	24.54	2.07	0.54
1995	206	1201	0	17.052	43.42	24.57	2.04	0.53
1995	206	1202	0	17.031	44.42	24.59	2.02	0.53
1995	206	1203	0	17.008	45.42	24.61	2.00	0.52
1995	206	1204	0	16.987	46.42	24.63	1.98	0.52
1995	206	1205	0	16.965	47.42	24.65	1.96	0.51
1995	206	1206	0	16.943	48.42	24.68	1.94	0.51
1995	206	1207	0	16.922	49.42	24.70	1.91	0.50
1995	206	1208	0	16.898	50.42	24.72	1.89	0.49
1995	206	1209	0	16.879	51.42	24.74	1.87	0.49
1995	206	1210	0	16.86	52.42	24.76	1.85	0.48
1995	206	1211	0	16.841	53.42	24.78	1.83	0.48
1995	206	1212	0	16.82	54.42	24.80	1.81	0.47
1995	206	1213	0	16.8	55.42	24.82	1.79	0.47
1995	206	1214	0	16.781	56.42	24.84	1.77	0.46
1995	206	1215	0	16.764	57.42	24.85	1.76	0.46
1995	206	1216	0	16.745	58.42	24.87	1.74	0.45
1995	206	1217	0	16.726	59.42	24.89	1.72	0.45
1995	206	1218	0	16.709	60.42	24.91	1.70	0.44
1995	206	1219	0	16.691	61.42	24.93	1.68	0.44
1995	206	1220	0	16.672	62.42	24.95	1.66	0.43
1995	206	1221	0	16.654	63.42	24.96	1.65	0.43
1995	206	1222	0	16.634	64.42	24.98	1.63	0.42
1995	206	1223	0	16.617	65.42	25.00	1.61	0.42
1995	206	1224	0	16.599	66.42	25.02	1.59	0.42
1995	206	1225	0	16.584	67.42	25.03	1.58	0.41
1995	206	1226	0	16.569	68.42	25.05	1.56	0.41
1995	206	1227	0	16.551	69.42	25.07	1.54	0.40
1995	206	1228	0	16.537	70.42	25.08	1.53	0.40
1995	206	1229	0	16.517	71.42	25.10	1.51	0.39
1995	206	1230	0	16.504	72.42	25.11	1.50	0.39
1995	206	1231	0	16.487	73.42	25.13	1.48	0.39
1995	206	1232	0	16.47	74.42	25.15	1.46	0.38
1995	206	1233	0	16.453	75.42	25.17	1.45	0.38
1995	206	1234	0	16.437	76.42	25.18	1.43	0.37
1995	206	1235	0	16.425	77.42	25.19	1.42	0.37
1995	206	1236	0	16.411	78.42	25.21	1.40	0.37
1995	206	1237	0	16.397	79.42	25.22	1.39	0.36
1995	206	1238	0	16.38	80.42	25.24	1.37	0.36
1995	206	1239	0	16.367	81.42	25.25	1.36	0.36
1995	206	1240	0	16.352	82.42	25.27	1.34	0.35
1995	206	1241	0	16.338	83.42	25.28	1.33	0.35
1995	206	1242	0	16.325	84.42	25.29	1.32	0.34
1995	206	1243	0	16.313	85.42	25.31	1.31	0.34

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1244	0	16.298	86.42	25.32	1.29	0.34
1995	206	1245	0	16.285	87.42	25.33	1.28	0.33
1995	206	1246	0	16.27	88.42	25.35	1.26	0.33
1995	206	1247	0	16.257	89.42	25.36	1.25	0.33
1995	206	1248	0	16.246	90.42	25.37	1.24	0.32
1995	206	1249	0	16.234	91.42	25.38	1.23	0.32
1995	206	1250	0	16.222	92.42	25.40	1.21	0.32
1995	206	1251	0	16.206	93.42	25.41	1.20	0.31
1995	206	1252	0	16.193	94.42	25.43	1.19	0.31
1995	206	1253	0	16.179	95.42	25.44	1.17	0.31
1995	206	1254	0	16.166	96.42	25.45	1.16	0.30
1995	206	1255	0	16.152	97.42	25.47	1.14	0.30
1995	206	1256	0	16.137	98.42	25.48	1.13	0.30
1995	206	1257	0	16.129	99.42	25.49	1.12	0.29
1995	206	1258	0	16.117	100.42	25.50	1.11	0.29
1995	206	1259	0	16.106	101.42	25.51	1.10	0.29
1995	206	1300	0	16.095	102.42	25.52	1.09	0.28
1995	206	1301	0	16.083	103.42	25.54	1.08	0.28
1995	206	1302	0	16.071	104.42	25.55	1.06	0.28
1995	206	1303	0	16.06	105.42	25.56	1.05	0.27
1995	206	1304	0	16.051	106.42	25.57	1.04	0.27
1995	206	1305	0	16.036	107.42	25.58	1.03	0.27
1995	206	1306	0	16.028	108.42	25.59	1.02	0.27
1995	206	1307	0	16.02	109.42	25.60	1.01	0.26
1995	206	1308	0	16.007	110.42	25.61	1.00	0.26
1995	206	1309	0	15.995	111.42	25.62	0.99	0.26
1995	206	1310	0	15.983	112.42	25.64	0.98	0.25
1995	206	1311	0	15.975	113.42	25.64	0.97	0.25
1995	206	1312	0	15.964	114.42	25.65	0.96	0.25
1995	206	1313	0	15.955	115.42	25.66	0.95	0.25
1995	206	1314	0	15.946	116.42	25.67	0.94	0.25
1995	206	1315	0	15.936	117.42	25.68	0.93	0.24
1995	206	1316	0	15.925	118.42	25.69	0.92	0.24
1995	206	1317	0	15.917	119.42	25.70	0.91	0.24
1995	206	1318	0	15.905	120.42	25.71	0.90	0.23
1995	206	1319	0	15.896	121.42	25.72	0.89	0.23
1995	206	1320	0	15.886	122.42	25.73	0.88	0.23
1995	206	1321	0	15.878	123.42	25.74	0.87	0.23
1995	206	1322	0	15.87	124.42	25.75	0.86	0.23

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-SS

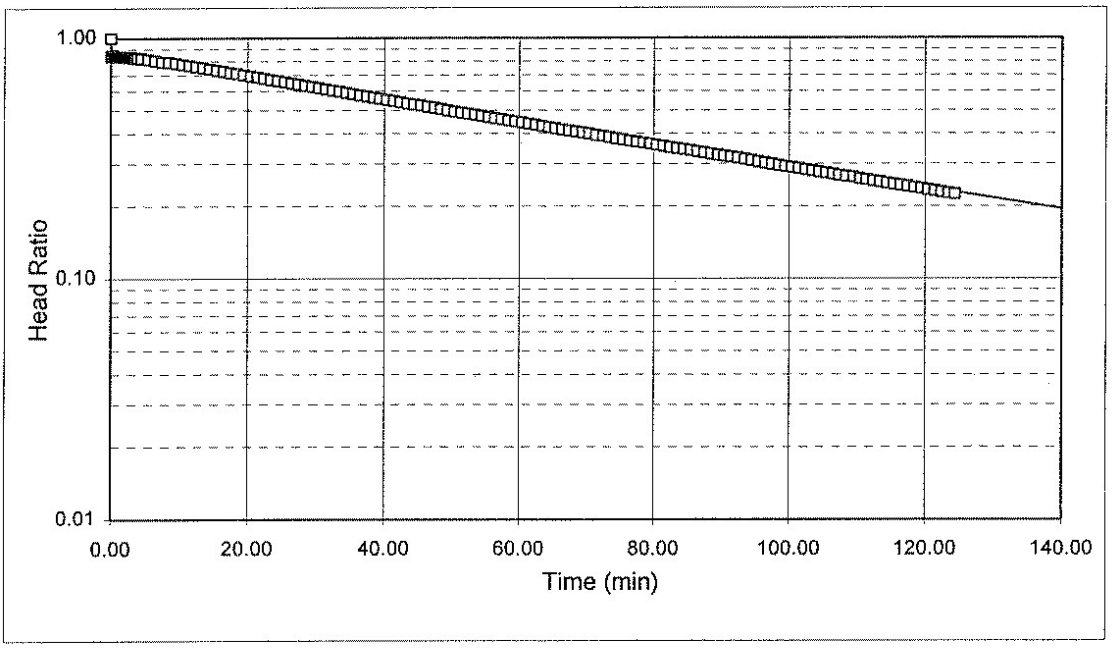
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14.5
t_1 (min) =	9.42
t_2 (min) =	140.00
h_1/h_0 =	0.78
h_2/h_0 =	0.19

RESULTS

K=	5.24E-06	cm/sec
K=	1.49E-02	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

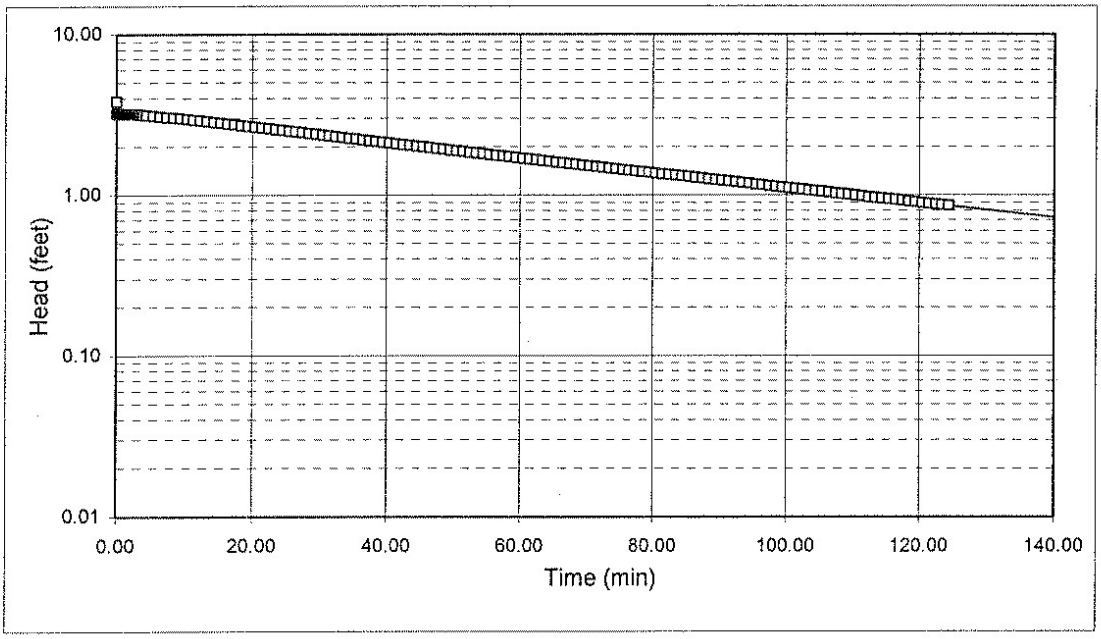
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	14.5
$\ln(R_e/r_w)$	3.80
y_0 =	3.16
y_t =	0.72
t =	140.00

RESULTS

K=	4.86E-06	cm/sec
K=	1.38E-02	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

FALLING HEAD TEST PZ-114-AS (TEST 1)

WELL NO. PZ-114-AS (TEST 1)

DATE		
INITAL HEAD ON TRANSDUCER	10.02	FEET H_2O
INITIAL DEPTH TO WATER	12.07	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	18.3	FEET (btoc)
BOTTOM OF OPEN INTERVAL	32.0	FEET (btoc)
SATURATED THICKNESS	40	FEET
WATER TABLE TO BOTTOM OF SCREEN	19.9	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	13.7	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	5.20	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	172	940	16	15.217	0.00	6.87	5.20	1.000
1995	172	940	18	11.364	0.03	10.73	1.34	0.259
1995	172	940	20	10.974	0.07	11.12	0.95	0.184
1995	172	940	22	10.832	0.10	11.26	0.81	0.156
1995	172	940	24	10.658	0.13	11.43	0.64	0.123
1995	172	940	26	10.519	0.17	11.57	0.50	0.096
1995	172	940	28	10.421	0.20	11.67	0.40	0.077
1995	172	940	30	10.343	0.23	11.75	0.32	0.062
1995	172	940	32	10.283	0.27	11.81	0.26	0.051
1995	172	940	34	10.235	0.30	11.86	0.22	0.041
1995	172	940	36	10.203	0.33	11.89	0.18	0.035
1995	172	940	38	10.173	0.37	11.92	0.15	0.029
1995	172	940	40	10.153	0.40	11.94	0.13	0.026
1995	172	940	42	10.128	0.43	11.96	0.11	0.021
1995	172	940	44	10.116	0.47	11.97	0.10	0.018
1995	172	940	46	10.102	0.50	11.99	0.08	0.016
1995	172	940	48	10.09	0.53	12.00	0.07	0.013
1995	172	940	50	10.087	0.57	12.00	0.07	0.013
1995	172	940	52	10.072	0.60	12.02	0.05	0.010
1995	172	940	54	10.066	0.63	12.02	0.05	0.009
1995	172	940	56	10.061	0.67	12.03	0.04	0.008
1995	172	940	58	10.058	0.70	12.03	0.04	0.007
1995	172	941	0	10.056	0.73	12.03	0.04	0.007
1995	172	941	2	10.058	0.77	12.03	0.04	0.007
1995	172	941	4	10.049	0.80	12.04	0.03	0.006

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-114-AS (TEST 1)

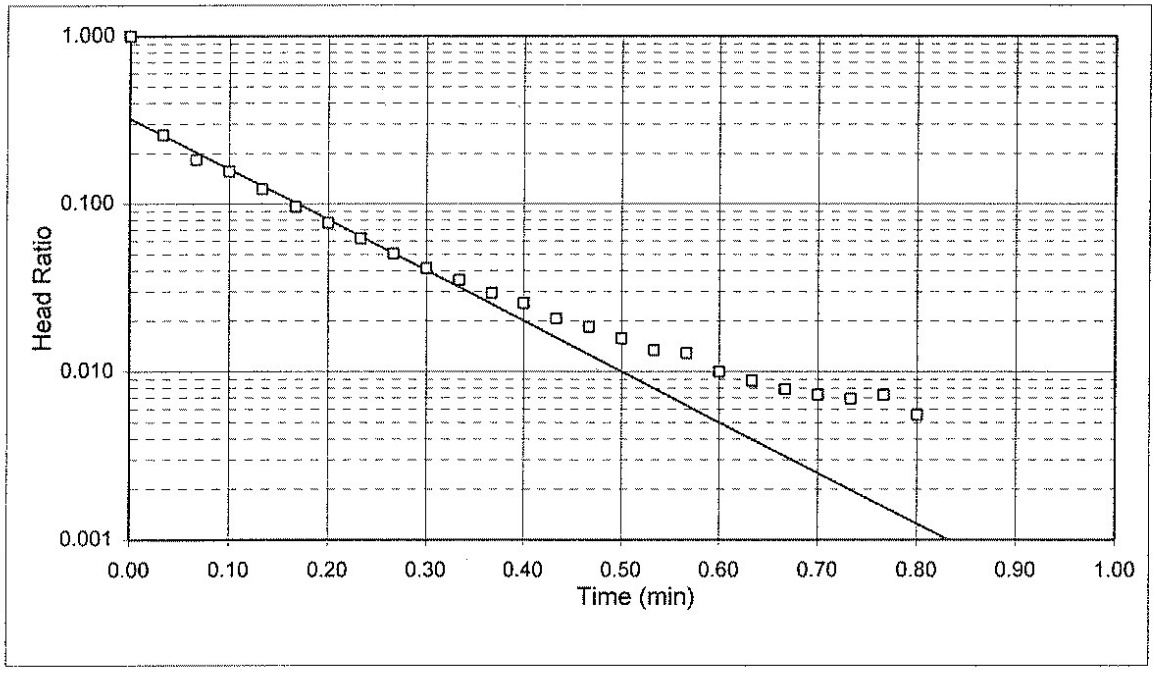
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.43
L_e =	13.7
t_1 (min) =	0
t_2 (min) =	0.83
h_1/h_0 =	0.32
h_2/h_0 =	0.00

RESULTS

K=	3.10E-03	cm/sec
K=	8.79E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

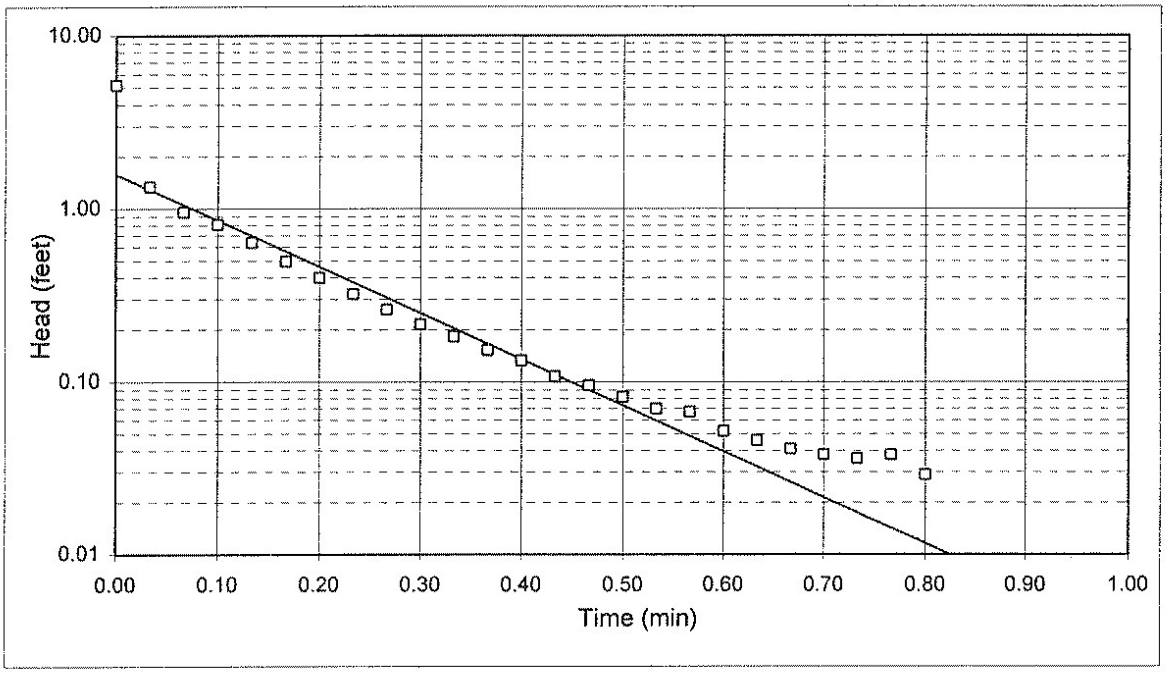
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-114-AS (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.43			
L_e =	13.7	K=	1.69E-03	cm/sec
$\ln(R_e/r_w)$	2.14	K=	4.79E+00	ft/day
y_0 =	1.58			
y_t =	0.01			
t =	0.82			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-114-AS (TEST 2)

WELL NO.	PZ-114-AS (TEST 2)	
DATE	6/21/95	
INITAL HEAD ON TRANSDUCER	10.02	FEET H_2O
INITIAL DEPTH TO WATER	12.07	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	18.3	FEET (btoc)
BOTTOM OF OPEN INTERVAL	32.0	FEET (btoc)
SATURATED THICKNESS	40	FEET
WATER TABLE TO BOTTOM OF SCREEN	19.9	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	13.7	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	5.07	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	172	944	8	15.094	0.00	7.00	5.07	1.000
1995	172	944	12	11.099	0.07	10.99	1.08	0.213
1995	172	944	14	10.84	0.10	11.25	0.82	0.162
1995	172	944	16	10.643	0.13	11.45	0.62	0.123
1995	172	944	18	10.486	0.17	11.60	0.47	0.092
1995	172	944	20	10.373	0.20	11.72	0.35	0.070
1995	172	944	22	10.286	0.23	11.80	0.27	0.052
1995	172	944	24	10.22	0.27	11.87	0.20	0.039
1995	172	944	26	10.165	0.30	11.93	0.15	0.029
1995	172	944	28	10.12	0.33	11.97	0.10	0.020
1995	172	944	30	10.092	0.37	12.00	0.07	0.014
1995	172	944	32	10.061	0.40	12.03	0.04	0.008

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-114-AS (TEST 2)

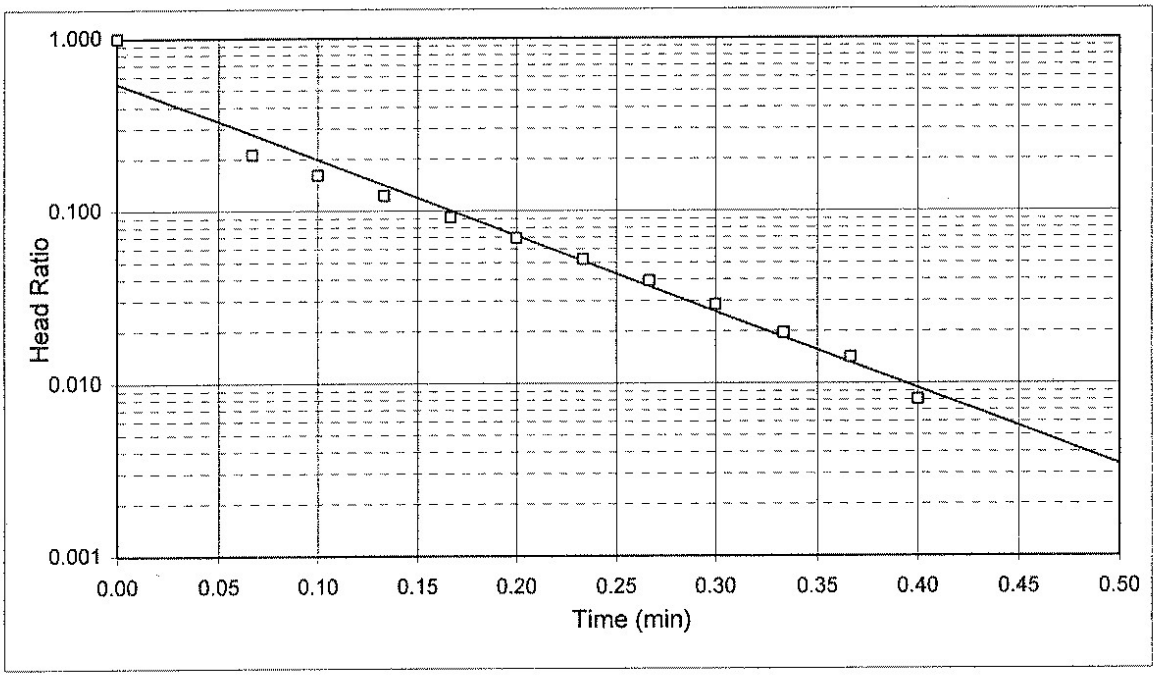
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.43
L_e =	13.7
t_1 (min) =	0
t_2 (min) =	0.50
h_1/h_0 =	0.55
h_2/h_0 =	0.00

RESULTS

K=	4.54E-03	cm/sec
K=	1.29E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-114-AS (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

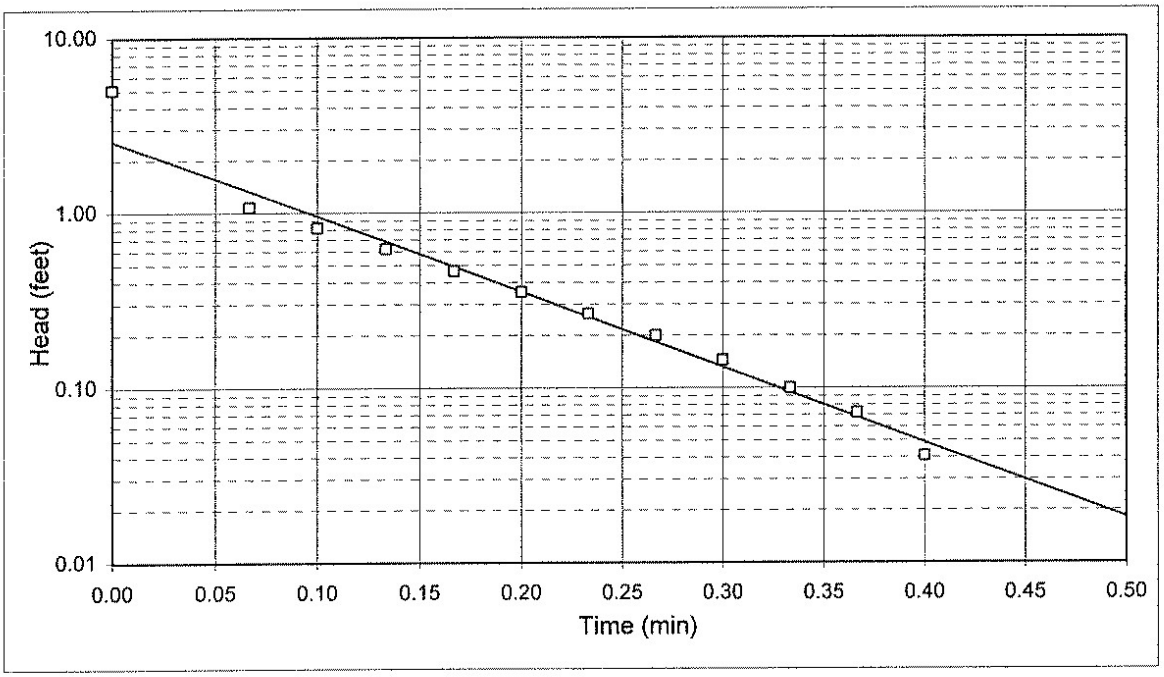
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.43
L_e =	13.7
$\ln(R_e/r_w)$	2.14
y_0 =	2.57
y_t =	0.02
t =	0.50

RESULTS

K=	2.72E-03	cm/sec
K=	7.72E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-115-SS

WELL NO. PZ-115-SS

DATE	6/22/95	
INITAL HEAD ON TRANSDUCER	14.99	FEET H_2O
INITIAL DEPTH TO WATER	25.14	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	72.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	86.7	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	61.56	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.72	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	173	852	30	18.706	0.00	21.42	3.72	1.00
1995	173	852	40	18.191	0.17	21.94	3.20	0.86
1995	173	853	20	17.883	0.83	22.25	2.89	0.78
1995	173	853	30	17.836	1.00	22.29	2.85	0.77
1995	173	853	40	17.797	1.17	22.33	2.81	0.76
1995	173	853	50	17.759	1.33	22.37	2.77	0.75
1995	173	854	0	17.726	1.50	22.40	2.74	0.74
1995	173	854	10	17.689	1.67	22.44	2.70	0.73
1995	173	854	20	17.654	1.83	22.48	2.66	0.72
1995	173	854	30	17.623	2.00	22.51	2.63	0.71
1995	173	854	40	17.592	2.17	22.54	2.60	0.70
1995	173	854	50	17.562	2.33	22.57	2.57	0.69
1995	173	855	0	17.532	2.50	22.60	2.54	0.68
1995	173	855	10	17.499	2.67	22.63	2.51	0.68
1995	173	855	20	17.469	2.83	22.66	2.48	0.67
1995	173	855	30	17.442	3.00	22.69	2.45	0.66
1995	173	855	40	17.415	3.17	22.72	2.43	0.65
1995	173	855	50	17.388	3.33	22.74	2.40	0.65
1995	173	856	0	17.364	3.50	22.77	2.37	0.64
1995	173	856	10	17.336	3.67	22.79	2.35	0.63
1995	173	856	30	17.283	4.00	22.85	2.29	0.62
1995	173	857	0	17.21	4.50	22.92	2.22	0.60
1995	173	857	30	17.133	5.00	23.00	2.14	0.58
1995	173	858	0	17.068	5.50	23.06	2.08	0.56
1995	173	858	30	17.002	6.00	23.13	2.01	0.54
1995	173	859	0	16.942	6.50	23.19	1.95	0.53
1995	173	859	30	16.885	7.00	23.25	1.90	0.51

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	173	900	0	16.831	7.50	23.30	1.84	0.50
1995	173	900	30	16.778	8.00	23.35	1.79	0.48
1995	173	901	0	16.728	8.50	23.40	1.74	0.47
1995	173	901	30	16.68	9.00	23.45	1.69	0.45
1995	173	902	0	16.632	9.50	23.50	1.64	0.44
1995	173	902	30	16.589	10.00	23.54	1.60	0.43
1995	173	903	0	16.547	10.50	23.58	1.56	0.42
1995	173	903	30	16.507	11.00	23.62	1.52	0.41
1995	173	904	0	16.468	11.50	23.66	1.48	0.40
1995	173	905	0	16.392	12.50	23.74	1.40	0.38
1995	173	910	0	16.1	17.50	24.03	1.11	0.30
1995	173	915	0	15.903	22.50	24.23	0.91	0.25
1995	173	920	0	15.772	27.50	24.36	0.78	0.21
1995	173	925	0	15.683	32.50	24.45	0.69	0.19
1995	173	930	0	15.622	37.50	24.51	0.63	0.17
1995	173	935	0	15.582	42.50	24.55	0.59	0.16
1995	173	940	0	15.55	47.50	24.58	0.56	0.15
1995	173	945	0	15.523	52.50	24.61	0.53	0.14
1995	173	950	0	15.504	57.50	24.63	0.51	0.14
1995	173	955	0	15.491	62.50	24.64	0.50	0.13
1995	173	1000	0	15.475	67.50	24.66	0.48	0.13
1995	173	1005	0	15.463	72.50	24.67	0.47	0.13
1995	173	1010	0	15.452	77.50	24.68	0.46	0.12
1995	173	1015	0	15.441	82.50	24.69	0.45	0.12
1995	173	1020	0	15.433	87.50	24.70	0.44	0.12
1995	173	1025	0	15.422	92.50	24.71	0.43	0.12
1995	173	1030	0	15.412	97.50	24.72	0.42	0.11
1995	173	1035	0	15.407	102.50	24.72	0.42	0.11
1995	173	1040	0	15.399	107.50	24.73	0.41	0.11
1995	173	1045	0	15.392	112.50	24.74	0.40	0.11
1995	173	1050	0	15.386	117.50	24.74	0.40	0.11
1995	173	1055	0	15.379	122.50	24.75	0.39	0.10
1995	173	1100	0	15.37	127.50	24.76	0.38	0.10
1995	173	1105	0	15.366	132.50	24.76	0.38	0.10
1995	173	1110	0	15.359	137.50	24.77	0.37	0.10
1995	173	1115	0	15.354	142.50	24.78	0.36	0.10
1995	173	1120	0	15.346	147.50	24.78	0.36	0.10
1995	173	1125	0	15.339	152.50	24.79	0.35	0.09
1995	173	1130	0	15.336	157.50	24.79	0.35	0.09
1995	173	1135	0	15.331	162.50	24.80	0.34	0.09
1995	173	1140	0	15.327	167.50	24.80	0.34	0.09
1995	173	1145	0	15.32	172.50	24.81	0.33	0.09
1995	173	1150	0	15.314	177.50	24.82	0.32	0.09
1995	173	1155	0	15.31	182.50	24.82	0.32	0.09
1995	173	1200	0	15.305	187.50	24.83	0.31	0.08

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	173	1205	0	15.302	192.50	24.83	0.31	0.08
1995	173	1210	0	15.296	197.50	24.83	0.31	0.08
1995	173	1215	0	15.294	202.50	24.84	0.30	0.08
1995	173	1220	0	15.288	207.50	24.84	0.30	0.08
1995	173	1225	0	15.282	212.50	24.85	0.29	0.08
1995	173	1230	0	15.281	217.50	24.85	0.29	0.08
1995	173	1235	0	15.278	222.50	24.85	0.29	0.08
1995	173	1240	0	15.272	227.50	24.86	0.28	0.08
1995	173	1245	0	15.267	232.50	24.86	0.28	0.07

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-115-SS

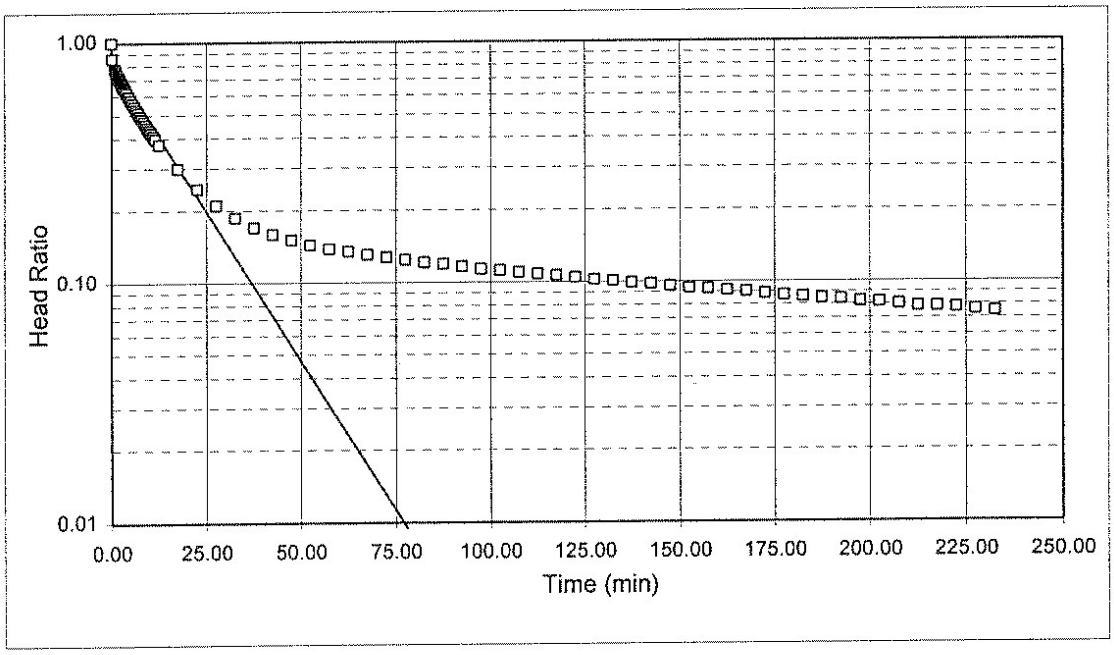
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14
t_1 (min) =	1.17
t_2 (min) =	78.30
h_1/h_0 =	0.78
h_2/h_0 =	0.01

RESULTS

K=	2.91E-05	cm/sec
K=	8.24E-02	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/22/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-115-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

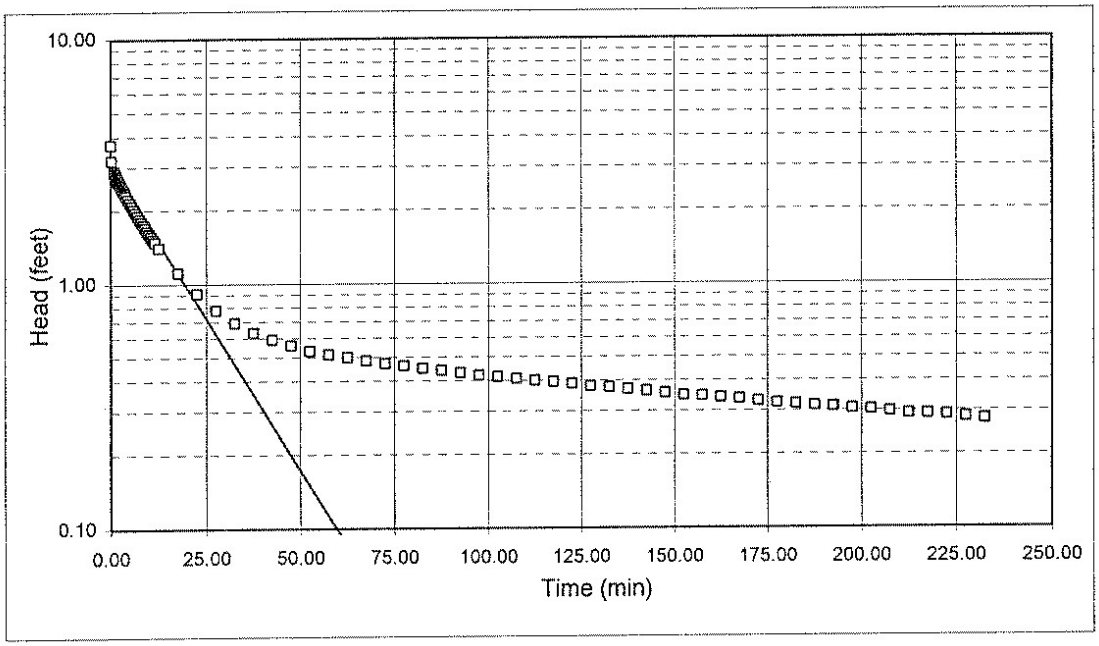
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	14
$\ln(R_e/r_w)$	3.38
y_0 =	2.84
y_t =	0.01
t =	99.20

RESULTS

K=	2.40E-05	cm/sec
K=	6.81E-02	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/22/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

RISING HEAD TEST PZ-116-SS

WELL NO. PZ-116-SS

DATE	7/24/95	
INITIAL DEPTH TO WATER	138.08	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	148.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	163.8	FEET (btoc)
SATURATED THICKNESS	80	FEET
WATER TABLE TO BOTTOM OF SCREEN	25.72	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.93	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1132	30	142.01	0.0	3.93	1.00
1	1135	0	142	2.5	3.92	1.00
1	1140	0	141.99	7.5	3.91	0.99
1	1145	0	141.99	12.5	3.91	0.99
1	1152	30	141.98	20.0	3.90	0.99
1	1440	0	141.82	187.5	3.74	0.95
2	702	0	141.77	1169.5	3.69	0.94
2	1139	0	141.47	1446.5	3.39	0.86
2	1520	0	141.46	1667.5	3.38	0.86
2	1738	0	141.49	1805.5	3.41	0.87
3	1122	0	141.48	2869.5	3.40	0.87
3	1608	0	141.5	3155.5	3.42	0.87
3	658	0	141.45	2605.5	3.37	0.86
3	1342	0	141.44	3009.5	3.36	0.85

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-116-SS

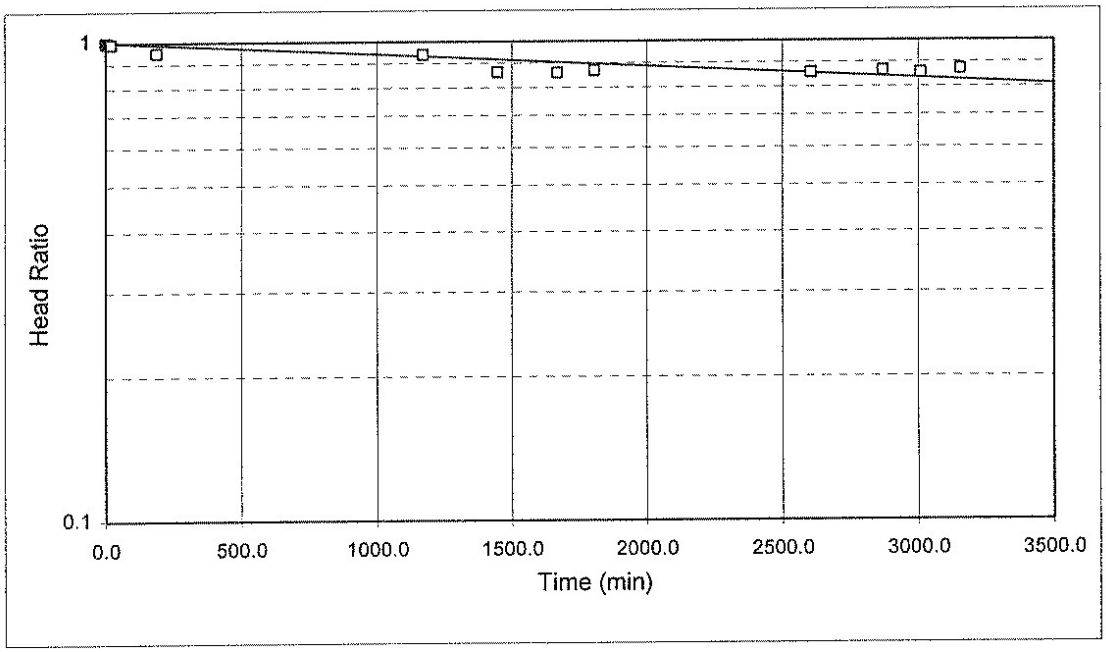
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	15
t_1 (min) =	0
t_2 (min) =	3500
h_1/h_0 =	1.00
h_2/h_0 =	0.81

RESULTS

K=	2.90E-08	cm/sec
K=	8.22E-05	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-116-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

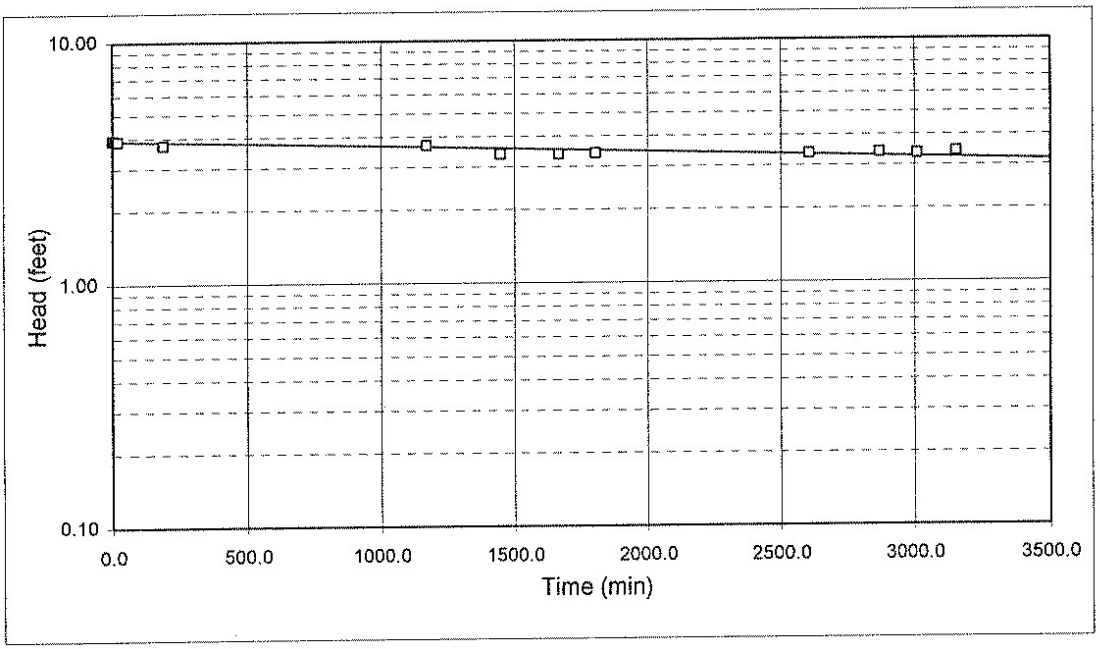
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	15
$\ln(R_e/r_w)$	2.95
y_0 =	3.90
y_t =	3.16
t =	3500.0

RESULTS

K=	1.73E-08	cm/sec
K=	4.91E-05	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

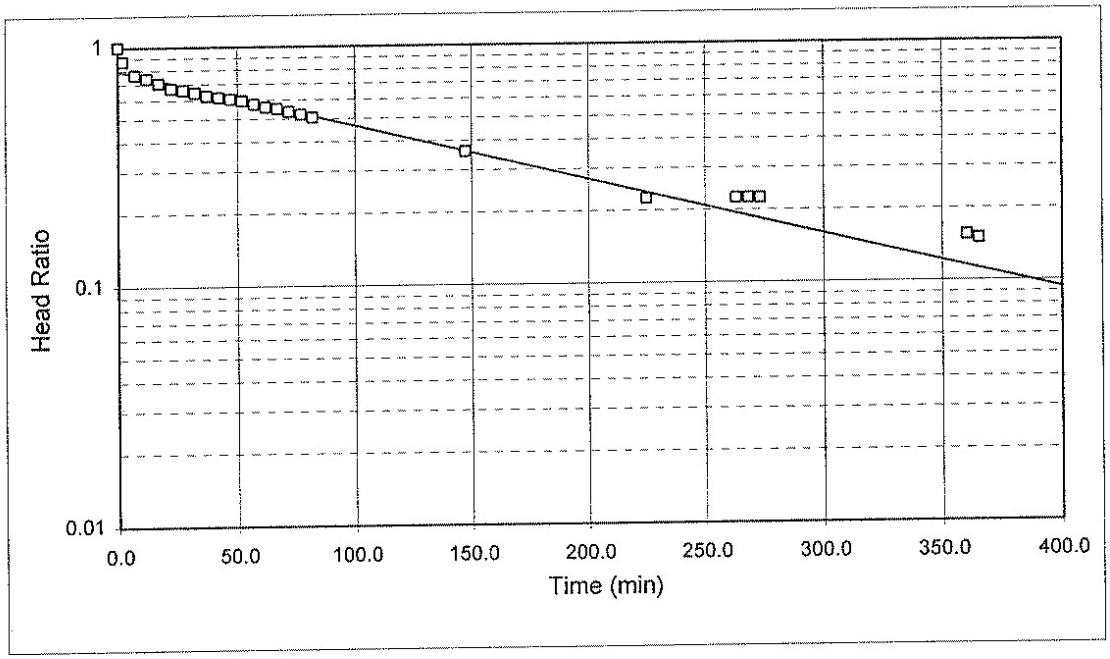
Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-200-SS

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	29.76	K=	1.52E-06	cm/sec
t_1 (min) =	0	K=	4.30E-03	ft/day
t_2 (min) =	400			
h_1/h_0 =	0.79			
h_2/h_0 =	0.09			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

RISING HEAD TEST PZ-201-SS

WELL NO. PZ-201-SS

DATE	7/17/95	
INITIAL DEPTH TO WATER	25.43	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	9.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	91.3	FEET (btoc)
SATURATED THICKNESS	220	FEET
WATER TABLE TO BOTTOM OF SCREEN	65.89	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	65.89	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.40	FEET
MAX. HEAD IN SCREEN?	Y	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1115	0	26.83	0.0	1.40	1.00
1	1116	0	26.29	1.0	0.86	0.61
1	1116	30	26.18	1.5	0.75	0.54
1	1117	0	26.09	2.0	0.66	0.47
1	1117	30	26.01	2.5	0.58	0.41
1	1118	0	25.98	3.0	0.55	0.39
1	1119	30	25.91	4.5	0.48	0.34
1	1119	0	25.87	4.0	0.44	0.31
1	1120	30	25.82	5.5	0.39	0.28
1	1120	0	25.79	5.0	0.36	0.26
1	1121	30	25.75	6.5	0.32	0.23
1	1122	0	25.69	7.0	0.26	0.19
1	1122	30	25.67	7.5	0.24	0.17
1	1123	0	25.65	8.0	0.22	0.16
1	1123	30	25.63	8.5	0.20	0.14
1	1124	0	25.6	9.0	0.17	0.12
1	1124	30	25.59	9.5	0.16	0.11
1	1125	0	25.58	10.0	0.15	0.11
1	1125	30	25.56	10.5	0.13	0.09
1	1126	0	25.54	11.0	0.11	0.08
1	1126	30	25.51	11.5	0.08	0.06
1	1127	0	25.51	12.0	0.08	0.06

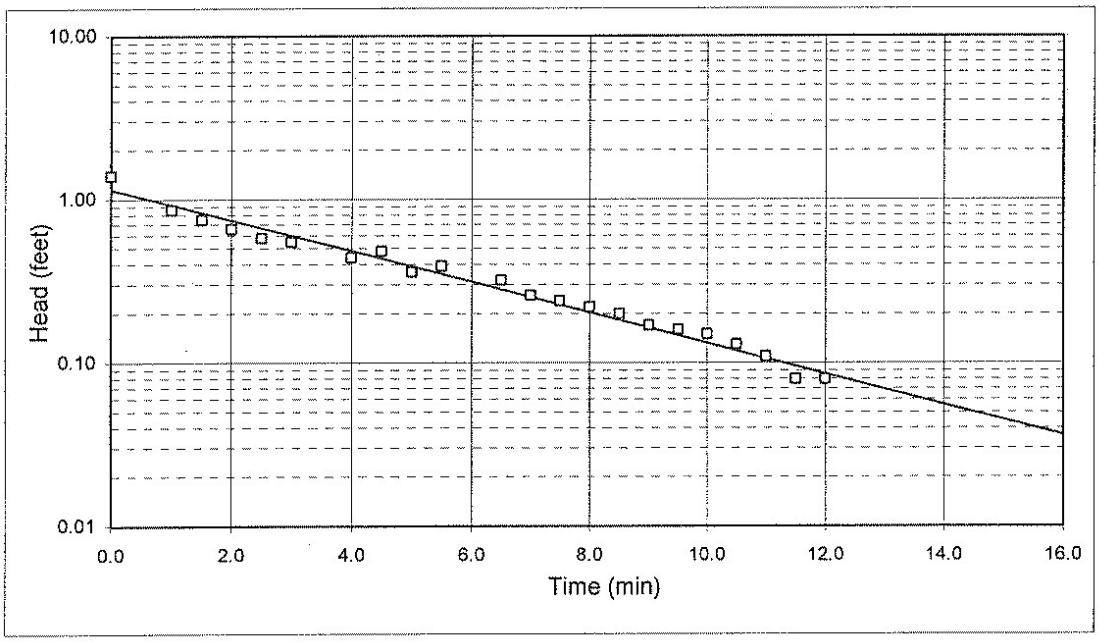
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-201-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	65.89	K=	5.39E-05	cm/sec
$\ln(R_e/r_w)$	3.88	K=	1.53E-01	ft/day
y_0 =	1.15			
y_t =	0.04			
t =	16.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

FALLING HEAD TEST PZ-201A-SS

WELL NO. PZ-201A-SS

DATE	7/17/95	
INITIAL DEPTH TO WATER	65.46	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	76.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	91.8	FEET (btoc)
SATURATED THICKNESS	180	FEET
WATER TABLE TO BOTTOM OF SCREEN	26.34	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.89	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.42	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1439	0	68.88	0.0	3.42	1.00
1	1440	0	68.87	1.0	3.41	1.00
1	1441	0	68.87	2.0	3.41	1.00
1	1446	0	68.8	7.0	3.34	0.98
1	1451	0	68.78	12.0	3.32	0.97
1	1456	0	68.77	17.0	3.31	0.97
1	1501	0	68.76	22.0	3.30	0.96
1	1506	0	68.75	27.0	3.29	0.96
1	1511	0	68.74	32.0	3.28	0.96
1	1516	0	68.72	37.0	3.26	0.95
1	1647	30	68.52	128.5	3.06	0.89
1	1816	0	68.62	217.0	3.16	0.92
2	654	0	68.11	975.0	2.65	0.77

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-201A-SS

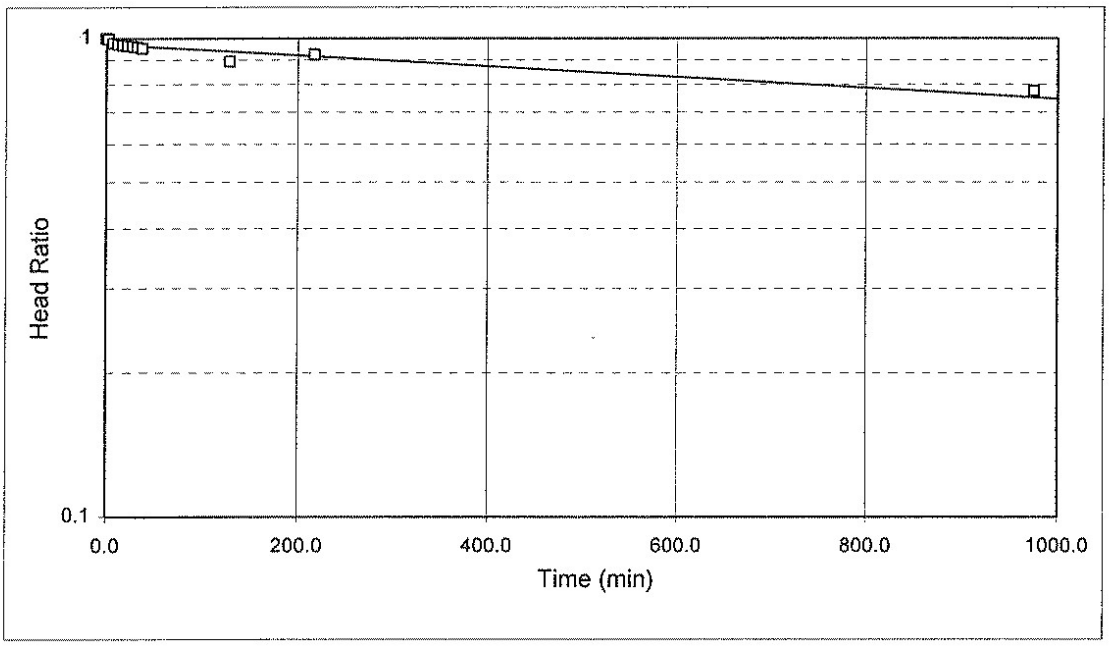
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14.89
t_1 (min) =	0
t_2 (min) =	1000
h_1/h_0 =	0.97
h_2/h_0 =	0.75

RESULTS

K=	1.27E-07	cm/sec
K=	3.60E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

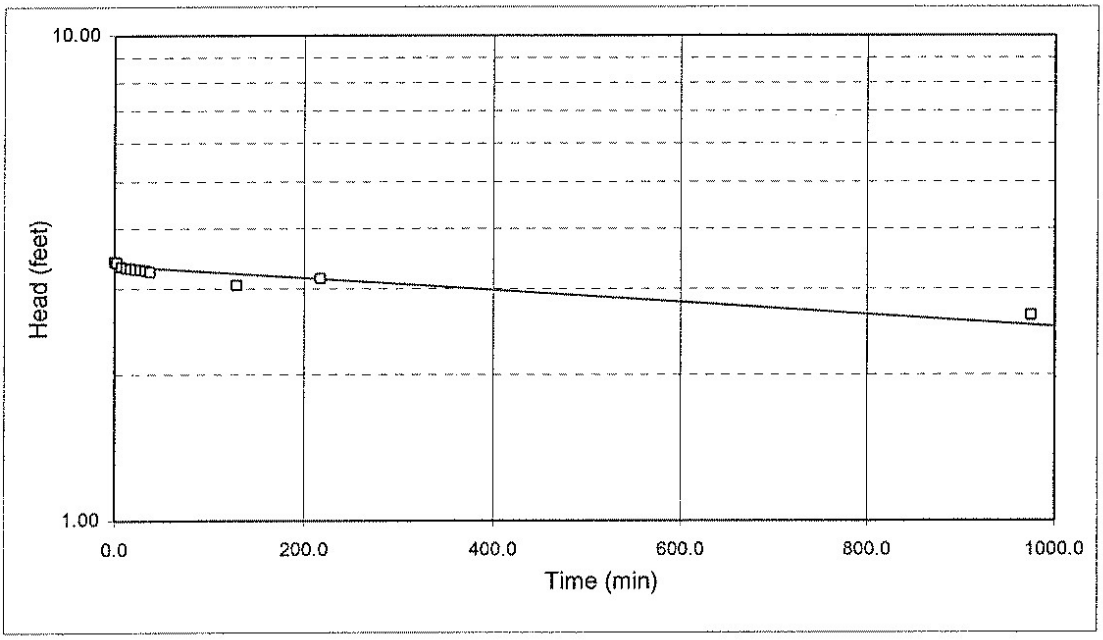
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-201A-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14.89	K=	8.34E-08	cm/sec
$\ln(R_e/r_w)$	2.88	K=	2.36E-04	ft/day
y_0 =	3.35			
y_t =	2.51			
t =	1000.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

FALLING HEAD TEST PZ-202-SS

WELL NO. PZ-202-SS

DATE	7/19/95	
INITAL HEAD ON TRANSDUCER	14.968	FEET H_2O
INITIAL DEPTH TO WATER	36.3	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	40.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	92.2	FEET (btoc)
SATURATED THICKNESS	210	FEET
WATER TABLE TO BOTTOM OF SCREEN	55.9	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	52	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	0.53	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	200	1517	58	15.503	0.00	35.77	0.53	1.00
1995	200	1517	59	15.454	0.02	35.81	0.49	0.91
1995	200	1518	0	15.296	0.03	35.97	0.33	0.61
1995	200	1518	1	15.212	0.05	36.06	0.24	0.46
1995	200	1518	2	15.153	0.07	36.12	0.19	0.35
1995	200	1518	3	15.107	0.08	36.16	0.14	0.26
1995	200	1518	4	15.067	0.10	36.20	0.10	0.19
1995	200	1518	5	15.054	0.12	36.21	0.09	0.16
1995	200	1518	6	15.026	0.13	36.24	0.06	0.11
1995	200	1518	7	15.02	0.15	36.25	0.05	0.10
1995	200	1518	8	15.023	0.17	36.25	0.05	0.10
1995	200	1518	9	15.015	0.18	36.25	0.05	0.09
1995	200	1518	10	15.003	0.20	36.27	0.03	0.07
1995	200	1518	11	14.997	0.22	36.27	0.03	0.05
1995	200	1518	12	15.01	0.23	36.26	0.04	0.08
1995	200	1518	13	15.008	0.25	36.26	0.04	0.07
1995	200	1518	14	14.994	0.27	36.27	0.03	0.05
1995	200	1518	15	15.008	0.28	36.26	0.04	0.07
1995	200	1518	16	15.007	0.30	36.26	0.04	0.07
1995	200	1518	17	15.009	0.32	36.26	0.04	0.08
1995	200	1518	18	15.005	0.33	36.26	0.04	0.07
1995	200	1518	19	15.006	0.35	36.26	0.04	0.07
1995	200	1518	20	15.004	0.37	36.26	0.04	0.07
1995	200	1518	21	14.991	0.38	36.28	0.02	0.04
1995	200	1518	22	15.003	0.40	36.27	0.03	0.07
1995	200	1518	23	15.005	0.42	36.26	0.04	0.07
1995	200	1518	24	14.991	0.43	36.28	0.02	0.04

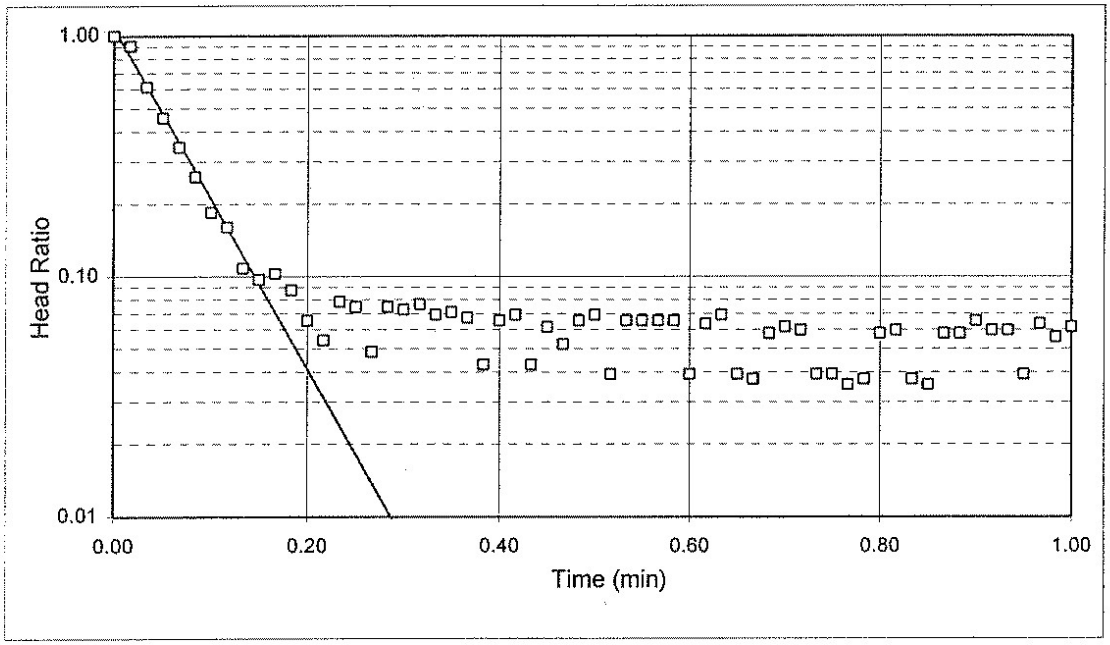
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	200	1518	25	15.001	0.45	36.27	0.03	0.06
1995	200	1518	26	14.996	0.47	36.27	0.03	0.05
1995	200	1518	27	15.003	0.48	36.27	0.03	0.07
1995	200	1518	28	15.005	0.50	36.26	0.04	0.07
1995	200	1518	29	14.989	0.52	36.28	0.02	0.04
1995	200	1518	30	15.003	0.53	36.27	0.03	0.07
1995	200	1518	31	15.003	0.55	36.27	0.03	0.07
1995	200	1518	32	15.003	0.57	36.27	0.03	0.07
1995	200	1518	33	15.003	0.58	36.27	0.03	0.07
1995	200	1518	34	14.989	0.60	36.28	0.02	0.04
1995	200	1518	35	15.002	0.62	36.27	0.03	0.06
1995	200	1518	36	15.005	0.63	36.26	0.04	0.07
1995	200	1518	37	14.989	0.65	36.28	0.02	0.04
1995	200	1518	38	14.988	0.67	36.28	0.02	0.04
1995	200	1518	39	14.999	0.68	36.27	0.03	0.06
1995	200	1518	40	15.001	0.70	36.27	0.03	0.06
1995	200	1518	41	15	0.72	36.27	0.03	0.06
1995	200	1518	42	14.989	0.73	36.28	0.02	0.04
1995	200	1518	43	14.989	0.75	36.28	0.02	0.04
1995	200	1518	44	14.987	0.77	36.28	0.02	0.04
1995	200	1518	45	14.988	0.78	36.28	0.02	0.04
1995	200	1518	46	14.999	0.80	36.27	0.03	0.06
1995	200	1518	47	15	0.82	36.27	0.03	0.06
1995	200	1518	48	14.988	0.83	36.28	0.02	0.04
1995	200	1518	49	14.987	0.85	36.28	0.02	0.04
1995	200	1518	50	14.999	0.87	36.27	0.03	0.06
1995	200	1518	51	14.999	0.88	36.27	0.03	0.06
1995	200	1518	52	15.003	0.90	36.27	0.03	0.07
1995	200	1518	53	15	0.92	36.27	0.03	0.06
1995	200	1518	54	15	0.93	36.27	0.03	0.06
1995	200	1518	55	14.989	0.95	36.28	0.02	0.04
1995	200	1518	56	15.002	0.97	36.27	0.03	0.06
1995	200	1518	57	14.998	0.98	36.27	0.03	0.06
1995	200	1518	58	15.001	1.00	36.27	0.03	0.06

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-202-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	52	K=	2.95E-03	cm/sec
t_1 (min) =	0	K=	8.37E+00	ft/day
t_2 (min) =	0.29			
h_1/h_0 =	1.07			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-202-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

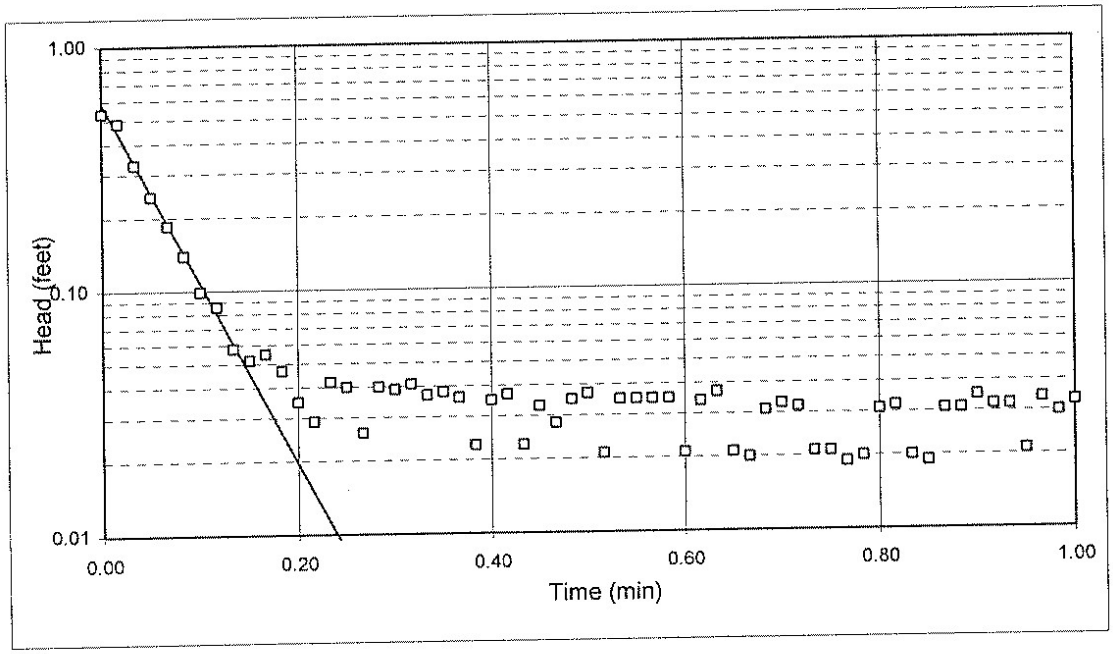
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	52
$\ln(R_e/r_w)$	4.35
y_0 =	0.59
y_t =	0.01
t =	0.25

RESULTS

K=	2.51E-03	cm/sec
K=	7.11E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

RISING HEAD TEST PZ-204-SS

WELL NO. PZ-204-SS

DATE	6/23/95	
INITIAL DEPTH TO WATER	27.35	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	11.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	92.9	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	65.55	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	65.55	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.04	FEET
MAX. HEAD IN SCREEN?	Y	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	758	30	28.39	0.0	1.04	1.00
1	759	30	28.38	1.0	1.03	0.99
1	800	30	28.37	2.0	1.02	0.98
1	801	30	28.37	3.0	1.02	0.98
1	806	30	28.29	8.0	0.94	0.90
1	811	30	28.21	13.0	0.86	0.83
1	816	30	28.15	18.0	0.80	0.77
1	821	30	28.07	23.0	0.72	0.69
1	826	30	28.05	28.0	0.70	0.67
1	831	30	28.01	33.0	0.66	0.63
1	836	30	27.99	38.0	0.64	0.62
1	841	30	27.95	43.0	0.60	0.58
1	846	30	27.89	48.0	0.54	0.52
1	851	30	27.88	53.0	0.53	0.51
1	856	30	27.85	58.0	0.50	0.48
1	901	30	27.83	63.0	0.48	0.46
1	906	30	27.8	68.0	0.45	0.43
1	911	30	27.78	73.0	0.43	0.41
1	916	30	27.77	78.0	0.42	0.40
1	921	30	27.75	83.0	0.40	0.38
1	926	30	27.73	88.0	0.38	0.37
1	931	30	27.72	93.0	0.37	0.36
1	936	30	27.7	98.0	0.35	0.34
1	941	30	27.68	103.0	0.33	0.32
1	946	30	27.66	108.0	0.31	0.30
1	951	30	27.63	113.0	0.28	0.27
1	956	30	27.61	118.0	0.26	0.25
1	1001	30	27.58	123.0	0.23	0.22
1	1006	30	27.58	128.0	0.23	0.22
1	1011	30	27.58	133.0	0.23	0.22
1	1016	30	27.57	138.0	0.22	0.21

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-204-SS

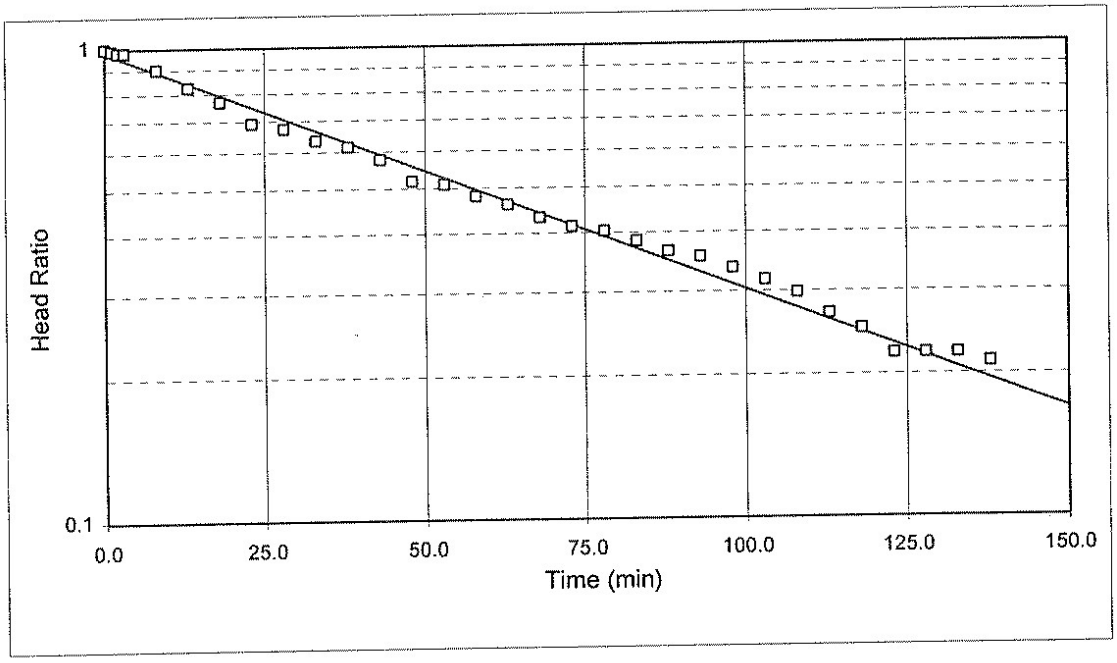
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	65.55
t_1 (min) =	0
t_2 (min) =	150
h_1/h_0 =	0.98
h_2/h_0 =	0.17

RESULTS

K=	1.76E-06	cm/sec
K=	4.98E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/23/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

RISING HEAD TEST PZ-204A-SS

WELL NO. PZ-204A-SS

DATE	7/19/95	
INITIAL DEPTH TO WATER	67.12	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	76.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	91.5	FEET (btoc)
SATURATED THICKNESS	140	FEET
WATER TABLE TO BOTTOM OF SCREEN	24.38	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.61	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1156	0	70.73	0.0	3.61	1.00
1	1157	0	70.72	1.0	3.60	1.00
1	1202	0	70.67	6.0	3.55	0.98
1	1207	0	70.66	11.0	3.54	0.98
1	1212	0	70.65	16.0	3.53	0.98
1	1304	0	70.49	68.0	3.37	0.93
1	1333	0	70.4	97.0	3.28	0.91
1	1631	0	70.04	275.0	2.92	0.81

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-204A-SS

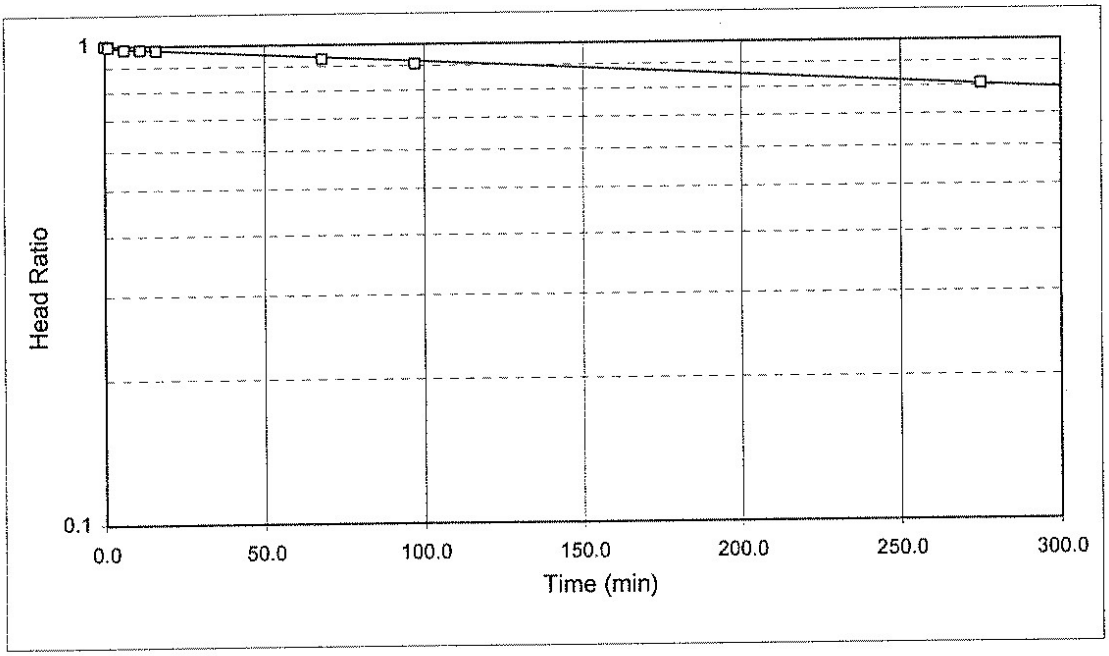
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	15.5
t_1 (min) =	0
t_2 (min) =	300
h_1/h_0 =	0.99
h_2/h_0 =	0.79

RESULTS

K=	3.48E-07	cm/sec
K=	9.87E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-204A-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

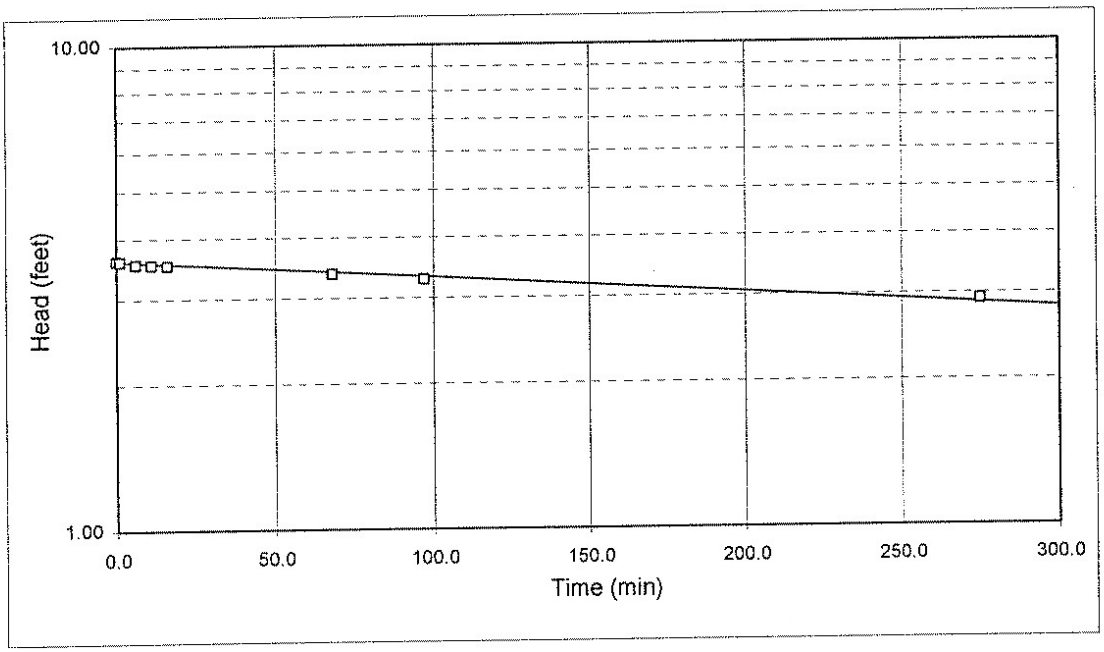
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	15.5
$\ln(R_e/r_w)$	2.88
y_0 =	3.60
y_t =	2.82
t =	300.0

RESULTS

K=	2.26E-07	cm/sec
K=	6.42E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

FALLING HEAD TEST PZ-205-AS

WELL NO. PZ-205-AS

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	14.92	FEET H_2O
INITIAL DEPTH TO WATER	26.71	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	36.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	50.7	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	23.99	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	14.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.80	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1600	4	17.718	0.00	23.91	2.80	1.00
1995	206	1600	6	17.177	0.03	24.45	2.26	0.81
1995	206	1600	7	17.148	0.05	24.48	2.23	0.80
1995	206	1600	8	17.102	0.07	24.53	2.18	0.78
1995	206	1600	9	17.052	0.08	24.58	2.13	0.76
1995	206	1600	10	17.005	0.10	24.63	2.09	0.75
1995	206	1600	11	16.961	0.12	24.67	2.04	0.73
1995	206	1600	12	16.917	0.13	24.71	2.00	0.71
1995	206	1600	13	16.874	0.15	24.76	1.95	0.70
1995	206	1600	14	16.83	0.17	24.80	1.91	0.68
1995	206	1600	15	16.791	0.18	24.84	1.87	0.67
1995	206	1600	16	16.755	0.20	24.88	1.84	0.66
1995	206	1600	17	16.717	0.22	24.91	1.80	0.64
1995	206	1600	18	16.677	0.23	24.95	1.76	0.63
1995	206	1600	19	16.643	0.25	24.99	1.72	0.62
1995	206	1600	20	16.606	0.27	25.02	1.69	0.60
1995	206	1600	21	16.57	0.28	25.06	1.65	0.59
1995	206	1600	22	16.537	0.30	25.09	1.62	0.58
1995	206	1600	23	16.501	0.32	25.13	1.58	0.57
1995	206	1600	24	16.471	0.33	25.16	1.55	0.55
1995	206	1600	25	16.434	0.35	25.20	1.51	0.54
1995	206	1600	26	16.406	0.37	25.22	1.49	0.53
1995	206	1600	27	16.376	0.38	25.25	1.46	0.52
1995	206	1600	28	16.346	0.40	25.28	1.43	0.51
1995	206	1600	29	16.318	0.42	25.31	1.40	0.50
1995	206	1600	30	16.289	0.43	25.34	1.37	0.49
1995	206	1600	31	16.259	0.45	25.37	1.34	0.48

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1600	32	16.233	0.47	25.40	1.31	0.47
1995	206	1600	33	16.202	0.48	25.43	1.28	0.46
1995	206	1600	34	16.18	0.50	25.45	1.26	0.45
1995	206	1600	35	16.152	0.52	25.48	1.23	0.44
1995	206	1600	36	16.128	0.53	25.50	1.21	0.43
1995	206	1600	37	16.101	0.55	25.53	1.18	0.42
1995	206	1600	38	16.079	0.57	25.55	1.16	0.41
1995	206	1600	39	16.053	0.58	25.58	1.13	0.40
1995	206	1600	40	16.03	0.60	25.60	1.11	0.40
1995	206	1600	41	16.01	0.62	25.62	1.09	0.39
1995	206	1600	42	15.986	0.63	25.64	1.07	0.38
1995	206	1600	43	15.965	0.65	25.67	1.05	0.37
1995	206	1600	44	15.944	0.67	25.69	1.02	0.37
1995	206	1600	45	15.921	0.68	25.71	1.00	0.36
1995	206	1600	46	15.903	0.70	25.73	0.98	0.35
1995	206	1600	47	15.88	0.72	25.75	0.96	0.34
1995	206	1600	48	15.863	0.73	25.77	0.94	0.34
1995	206	1600	49	15.843	0.75	25.79	0.92	0.33
1995	206	1600	50	15.824	0.77	25.81	0.90	0.32
1995	206	1600	51	15.806	0.78	25.82	0.89	0.32
1995	206	1600	52	15.787	0.80	25.84	0.87	0.31
1995	206	1600	53	15.77	0.82	25.86	0.85	0.30
1995	206	1600	54	15.753	0.83	25.88	0.83	0.30
1995	206	1600	55	15.735	0.85	25.90	0.81	0.29
1995	206	1600	56	15.718	0.87	25.91	0.80	0.29
1995	206	1600	57	15.701	0.88	25.93	0.78	0.28
1995	206	1600	58	15.684	0.90	25.95	0.76	0.27
1995	206	1600	59	15.668	0.92	25.96	0.75	0.27
1995	206	1601	0	15.652	0.93	25.98	0.73	0.26
1995	206	1601	1	15.638	0.95	25.99	0.72	0.26
1995	206	1601	2	15.621	0.97	26.01	0.70	0.25
1995	206	1601	3	15.606	0.98	26.02	0.69	0.25
1995	206	1601	4	15.592	1.00	26.04	0.67	0.24
1995	206	1601	5	15.577	1.02	26.05	0.66	0.23
1995	206	1601	6	15.562	1.03	26.07	0.64	0.23
1995	206	1601	7	15.551	1.05	26.08	0.63	0.23
1995	206	1601	8	15.539	1.07	26.09	0.62	0.22
1995	206	1601	9	15.524	1.08	26.11	0.60	0.22
1995	206	1601	10	15.511	1.10	26.12	0.59	0.21
1995	206	1601	11	15.501	1.12	26.13	0.58	0.21
1995	206	1601	12	15.488	1.13	26.14	0.57	0.20
1995	206	1601	13	15.475	1.15	26.16	0.56	0.20
1995	206	1601	14	15.464	1.17	26.17	0.54	0.19
1995	206	1601	15	15.452	1.18	26.18	0.53	0.19
1995	206	1601	16	15.441	1.20	26.19	0.52	0.19

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1601	17	15.431	1.22	26.20	0.51	0.18
1995	206	1601	18	15.417	1.23	26.21	0.50	0.18
1995	206	1601	19	15.41	1.25	26.22	0.49	0.18
1995	206	1601	20	15.398	1.27	26.23	0.48	0.17
1995	206	1601	21	15.386	1.28	26.24	0.47	0.17
1995	206	1601	22	15.377	1.30	26.25	0.46	0.16
1995	206	1601	23	15.364	1.32	26.27	0.44	0.16
1995	206	1601	24	15.356	1.33	26.27	0.44	0.16
1995	206	1601	25	15.347	1.35	26.28	0.43	0.15
1995	206	1601	26	15.34	1.37	26.29	0.42	0.15
1995	206	1601	27	15.33	1.38	26.30	0.41	0.15
1995	206	1601	28	15.32	1.40	26.31	0.40	0.14
1995	206	1601	29	15.311	1.42	26.32	0.39	0.14
1995	206	1601	30	15.302	1.43	26.33	0.38	0.14
1995	206	1601	31	15.296	1.45	26.33	0.38	0.13
1995	206	1601	32	15.287	1.47	26.34	0.37	0.13
1995	206	1601	33	15.278	1.48	26.35	0.36	0.13
1995	206	1601	34	15.268	1.50	26.36	0.35	0.12
1995	206	1601	35	15.26	1.52	26.37	0.34	0.12
1995	206	1601	36	15.253	1.53	26.38	0.33	0.12
1995	206	1601	37	15.246	1.55	26.38	0.33	0.12
1995	206	1601	38	15.24	1.57	26.39	0.32	0.11
1995	206	1601	39	15.232	1.58	26.40	0.31	0.11
1995	206	1601	40	15.226	1.60	26.40	0.31	0.11
1995	206	1601	41	15.217	1.62	26.41	0.30	0.11
1995	206	1601	42	15.21	1.63	26.42	0.29	0.10
1995	206	1601	43	15.204	1.65	26.43	0.28	0.10
1995	206	1601	44	15.197	1.67	26.43	0.28	0.10
1995	206	1601	45	15.189	1.68	26.44	0.27	0.10
1995	206	1601	46	15.183	1.70	26.45	0.26	0.09
1995	206	1601	47	15.18	1.72	26.45	0.26	0.09
1995	206	1601	48	15.171	1.73	26.46	0.25	0.09
1995	206	1601	49	15.169	1.75	26.46	0.25	0.09
1995	206	1601	50	15.16	1.77	26.47	0.24	0.09
1995	206	1601	51	15.152	1.78	26.48	0.23	0.08
1995	206	1601	52	15.151	1.80	26.48	0.23	0.08
1995	206	1601	53	15.145	1.82	26.49	0.23	0.08
1995	206	1601	54	15.14	1.83	26.49	0.22	0.08
1995	206	1601	55	15.133	1.85	26.50	0.21	0.08
1995	206	1601	56	15.128	1.87	26.50	0.21	0.07
1995	206	1601	57	15.125	1.88	26.51	0.20	0.07
1995	206	1601	58	15.12	1.90	26.51	0.20	0.07
1995	206	1601	59	15.113	1.92	26.52	0.19	0.07
1995	206	1602	0	15.108	1.93	26.52	0.19	0.07
1995	206	1602	1	15.105	1.95	26.53	0.19	0.07

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1602	2	15.102	1.97	26.53	0.18	0.07
1995	206	1602	3	15.097	1.98	26.53	0.18	0.06
1995	206	1602	4	15.092	2.00	26.54	0.17	0.06
1995	206	1602	5	15.086	2.02	26.54	0.17	0.06
1995	206	1602	6	15.082	2.03	26.55	0.16	0.06
1995	206	1602	7	15.076	2.05	26.55	0.16	0.06
1995	206	1602	8	15.075	2.07	26.56	0.16	0.06
1995	206	1602	9	15.07	2.08	26.56	0.15	0.05
1995	206	1602	10	15.067	2.10	26.56	0.15	0.05
1995	206	1602	11	15.063	2.12	26.57	0.14	0.05
1995	206	1602	12	15.059	2.13	26.57	0.14	0.05
1995	206	1602	13	15.054	2.15	26.58	0.13	0.05
1995	206	1602	14	15.052	2.17	26.58	0.13	0.05
1995	206	1602	15	15.048	2.18	26.58	0.13	0.05
1995	206	1602	16	15.045	2.20	26.59	0.13	0.04
1995	206	1602	17	15.042	2.22	26.59	0.12	0.04
1995	206	1602	18	15.04	2.23	26.59	0.12	0.04
1995	206	1602	19	15.035	2.25	26.60	0.12	0.04
1995	206	1602	20	15.032	2.27	26.60	0.11	0.04
1995	206	1602	21	15.029	2.28	26.60	0.11	0.04
1995	206	1602	22	15.025	2.30	26.61	0.11	0.04
1995	206	1602	23	15.02	2.32	26.61	0.10	0.04
1995	206	1602	24	15.018	2.33	26.61	0.10	0.04
1995	206	1602	25	15.017	2.35	26.61	0.10	0.03
1995	206	1602	26	15.013	2.37	26.62	0.09	0.03
1995	206	1602	27	15.012	2.38	26.62	0.09	0.03
1995	206	1602	28	15.009	2.40	26.62	0.09	0.03
1995	206	1602	29	15.007	2.42	26.62	0.09	0.03
1995	206	1602	30	15.004	2.43	26.63	0.08	0.03
1995	206	1602	31	14.998	2.45	26.63	0.08	0.03
1995	206	1602	32	14.995	2.47	26.64	0.07	0.03
1995	206	1602	33	14.993	2.48	26.64	0.07	0.03
1995	206	1602	34	14.995	2.50	26.64	0.07	0.03
1995	206	1602	35	14.992	2.52	26.64	0.07	0.03
1995	206	1602	36	14.988	2.53	26.64	0.07	0.02
1995	206	1602	37	14.985	2.55	26.65	0.06	0.02
1995	206	1602	38	14.984	2.57	26.65	0.06	0.02
1995	206	1602	39	14.982	2.58	26.65	0.06	0.02
1995	206	1602	40	14.981	2.60	26.65	0.06	0.02
1995	206	1602	41	14.979	2.62	26.65	0.06	0.02
1995	206	1602	42	14.972	2.63	26.66	0.05	0.02
1995	206	1602	43	14.974	2.65	26.66	0.05	0.02
1995	206	1602	44	14.971	2.67	26.66	0.05	0.02
1995	206	1602	45	14.969	2.68	26.66	0.05	0.02
1995	206	1602	46	14.968	2.70	26.66	0.05	0.02

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1602	47	14.966	2.72	26.66	0.05	0.02
1995	206	1602	48	14.965	2.73	26.67	0.05	0.02
1995	206	1602	49	14.962	2.75	26.67	0.04	0.02
1995	206	1602	50	14.96	2.77	26.67	0.04	0.01
1995	206	1602	51	14.957	2.78	26.67	0.04	0.01
1995	206	1602	52	14.954	2.80	26.68	0.03	0.01
1995	206	1602	53	14.956	2.82	26.67	0.04	0.01
1995	206	1602	54	14.951	2.83	26.68	0.03	0.01
1995	206	1602	55	14.951	2.85	26.68	0.03	0.01
1995	206	1602	56	14.953	2.87	26.68	0.03	0.01
1995	206	1602	57	14.95	2.88	26.68	0.03	0.01
1995	206	1602	58	14.945	2.90	26.69	0.02	0.01
1995	206	1602	59	14.943	2.92	26.69	0.02	0.01
1995	206	1603	0	14.943	2.93	26.69	0.02	0.01
1995	206	1603	1	14.945	2.95	26.69	0.02	0.01
1995	206	1603	2	14.942	2.97	26.69	0.02	0.01
1995	206	1603	3	14.94	2.98	26.69	0.02	0.01
1995	206	1603	4	14.939	3.00	26.69	0.02	0.01
1995	206	1603	5	14.938	3.02	26.69	0.02	0.01

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-205-AS

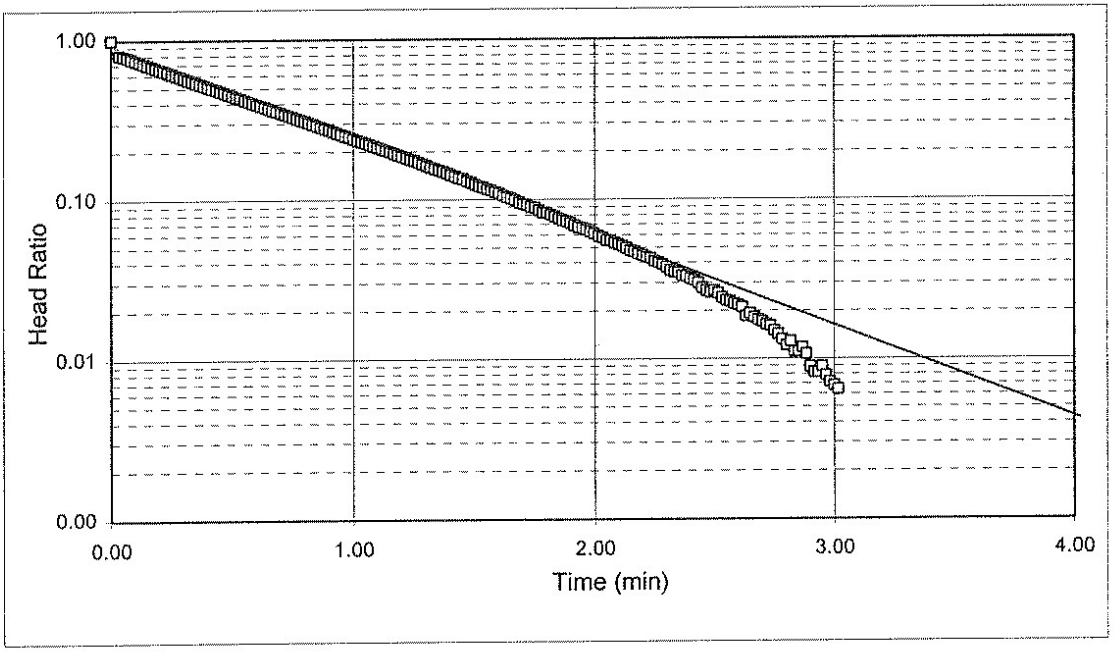
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	14.5
t_1 (min) =	0
t_2 (min) =	4.03
h_1/h_0 =	0.87
h_2/h_0 =	0.00

RESULTS

K=	6.03E-04	cm/sec
K=	1.71E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-205-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

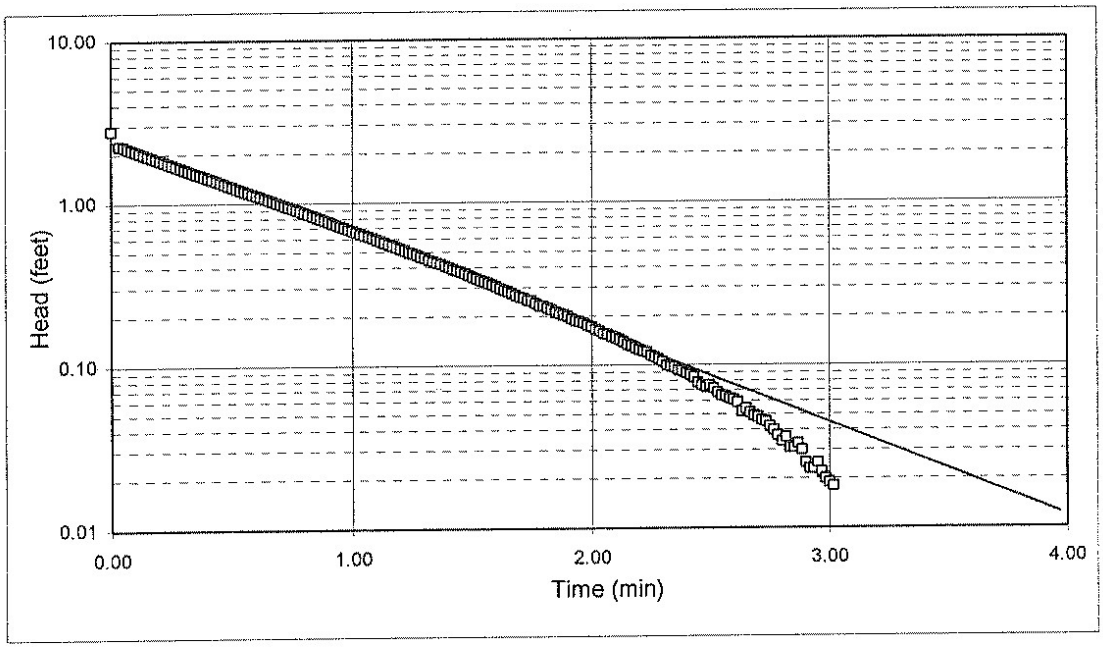
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	14.5
$\ln(R_e/r_w)$	2.70
y_0 =	2.40
y_t =	0.01
t =	3.97

RESULTS

K=	4.36E-04	cm/sec
K=	1.23E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

FALLING HEAD TEST PZ-205-SS

WELL NO. PZ-205-SS

DATE	7/18/95	
INITAL HEAD ON TRANSDUCER	10.86	FEET H_2O
INITIAL DEPTH TO WATER	37.66	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	86.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	100.7	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	63.04	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.34	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	199	856	0	13.195	0.0	35.33	2.34	1.000
1995	199	856	5	13.189	0.1	35.33	2.33	0.997
1995	199	856	10	13.173	0.2	35.35	2.31	0.991
1995	199	856	15	13.176	0.3	35.34	2.32	0.992
1995	199	856	20	13.161	0.3	35.36	2.30	0.985
1995	199	856	25	13.172	0.4	35.35	2.31	0.990
1995	199	856	30	13.174	0.5	35.35	2.31	0.991
1995	199	856	35	13.171	0.6	35.35	2.31	0.990
1995	199	856	40	13.172	0.7	35.35	2.31	0.990
1995	199	856	45	13.173	0.8	35.35	2.31	0.991
1995	199	856	50	13.171	0.8	35.35	2.31	0.990
1995	199	856	55	13.171	0.9	35.35	2.31	0.990
1995	199	857	0	13.171	1.0	35.35	2.31	0.990
1995	199	857	5	13.17	1.1	35.35	2.31	0.989
1995	199	857	10	13.17	1.2	35.35	2.31	0.989
1995	199	857	15	13.168	1.2	35.35	2.31	0.988
1995	199	857	20	13.169	1.3	35.35	2.31	0.989
1995	199	857	25	13.17	1.4	35.35	2.31	0.989
1995	199	857	30	13.096	1.5	35.42	2.24	0.958
1995	199	857	35	13.101	1.6	35.42	2.24	0.960
1995	199	857	40	13.103	1.7	35.42	2.24	0.961
1995	199	857	45	13.103	1.7	35.42	2.24	0.961
1995	199	857	50	13.104	1.8	35.42	2.24	0.961
1995	199	857	55	13.103	1.9	35.42	2.24	0.961
1995	199	858	0	13.103	2.0	35.42	2.24	0.961
1995	199	858	5	13.102	2.1	35.42	2.24	0.960
1995	199	858	10	13.104	2.2	35.42	2.24	0.961

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	199	858	15	13.103	2.2	35.42	2.24	0.961
1995	199	858	20	13.103	2.3	35.42	2.24	0.961
1995	199	858	25	13.102	2.4	35.42	2.24	0.960
1995	199	858	30	13.102	2.5	35.42	2.24	0.960
1995	199	858	35	13.102	2.6	35.42	2.24	0.960
1995	199	858	40	13.103	2.7	35.42	2.24	0.961
1995	199	858	45	13.102	2.7	35.42	2.24	0.960
1995	199	858	50	13.102	2.8	35.42	2.24	0.960
1995	199	858	55	13.101	2.9	35.42	2.24	0.960
1995	199	859	0	13.102	3.0	35.42	2.24	0.960
1995	199	859	5	13.101	3.1	35.42	2.24	0.960
1995	199	859	10	13.1	3.2	35.42	2.24	0.959
1995	199	859	15	13.101	3.2	35.42	2.24	0.960
1995	199	859	20	13.101	3.3	35.42	2.24	0.960
1995	199	859	25	13.103	3.4	35.42	2.24	0.961
1995	199	859	30	13.102	3.5	35.42	2.24	0.960
1995	199	859	35	13.102	3.6	35.42	2.24	0.960
1995	199	859	40	13.101	3.7	35.42	2.24	0.960
1995	199	859	45	13.101	3.7	35.42	2.24	0.960
1995	199	859	50	13.102	3.8	35.42	2.24	0.960
1995	199	859	55	13.101	3.9	35.42	2.24	0.960
1995	199	900	0	13.101	4.0	35.42	2.24	0.960
1995	199	900	5	13.101	4.1	35.42	2.24	0.960
1995	199	900	10	13.1	4.2	35.42	2.24	0.959
1995	199	900	15	13.1	4.2	35.42	2.24	0.959
1995	199	900	20	13.1	4.3	35.42	2.24	0.959
1995	199	900	25	13.099	4.4	35.42	2.24	0.959
1995	199	900	30	13.1	4.5	35.42	2.24	0.959
1995	199	900	35	13.099	4.6	35.42	2.24	0.959
1995	199	900	40	13.099	4.7	35.42	2.24	0.959
1995	199	900	45	13.1	4.7	35.42	2.24	0.959
1995	199	900	50	13.101	4.8	35.42	2.24	0.960
1995	199	900	55	13.102	4.9	35.42	2.24	0.960
1995	199	901	0	13.101	5.0	35.42	2.24	0.960
1995	199	901	5	13.1	5.1	35.42	2.24	0.959
1995	199	901	10	13.101	5.2	35.42	2.24	0.960
1995	199	901	15	13.101	5.2	35.42	2.24	0.960
1995	199	901	20	13.1	5.3	35.42	2.24	0.959
1995	199	901	25	13.1	5.4	35.42	2.24	0.959
1995	199	901	30	13.1	5.5	35.42	2.24	0.959
1995	199	901	35	13.1	5.6	35.42	2.24	0.959
1995	199	901	40	13.099	5.7	35.42	2.24	0.959
1995	199	901	45	13.098	5.7	35.42	2.24	0.958
1995	199	901	50	13.099	5.8	35.42	2.24	0.959
1995	199	901	55	13.098	5.9	35.42	2.24	0.958

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	199	902	0	13.098	6.0	35.42	2.24	0.958
1995	199	902	5	13.098	6.1	35.42	2.24	0.958
1995	199	902	10	13.098	6.2	35.42	2.24	0.958
1995	199	902	15	13.099	6.2	35.42	2.24	0.959
1995	199	902	20	13.098	6.3	35.42	2.24	0.958
1995	199	902	25	13.098	6.4	35.42	2.24	0.958
1995	199	902	30	13.097	6.5	35.42	2.24	0.958
1995	199	902	35	13.098	6.6	35.42	2.24	0.958
1995	199	902	40	13.098	6.7	35.42	2.24	0.958
1995	199	902	45	13.096	6.7	35.42	2.24	0.958
1995	199	902	50	13.095	6.8	35.43	2.24	0.957
1995	199	905	0	13.089	9.0	35.43	2.23	0.955
1995	199	910	0	13.077	14.0	35.44	2.22	0.949
1995	199	915	0	13.065	19.0	35.46	2.21	0.944
1995	199	920	0	13.054	24.0	35.47	2.19	0.940
1995	199	925	0	13.045	29.0	35.48	2.19	0.936
1995	199	930	0	13.035	34.0	35.49	2.18	0.931
1995	199	935	0	13.025	39.0	35.50	2.17	0.927
1995	199	940	0	13.016	44.0	35.50	2.16	0.923
1995	199	945	0	13.008	49.0	35.51	2.15	0.920
1995	199	950	0	12.998	54.0	35.52	2.14	0.916
1995	199	955	0	12.991	59.0	35.53	2.13	0.913
1995	199	1000	0	12.985	64.0	35.54	2.13	0.910
1995	199	1005	0	12.977	69.0	35.54	2.12	0.907
1995	199	1010	0	12.97	74.0	35.55	2.11	0.904
1995	199	1015	0	12.961	79.0	35.56	2.10	0.900
1995	199	1020	0	12.952	84.0	35.57	2.09	0.896
1995	199	1025	0	12.946	89.0	35.57	2.09	0.893
1995	199	1030	0	12.938	94.0	35.58	2.08	0.890
1995	199	1035	0	12.928	99.0	35.59	2.07	0.886
1995	199	1040	0	12.922	104.0	35.60	2.06	0.883
1995	199	1045	0	12.917	109.0	35.60	2.06	0.881
1995	199	1050	0	12.908	114.0	35.61	2.05	0.877
1995	199	1055	0	12.9	119.0	35.62	2.04	0.874
1995	199	1100	0	12.893	124.0	35.63	2.03	0.871
1995	199	1105	0	12.885	129.0	35.64	2.03	0.867
1995	199	1110	0	12.879	134.0	35.64	2.02	0.865
1995	199	1115	0	12.87	139.0	35.65	2.01	0.861
1995	199	1120	0	12.861	144.0	35.66	2.00	0.857
1995	199	1125	0	12.853	149.0	35.67	1.99	0.854
1995	199	1130	0	12.844	154.0	35.68	1.98	0.850
1995	199	1135	0	12.837	159.0	35.68	1.98	0.847
1995	199	1140	0	12.828	164.0	35.69	1.97	0.843
1995	199	1145	0	12.82	169.0	35.70	1.96	0.839
1995	199	1150	0	12.813	174.0	35.71	1.95	0.836

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	199	1155	0	12.805	179.0	35.72	1.95	0.833
1995	199	1200	0	12.795	184.0	35.73	1.94	0.829
1995	199	1205	0	12.789	189.0	35.73	1.93	0.826
1995	199	1210	0	12.78	194.0	35.74	1.92	0.822
1995	199	1215	0	12.771	199.0	35.75	1.91	0.818
1995	199	1220	0	12.765	204.0	35.76	1.91	0.816
1995	199	1225	0	12.755	209.0	35.77	1.90	0.812
1995	199	1230	0	12.745	214.0	35.78	1.89	0.807
1995	199	1235	0	12.737	219.0	35.78	1.88	0.804
1995	199	1240	0	12.728	224.0	35.79	1.87	0.800
1995	199	1245	0	12.718	229.0	35.80	1.86	0.796
1995	199	1250	0	12.71	234.0	35.81	1.85	0.792
1995	199	1255	0	12.704	239.0	35.82	1.84	0.790
1995	199	1300	0	12.697	244.0	35.82	1.84	0.787
1995	199	1305	0	12.689	249.0	35.83	1.83	0.783
1995	199	1310	0	12.681	254.0	35.84	1.82	0.780
1995	199	1315	0	12.671	259.0	35.85	1.81	0.776
1995	199	1320	0	12.665	264.0	35.86	1.81	0.773
1995	199	1325	0	12.657	269.0	35.86	1.80	0.770
1995	199	1330	0	12.647	274.0	35.87	1.79	0.765
1995	199	1335	0	12.637	279.0	35.88	1.78	0.761
1995	199	1340	0	12.631	284.0	35.89	1.77	0.758
1995	199	1345	0	12.62	289.0	35.90	1.76	0.754
1995	199	1350	0	12.614	294.0	35.91	1.75	0.751
1995	199	1355	0	12.608	299.0	35.91	1.75	0.749
1995	199	1400	0	12.595	304.0	35.93	1.74	0.743
1995	199	1405	0	12.591	309.0	35.93	1.73	0.741
1995	199	1410	0	12.578	314.0	35.94	1.72	0.736
1995	199	1415	0	12.569	319.0	35.95	1.71	0.732
1995	199	1420	0	12.562	324.0	35.96	1.70	0.729
1995	199	1425	0	12.555	329.0	35.97	1.70	0.726
1995	199	1430	0	12.549	334.0	35.97	1.69	0.723
1995	199	1435	0	12.539	339.0	35.98	1.68	0.719
1995	199	1440	0	12.53	344.0	35.99	1.67	0.715
1995	199	1445	0	12.522	349.0	36.00	1.66	0.712
1995	199	1450	0	12.514	354.0	36.01	1.65	0.708
1995	199	1455	0	12.507	359.0	36.01	1.65	0.705
1995	199	1500	0	12.503	364.0	36.02	1.64	0.704
1995	199	1505	0	12.492	369.0	36.03	1.63	0.699

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-205-SS

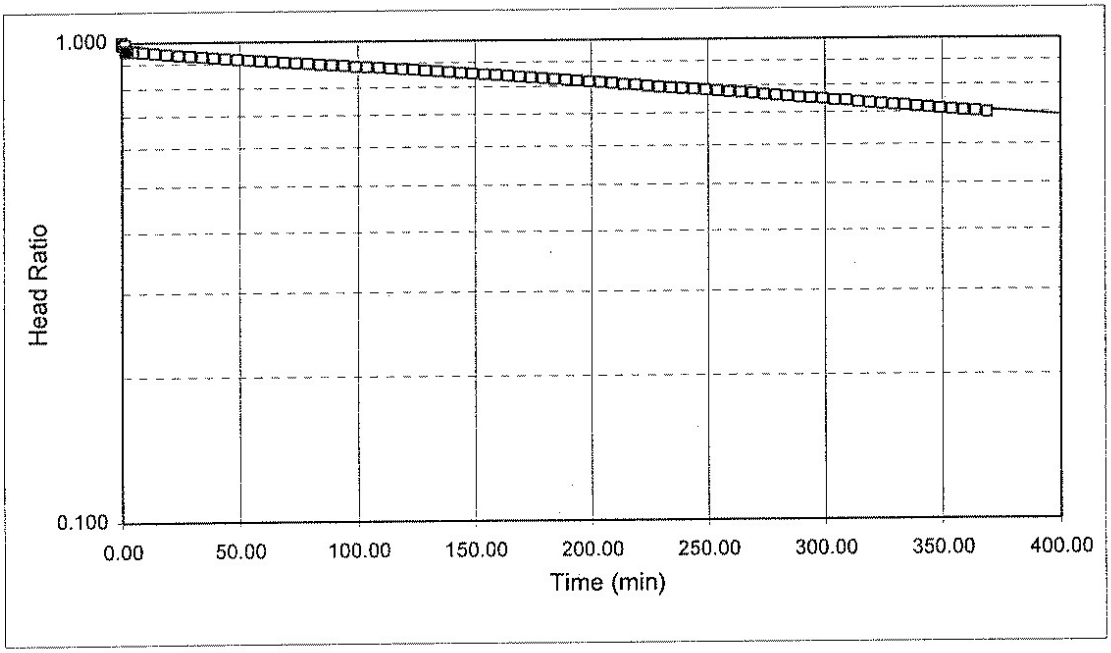
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14.5
t_1 (min) =	0
t_2 (min) =	400.00
h_1/h_0 =	0.98
h_2/h_0 =	0.69

RESULTS

K=	4.36E-07	cm/sec
K=	1.23E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/18/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

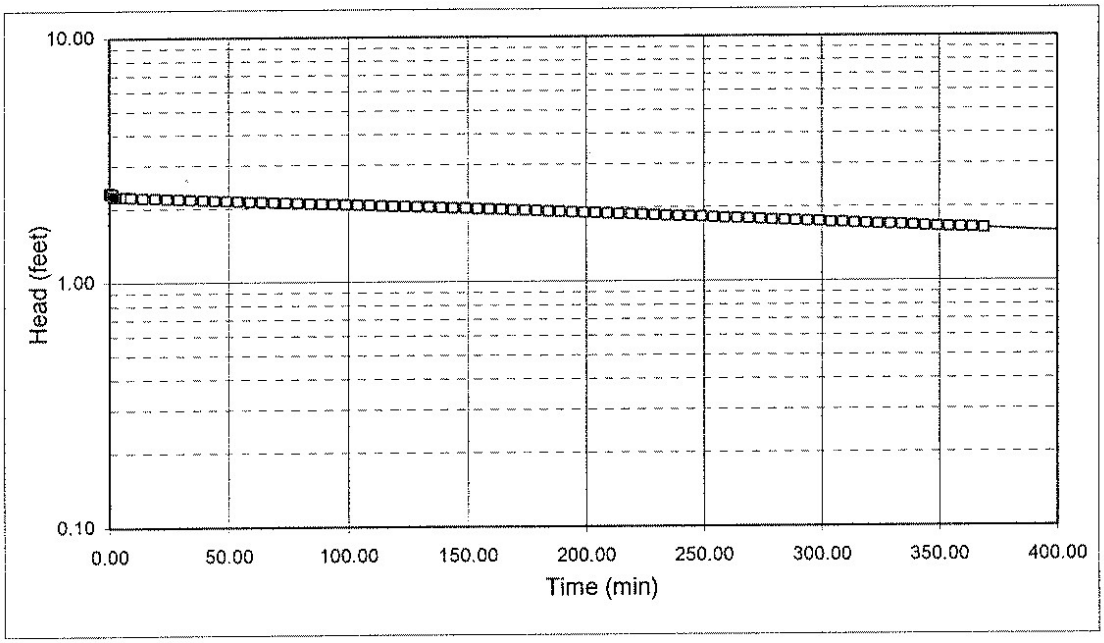
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-205-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14.5	K=	3.88E-07	cm/sec
$\ln(R_e/r_w)$	3.43	K=	1.10E-03	ft/day
y_0 =	2.30			
y_t =	1.58			
t =	400.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/18/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

RISING HEAD TEST PZ-206-SS

WELL NO. PZ-206-SS

DATE	6/23/95	
INITIAL DEPTH TO WATER	40.14	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	112.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	127.3	FEET (btoc)
SATURATED THICKNESS	160	FEET
WATER TABLE TO BOTTOM OF SCREEN	87.16	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	5.60	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1152	0	45.74	0.0	5.60	1.00
1	1154	0	45.2	2.0	5.06	0.90
1	1155	0	44.96	3.0	4.82	0.86
1	1155	30	44.84	3.5	4.70	0.84
1	1156	0	44.75	4.0	4.61	0.82
1	1157	0	44.62	5.0	4.48	0.80
1	1157	30	44.49	5.5	4.35	0.78
1	1158	30	44.29	6.5	4.15	0.74
1	1159	0	44.16	7.0	4.02	0.72
1	1159	30	44.11	7.5	3.97	0.71
1	1200	0	44.04	8.0	3.90	0.70
1	1201	0	43.89	9.0	3.75	0.67
1	1201	30	43.8	9.5	3.66	0.65
1	1202	0	43.73	10.0	3.59	0.64
1	1202	30	43.67	10.5	3.53	0.63
1	1203	0	43.61	11.0	3.47	0.62
1	1203	30	43.54	11.5	3.40	0.61
1	1204	0	43.47	12.0	3.33	0.59
1	1204	30	43.39	12.5	3.25	0.58
1	1205	0	43.35	13.0	3.21	0.57
1	1205	30	43.28	13.5	3.14	0.56
1	1206	0	43.24	14.0	3.10	0.55
1	1207	0	43.13	15.0	2.99	0.53
1	1208	0	43.01	16.0	2.87	0.51

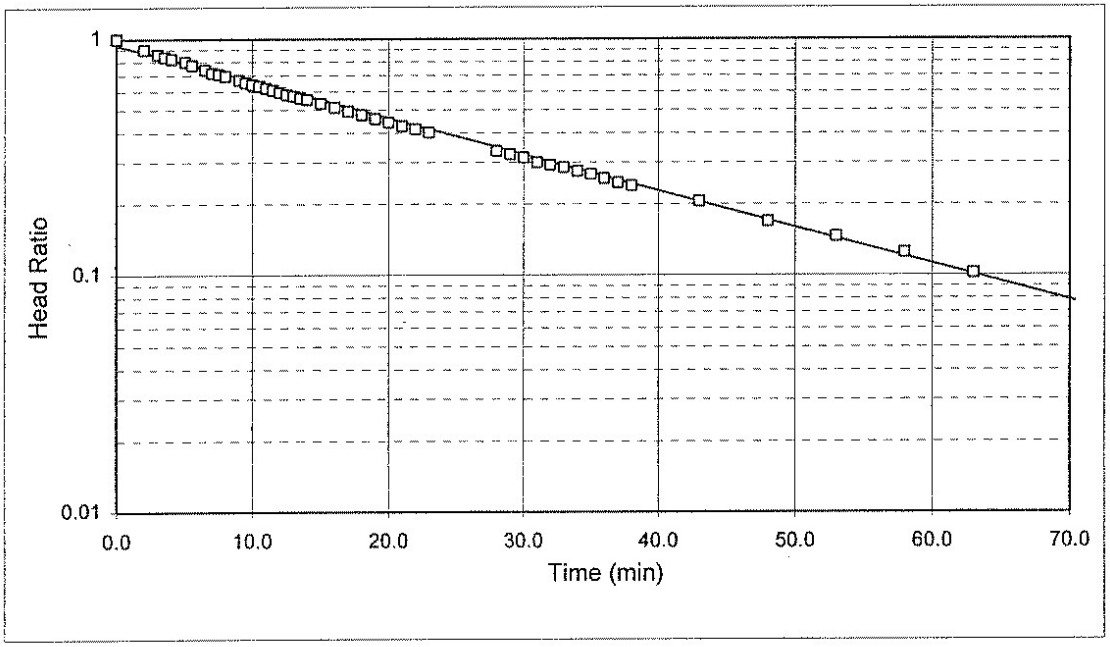
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1209	0	42.91	17.0	2.77	0.49
1	1210	0	42.81	18.0	2.67	0.48
1	1211	0	42.71	19.0	2.57	0.46
1	1212	0	42.62	20.0	2.48	0.44
1	1213	0	42.54	21.0	2.40	0.43
1	1214	0	42.46	22.0	2.32	0.41
1	1215	0	42.39	23.0	2.25	0.40
1	1220	0	42.02	28.0	1.88	0.34
1	1221	0	41.96	29.0	1.82	0.33
1	1222	0	41.9	30.0	1.76	0.31
1	1223	0	41.82	31.0	1.68	0.30
1	1224	0	41.78	32.0	1.64	0.29
1	1225	0	41.74	33.0	1.60	0.29
1	1226	0	41.68	34.0	1.54	0.28
1	1227	0	41.64	35.0	1.50	0.27
1	1228	0	41.58	36.0	1.44	0.26
1	1229	0	41.52	37.0	1.38	0.25
1	1230	0	41.48	38.0	1.34	0.24
1	1235	0	41.29	43.0	1.15	0.21
1	1240	0	41.09	48.0	0.95	0.17
1	1245	0	40.96	53.0	0.82	0.15
1	1250	0	40.84	58.0	0.70	0.13
1	1255	0	40.71	63.0	0.57	0.10

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-206-SS

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS	
r_c =	0.08		
R_e =	0.25		
L_e =	14.4	K=	1.76E-05 cm/sec
t_1 (min) =	0	K=	4.99E-02 ft/day
t_2 (min) =	70.4		
h_1/h_0 =	0.94		
h_2/h_0 =	0.08		



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/23/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-206-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

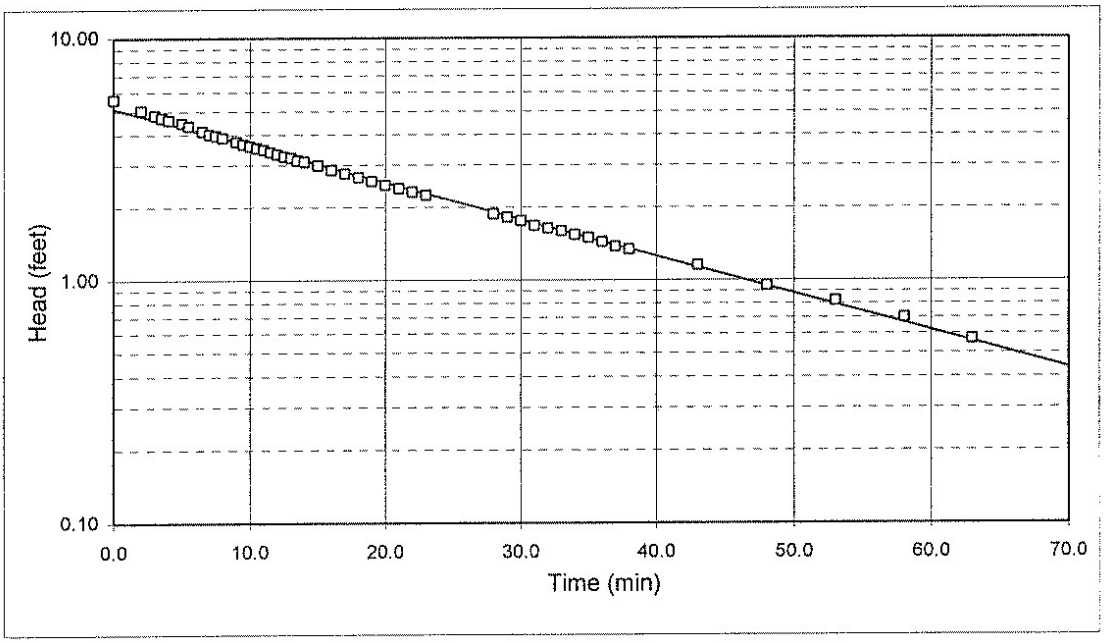
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	14.4
$\ln(R_e/r_w)$	3.41
y_0 =	5.13
y_t =	0.44
t =	70.0

RESULTS

K=	1.13E-05	cm/sec
K=	3.19E-02	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/23/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

RISING HEAD TEST PZ-207-AS

WELL NO. PZ-207-AS

DATE	7/21/95	
INITAL HEAD ON TRANSDUCER	10.316	FEET H_2O
INITIAL DEPTH TO WATER	28.06	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	33.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	41.7	FEET (btoc)
SATURATED THICKNESS	120	FEET
WATER TABLE TO BOTTOM OF SCREEN	13.64	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.25	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	202	1127	32	9.063	0.00	29.31	1.25	1.00
305	202	1127	33	9.3334	0.02	29.04	0.98	0.78
305	202	1127	34	9.5265	0.03	28.85	0.79	0.63
305	202	1127	35	9.6731	0.05	28.70	0.64	0.51
305	202	1127	36	9.7758	0.07	28.60	0.54	0.43
305	202	1127	37	9.8567	0.08	28.52	0.46	0.37
305	202	1127	38	9.9132	0.10	28.46	0.40	0.32
305	202	1127	39	9.9567	0.12	28.42	0.36	0.29
305	202	1127	40	9.9925	0.13	28.38	0.32	0.26
305	202	1127	41	10.017	0.15	28.36	0.30	0.24
305	202	1127	42	10.034	0.17	28.34	0.28	0.23
305	202	1127	43	10.17	0.18	28.21	0.15	0.12
305	202	1127	44	10.184	0.20	28.19	0.13	0.11
305	202	1127	45	10.193	0.22	28.18	0.12	0.10
305	202	1127	46	10.197	0.23	28.18	0.12	0.09
305	202	1127	47	10.204	0.25	28.17	0.11	0.09
305	202	1127	48	10.208	0.27	28.17	0.11	0.09
305	202	1127	49	10.209	0.28	28.17	0.11	0.09
305	202	1127	50	10.214	0.30	28.16	0.10	0.08
305	202	1127	51	10.215	0.32	28.16	0.10	0.08
305	202	1127	52	10.216	0.33	28.16	0.10	0.08
305	202	1127	53	10.218	0.35	28.16	0.10	0.08
305	202	1127	54	10.22	0.37	28.16	0.10	0.08
305	202	1127	55	10.221	0.38	28.16	0.10	0.08

March 1996

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	202	1127	56	10.221	0.40	28.16	0.10	0.08
305	202	1127	57	10.222	0.42	28.15	0.09	0.08
305	202	1127	58	10.223	0.43	28.15	0.09	0.07
305	202	1127	59	10.224	0.45	28.15	0.09	0.07
305	202	1128	0	10.223	0.47	28.15	0.09	0.07
305	202	1128	1	10.224	0.48	28.15	0.09	0.07
305	202	1128	2	10.225	0.50	28.15	0.09	0.07
305	202	1128	3	10.226	0.52	28.15	0.09	0.07
305	202	1128	4	10.225	0.53	28.15	0.09	0.07
305	202	1128	5	10.225	0.55	28.15	0.09	0.07
305	202	1128	6	10.226	0.57	28.15	0.09	0.07
305	202	1128	7	10.225	0.58	28.15	0.09	0.07
305	202	1128	8	10.226	0.60	28.15	0.09	0.07
305	202	1128	9	10.228	0.62	28.15	0.09	0.07
305	202	1128	10	10.226	0.63	28.15	0.09	0.07
305	202	1128	11	10.226	0.65	28.15	0.09	0.07
305	202	1128	12	10.226	0.67	28.15	0.09	0.07
305	202	1128	13	10.226	0.68	28.15	0.09	0.07
305	202	1128	14	10.226	0.70	28.15	0.09	0.07
305	202	1128	15	10.226	0.72	28.15	0.09	0.07
305	202	1128	16	10.227	0.73	28.15	0.09	0.07
305	202	1128	17	10.228	0.75	28.15	0.09	0.07
305	202	1128	18	10.226	0.77	28.15	0.09	0.07
305	202	1128	19	10.228	0.78	28.15	0.09	0.07
305	202	1128	20	10.228	0.80	28.15	0.09	0.07
305	202	1128	21	10.227	0.82	28.15	0.09	0.07
305	202	1128	22	10.229	0.83	28.15	0.09	0.07
305	202	1128	23	10.227	0.85	28.15	0.09	0.07
305	202	1128	24	10.227	0.87	28.15	0.09	0.07
305	202	1128	25	10.227	0.88	28.15	0.09	0.07
305	202	1128	26	10.229	0.90	28.15	0.09	0.07
305	202	1128	27	10.228	0.92	28.15	0.09	0.07
305	202	1128	28	10.228	0.93	28.15	0.09	0.07
305	202	1128	29	10.227	0.95	28.15	0.09	0.07
305	202	1128	30	10.228	0.97	28.15	0.09	0.07
305	202	1128	31	10.228	0.98	28.15	0.09	0.07
305	202	1128	32	10.228	1.00	28.15	0.09	0.07
305	202	1128	33	10.229	1.02	28.15	0.09	0.07
305	202	1128	34	10.228	1.03	28.15	0.09	0.07
305	202	1128	35	10.229	1.05	28.15	0.09	0.07
305	202	1128	36	10.228	1.07	28.15	0.09	0.07
305	202	1128	37	10.228	1.08	28.15	0.09	0.07

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	202	1128	38	10.228	1.10	28.15	0.09	0.07
305	202	1128	39	10.229	1.12	28.15	0.09	0.07
305	202	1128	40	10.228	1.13	28.15	0.09	0.07
305	202	1128	41	10.229	1.15	28.15	0.09	0.07
305	202	1128	42	10.229	1.17	28.15	0.09	0.07
305	202	1128	43	10.23	1.18	28.15	0.09	0.07
305	202	1128	44	10.229	1.20	28.15	0.09	0.07
305	202	1128	45	10.229	1.22	28.15	0.09	0.07
305	202	1128	46	10.228	1.23	28.15	0.09	0.07
305	202	1128	47	10.231	1.25	28.15	0.09	0.07
305	202	1128	48	10.239	1.27	28.14	0.08	0.06
305	202	1128	49	10.239	1.28	28.14	0.08	0.06
305	202	1128	50	10.239	1.30	28.14	0.08	0.06
305	202	1128	51	10.239	1.32	28.14	0.08	0.06
305	202	1128	52	10.24	1.33	28.14	0.08	0.06
305	202	1128	53	10.241	1.35	28.14	0.07	0.06
305	202	1128	54	10.24	1.37	28.14	0.08	0.06
305	202	1128	55	10.24	1.38	28.14	0.08	0.06
305	202	1128	56	10.239	1.40	28.14	0.08	0.06
305	202	1128	57	10.242	1.42	28.13	0.07	0.06
305	202	1128	58	10.24	1.43	28.14	0.08	0.06
305	202	1128	59	10.241	1.45	28.14	0.07	0.06
305	202	1129	0	10.24	1.47	28.14	0.08	0.06
305	202	1129	1	10.24	1.48	28.14	0.08	0.06
305	202	1129	2	10.24	1.50	28.14	0.08	0.06
305	202	1129	3	10.24	1.52	28.14	0.08	0.06
305	202	1129	4	10.24	1.53	28.14	0.08	0.06
305	202	1129	5	10.242	1.55	28.13	0.07	0.06
305	202	1129	6	10.242	1.57	28.13	0.07	0.06
305	202	1129	7	10.242	1.58	28.13	0.07	0.06
305	202	1129	8	10.239	1.60	28.14	0.08	0.06
305	202	1129	9	10.241	1.62	28.14	0.07	0.06
305	202	1129	10	10.241	1.63	28.14	0.07	0.06
305	202	1129	11	10.241	1.65	28.14	0.07	0.06
305	202	1129	12	10.241	1.67	28.14	0.07	0.06
305	202	1129	13	10.242	1.68	28.13	0.07	0.06
305	202	1129	14	10.243	1.70	28.13	0.07	0.06

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-207-AS

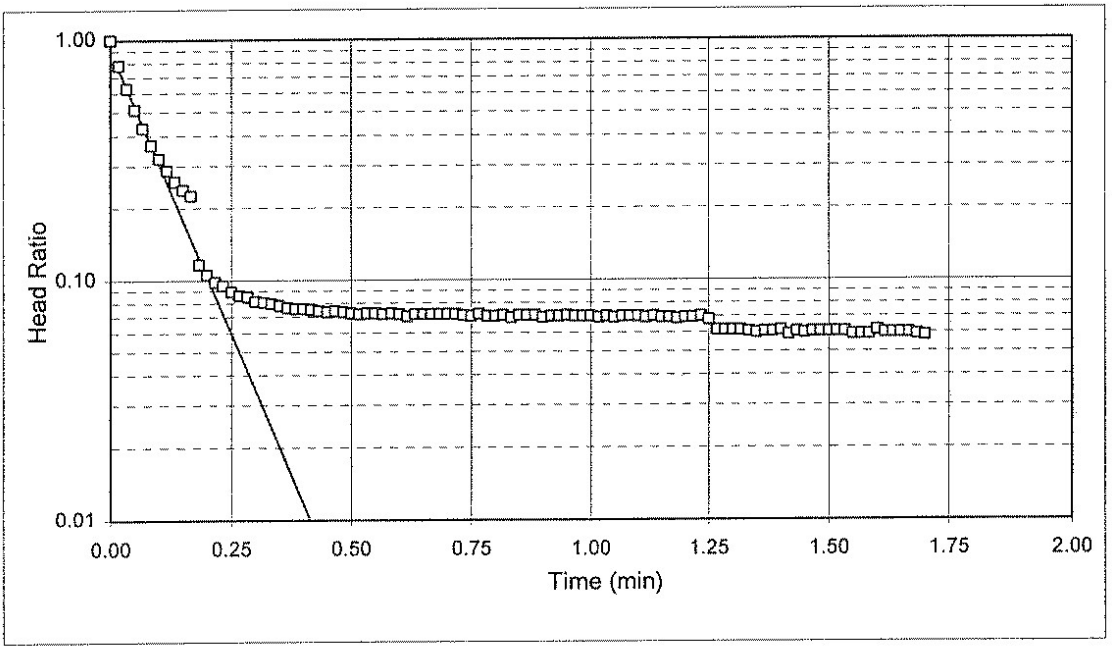
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	8
t_1 (min) =	0.013
t_2 (min) =	0.41
h_1/h_0 =	0.79
h_2/h_0 =	0.01

RESULTS

K=	7.55E-03	cm/sec
K=	2.14E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

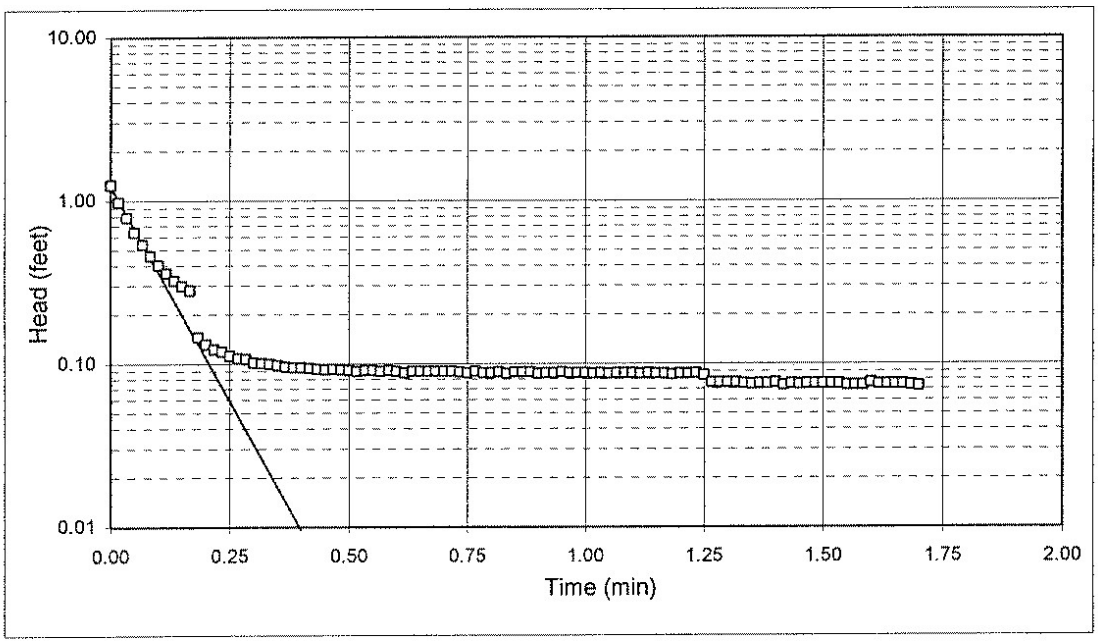
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-207-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	8	K=	4.76E-03	cm/sec
$\ln(R_e/r_w)$	1.78	K=	1.35E+01	ft/day
y_0 =	1.23			
y_t =	0.01			
t =	0.40			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

RISING HEAD TEST PZ-208-SS

WELL NO. PZ-208-SS

DATE	7/25/95	
INITIAL DEPTH TO WATER	37.81	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	85.6	FEET (btoc)
BOTTOM OF OPEN INTERVAL	100.9	FEET (btoc)
SATURATED THICKNESS	190	FEET
WATER TABLE TO BOTTOM OF SCREEN	63.09	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.3	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.92	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1003	0	39.73	0.0	1.92	1.00
1	1004	0	39.71	1.0	1.90	0.99
1	1005	0	39.71	2.0	1.90	0.99
1	1010	0	39.7	7.0	1.89	0.98
1	1018	0	39.69	15.0	1.88	0.98
1	1155	0	39.49	112.0	1.68	0.88
1	1751	0	39.14	468.0	1.33	0.69
2	1241	0	38.42	1598.0	0.61	0.32
2	1627	0	38.29	1824.0	0.48	0.25
3	720	0	37.97	2717.0	0.16	0.08
3	1350	0	37.88	3107.0	0.07	0.04

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-208-SS

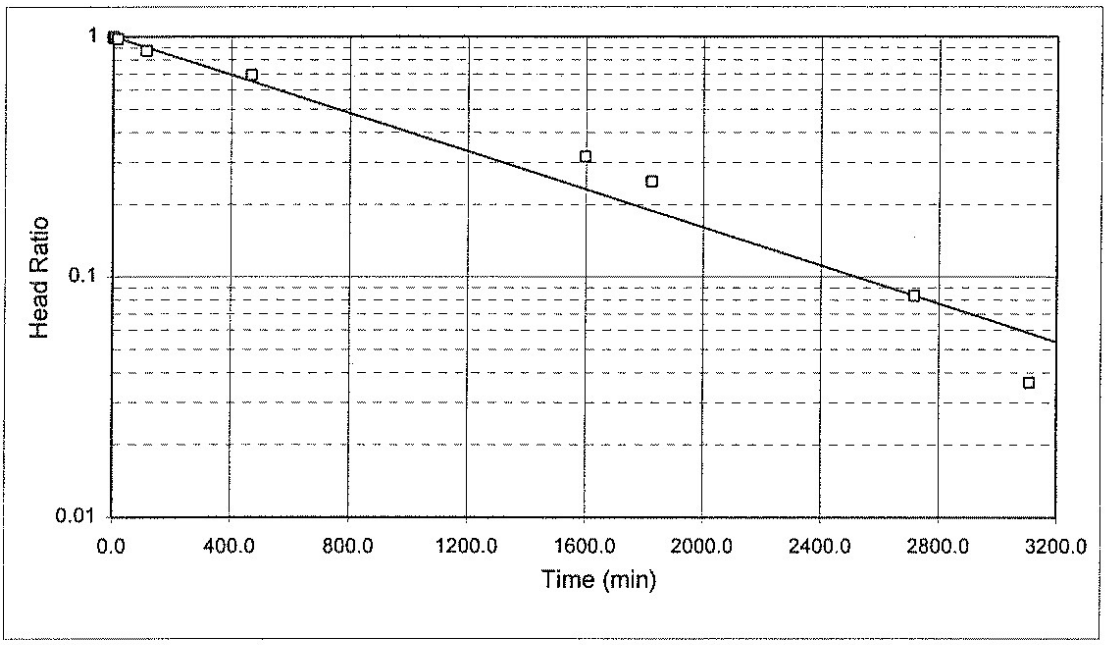
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	15.3
t_1 (min) =	0
t_2 (min) =	3200
h_1/h_0 =	1.00
h_2/h_0 =	0.05

RESULTS

K=	4.33E-07	cm/sec
K=	1.23E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-208-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

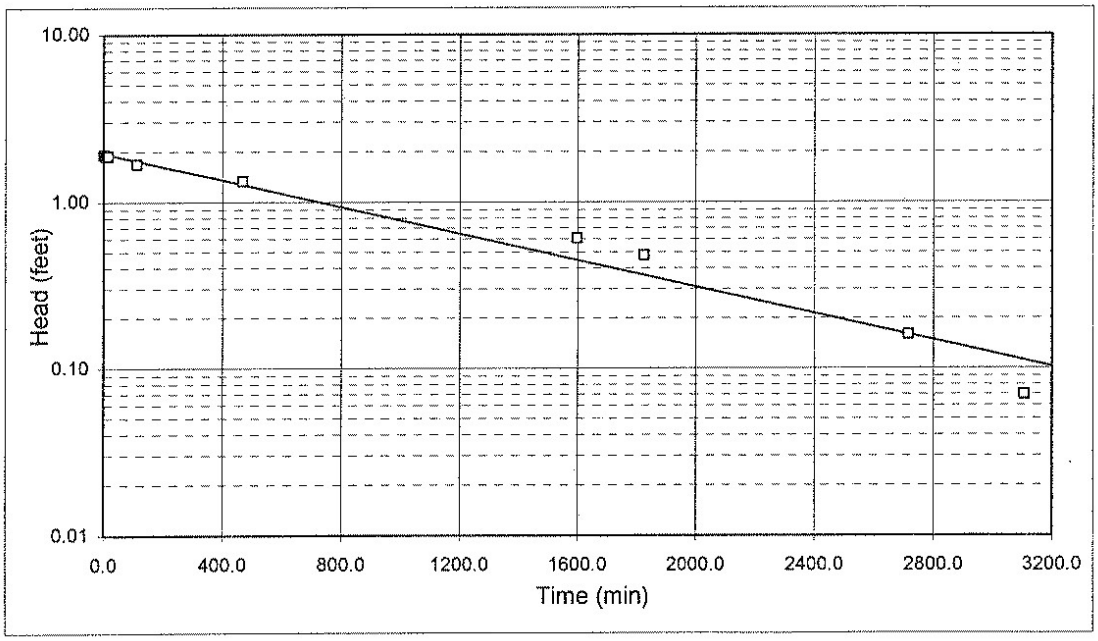
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	15.3
$\ln(R_e/r_w)$	3.26
y_0 =	1.95
y_t =	0.10
t =	3200.0

RESULTS

K=	2.73E-07	cm/sec
K=	7.73E-04	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

FALLING HEAD TEST PZ-300-AS

WELL NO. PZ-300-AS

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	6.69	FEET H_2O
INITIAL DEPTH TO WATER	14.48	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	8.46	FEET (btoc)
BOTTOM OF OPEN INTERVAL	22.16	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.68	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	7.68	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.25	FEET
MAX. HEAD IN SCREEN?	Y	

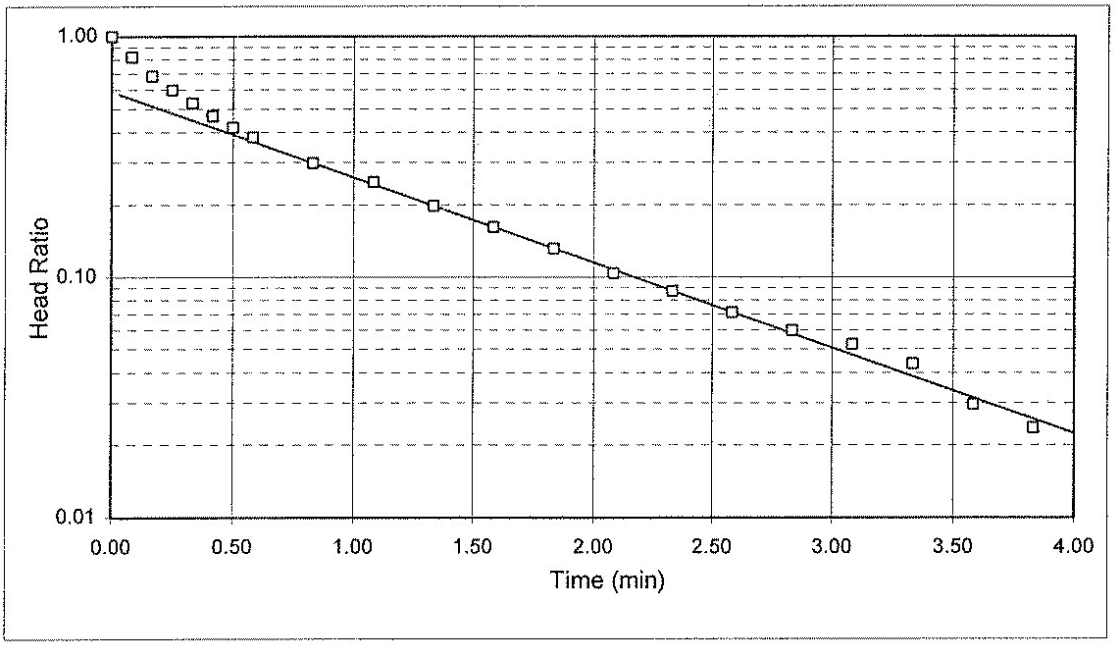
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
307	295	1135	36	6.9399	0.00	14.23	0.25	1.00
307	295	1135	41	6.895	0.08	14.28	0.20	0.82
307	295	1135	46	6.8614	0.17	14.31	0.17	0.69
307	295	1135	51	6.8398	0.25	14.33	0.15	0.60
307	295	1135	56	6.8222	0.33	14.35	0.13	0.53
307	295	1136	1	6.807	0.42	14.36	0.12	0.47
307	295	1136	6	6.7949	0.50	14.38	0.10	0.42
307	295	1136	11	6.7854	0.58	14.38	0.10	0.38
307	295	1136	26	6.7646	0.83	14.41	0.07	0.30
307	295	1136	41	6.7522	1.08	14.42	0.06	0.25
307	295	1136	56	6.7395	1.33	14.43	0.05	0.20
307	295	1137	11	6.7304	1.58	14.44	0.04	0.16
307	295	1137	26	6.7229	1.83	14.45	0.03	0.13
307	295	1137	41	6.7159	2.08	14.45	0.03	0.10
307	295	1137	56	6.7118	2.33	14.46	0.02	0.09
307	295	1138	11	6.7078	2.58	14.46	0.02	0.07
307	295	1138	26	6.705	2.83	14.47	0.02	0.06
307	295	1138	41	6.7031	3.08	14.47	0.01	0.05
307	295	1138	56	6.7009	3.33	14.47	0.01	0.04
307	295	1139	11	6.6974	3.58	14.47	0.01	0.03
307	295	1139	26	6.6959	3.83	14.47	0.01	0.02

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-AS

$$K = \frac{r_c'^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	7.68	K=	5.83E-04	cm/sec
t_1 (min) =	0.03	K=	1.65E+00	ft/day
t_2 (min) =	4.00			
h_1/h_0 =	0.58			
h_2/h_0 =	0.02			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-303-AS

WELL NO. PZ-303-AS

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	6.3	FEET H_2O
INITIAL DEPTH TO WATER	20.96	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	14.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	28.9	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.92	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	7.92	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.62	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1145	17	6.9176	0.00	20.34	0.62	1.00
305	305	1145	18	6.8904	0.02	20.37	0.59	0.96
305	305	1145	19	6.7545	0.03	20.51	0.45	0.74
305	305	1145	20	6.8514	0.05	20.41	0.55	0.89
305	305	1145	21	6.7295	0.07	20.53	0.43	0.70
305	305	1145	22	6.7046	0.08	20.56	0.40	0.66
305	305	1145	23	6.6789	0.10	20.58	0.38	0.61
305	305	1145	24	6.6451	0.12	20.61	0.35	0.56
305	305	1145	25	6.633	0.13	20.63	0.33	0.54
305	305	1145	26	6.6206	0.15	20.64	0.32	0.52
305	305	1145	27	6.6191	0.17	20.64	0.32	0.52
305	305	1145	28	6.6088	0.18	20.65	0.31	0.50
305	305	1145	29	6.6027	0.20	20.66	0.30	0.49
305	305	1145	30	6.5975	0.22	20.66	0.30	0.48
305	305	1145	31	6.5928	0.23	20.67	0.29	0.47
305	305	1145	32	6.5846	0.25	20.68	0.28	0.46
305	305	1145	33	6.5853	0.27	20.67	0.29	0.46
305	305	1145	34	6.5764	0.28	20.68	0.28	0.45
305	305	1145	35	6.5711	0.30	20.69	0.27	0.44
305	305	1145	36	6.5672	0.32	20.69	0.27	0.43
305	305	1145	37	6.5631	0.33	20.70	0.26	0.43
305	305	1145	38	6.5586	0.35	20.70	0.26	0.42
305	305	1145	39	6.5554	0.37	20.70	0.26	0.41
305	305	1145	40	6.5495	0.38	20.71	0.25	0.40
305	305	1145	41	6.5459	0.40	20.71	0.25	0.40
305	305	1145	42	6.5439	0.42	20.72	0.24	0.39
305	305	1145	43	6.5392	0.43	20.72	0.24	0.39

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1145	44	6.5352	0.45	20.72	0.24	0.38
305	305	1145	45	6.5311	0.47	20.73	0.23	0.37
305	305	1145	46	6.5272	0.48	20.73	0.23	0.37
305	305	1145	47	6.5248	0.50	20.74	0.22	0.36
305	305	1145	48	6.5178	0.52	20.74	0.22	0.35
305	305	1145	49	6.5121	0.53	20.75	0.21	0.34
305	305	1145	50	6.5118	0.55	20.75	0.21	0.34
305	305	1145	51	6.5109	0.57	20.75	0.21	0.34
305	305	1145	52	6.5093	0.58	20.75	0.21	0.34
305	305	1145	53	6.5075	0.60	20.75	0.21	0.34
305	305	1145	54	6.5053	0.62	20.75	0.21	0.33
305	305	1145	55	6.5022	0.63	20.76	0.20	0.33
305	305	1145	56	6.5	0.65	20.76	0.20	0.32
305	305	1145	57	6.4975	0.67	20.76	0.20	0.32
305	305	1145	58	6.4947	0.68	20.77	0.19	0.32
305	305	1145	59	6.4922	0.70	20.77	0.19	0.31
305	305	1146	0	6.4907	0.72	20.77	0.19	0.31
305	305	1146	1	6.4879	0.73	20.77	0.19	0.30
305	305	1146	2	6.489	0.75	20.77	0.19	0.31
305	305	1146	3	6.485	0.77	20.78	0.19	0.30
305	305	1146	4	6.4871	0.78	20.77	0.19	0.30
305	305	1146	5	6.3968	0.80	20.86	0.10	0.16
305	305	1146	6	6.4968	0.82	20.76	0.20	0.32
305	305	1146	7	6.4873	0.83	20.77	0.19	0.30
305	305	1146	8	6.4824	0.85	20.78	0.18	0.30
305	305	1146	9	6.4792	0.87	20.78	0.18	0.29
305	305	1146	10	6.4767	0.88	20.78	0.18	0.29
305	305	1146	11	6.4737	0.90	20.79	0.17	0.28
305	305	1146	12	6.4714	0.92	20.79	0.17	0.28
305	305	1146	13	6.4687	0.93	20.79	0.17	0.27
305	305	1146	14	6.4673	0.95	20.79	0.17	0.27
305	305	1146	15	6.4659	0.97	20.79	0.17	0.27
305	305	1146	16	6.4643	0.98	20.80	0.16	0.27
305	305	1146	17	6.4666	1.00	20.79	0.17	0.27
305	305	1146	18	6.465	1.02	20.80	0.16	0.27
305	305	1146	19	6.4608	1.03	20.80	0.16	0.26
305	305	1146	20	6.4656	1.05	20.79	0.17	0.27
305	305	1146	21	6.4583	1.07	20.80	0.16	0.26
305	305	1146	22	6.4613	1.08	20.80	0.16	0.26
305	305	1146	23	6.4606	1.10	20.80	0.16	0.26
305	305	1146	24	6.4562	1.12	20.80	0.16	0.25
305	305	1146	25	6.4551	1.13	20.80	0.16	0.25
305	305	1146	26	6.4573	1.15	20.80	0.16	0.25
305	305	1146	27	6.4571	1.17	20.80	0.16	0.25
305	305	1146	28	6.4521	1.18	20.81	0.15	0.25

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1146	29	6.4508	1.20	20.81	0.15	0.24
305	305	1146	30	6.4507	1.22	20.81	0.15	0.24
305	305	1146	31	6.4527	1.23	20.81	0.15	0.25
305	305	1146	32	6.4513	1.25	20.81	0.15	0.24
305	305	1146	33	6.4476	1.27	20.81	0.15	0.24
305	305	1146	34	6.4488	1.28	20.81	0.15	0.24
305	305	1146	35	6.4485	1.30	20.81	0.15	0.24
305	305	1146	36	6.4466	1.32	20.81	0.15	0.24
305	305	1146	37	6.4463	1.33	20.81	0.15	0.24
305	305	1146	38	6.4403	1.35	20.82	0.14	0.23
305	305	1146	39	6.4402	1.37	20.82	0.14	0.23
305	305	1146	40	6.4422	1.38	20.82	0.14	0.23
305	305	1146	41	6.4373	1.40	20.82	0.14	0.22
305	305	1146	42	6.4396	1.42	20.82	0.14	0.23
305	305	1146	43	6.4381	1.43	20.82	0.14	0.22
305	305	1146	44	6.4349	1.45	20.83	0.13	0.22
305	305	1146	45	6.4393	1.47	20.82	0.14	0.23
305	305	1146	46	6.4363	1.48	20.82	0.14	0.22
305	305	1146	47	6.4352	1.50	20.82	0.14	0.22
305	305	1146	48	6.4338	1.52	20.83	0.13	0.22
305	305	1146	49	6.4337	1.53	20.83	0.13	0.22
305	305	1146	50	6.4314	1.55	20.83	0.13	0.21
305	305	1146	51	6.4319	1.57	20.83	0.13	0.21
305	305	1146	52	6.4306	1.58	20.83	0.13	0.21
305	305	1146	53	6.4283	1.60	20.83	0.13	0.21
305	305	1146	54	6.4248	1.62	20.84	0.12	0.20
305	305	1146	55	6.419	1.63	20.84	0.12	0.19
305	305	1146	56	6.4194	1.65	20.84	0.12	0.19
305	305	1146	57	6.4257	1.67	20.83	0.13	0.20
305	305	1146	58	6.4207	1.68	20.84	0.12	0.20
305	305	1146	59	6.4191	1.70	20.84	0.12	0.19
305	305	1147	0	6.4169	1.72	20.84	0.12	0.19
305	305	1147	1	6.4102	1.73	20.85	0.11	0.18
305	305	1147	2	6.4092	1.75	20.85	0.11	0.18
305	305	1147	3	6.4131	1.77	20.85	0.11	0.18

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-303-AS

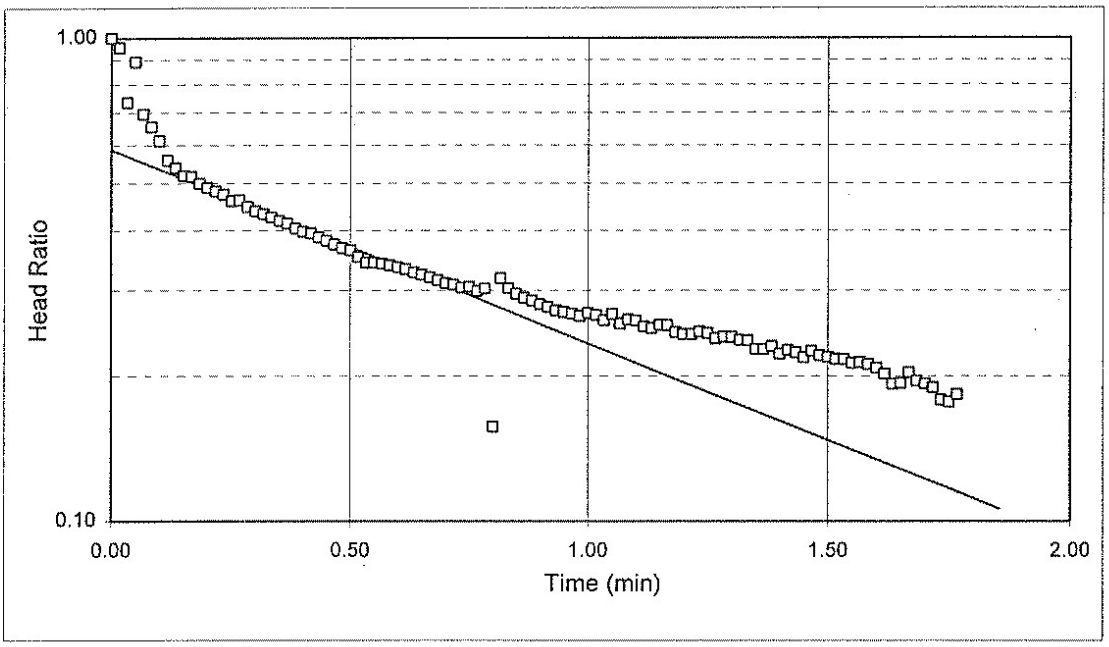
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.43
L_e =	7.92
t_1 (min) =	0
t_2 (min) =	1.86
h_1/h_0 =	0.59
h_2/h_0 =	0.11

RESULTS

K=	6.00E-04	cm/sec
K=	1.70E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-300-AS

WELL NO. PZ-300-AS

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	6.69	FEET H_2O
INITIAL DEPTH TO WATER	14.48	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	8.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	22.2	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.68	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	7.68	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.95	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
307	295	1143	12	5.7409	0.00	15.43	0.95	1.00
307	295	1143	17	6.2245	0.08	14.95	0.47	0.49
307	295	1143	22	6.4359	0.17	14.73	0.25	0.27
307	295	1143	27	6.511	0.25	14.66	0.18	0.19
307	295	1143	32	6.5537	0.33	14.62	0.14	0.14
307	295	1143	37	6.576	0.42	14.59	0.11	0.12
307	295	1143	42	6.5945	0.50	14.58	0.10	0.10
307	295	1143	47	6.6042	0.58	14.57	0.09	0.09
307	295	1143	52	6.6124	0.67	14.56	0.08	0.08
307	295	1144	7	6.6291	0.92	14.54	0.06	0.06
307	295	1144	22	6.6406	1.17	14.53	0.05	0.05
307	295	1144	37	6.6531	1.42	14.52	0.04	0.04
307	295	1144	52	6.6587	1.67	14.51	0.03	0.03
307	295	1145	7	6.6633	1.92	14.51	0.03	0.03
307	295	1145	22	6.6645	2.17	14.51	0.03	0.03
307	295	1145	37	6.6666	2.42	14.50	0.02	0.02
307	295	1145	52	6.6623	2.67	14.51	0.03	0.03

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-300-AS

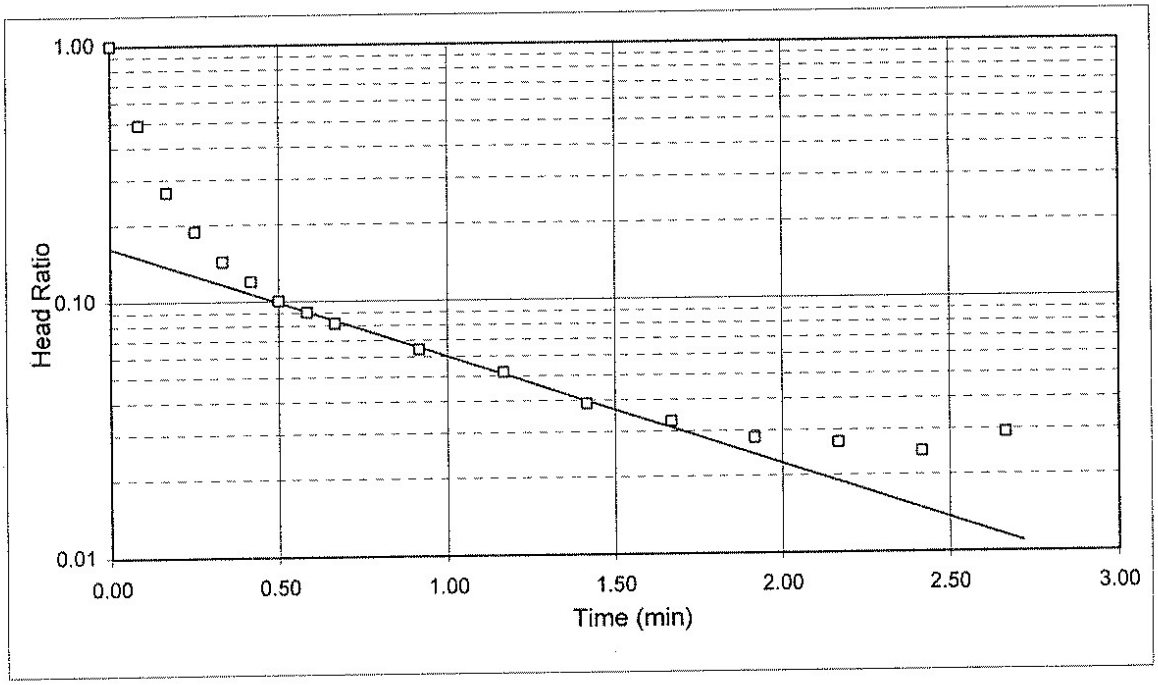
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	7.68
t_1 (min) =	0
t_2 (min) =	2.72
h_1/h_0 =	0.16
h_2/h_0 =	0.01

RESULTS

K=	7.07E-04	cm/sec
K=	2.00E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-300-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

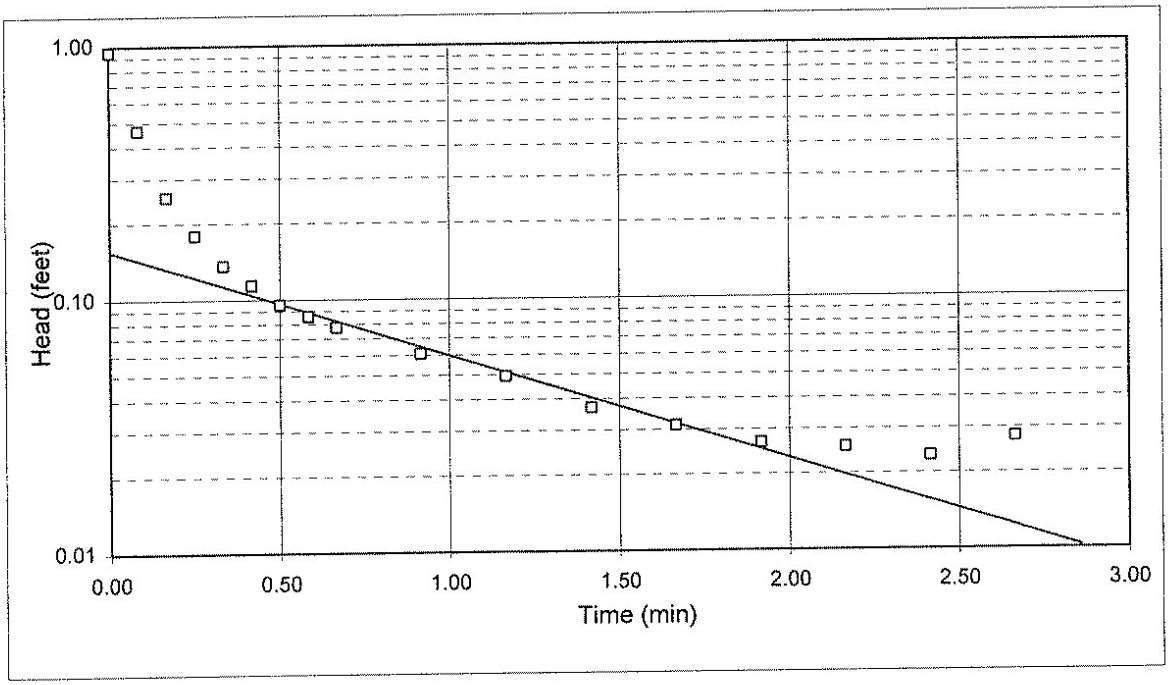
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	7.68
$\ln(R_e/r_w)$	1.68
y_0 =	0.15
y_t =	0.01
t =	2.86

RESULTS

K=	2.13E-03 cm/sec
K=	6.04E+00 ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-300-AD

WELL NO. PZ-300-AD

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	9.93	FEET H_2O
INITIAL DEPTH TO WATER	16.55	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	35.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	43.7	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	27.17	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8.62	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.55	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	841	48	12.475	0.00	14.01	2.55	1.00
305	295	841	50	12.417	0.03	14.06	2.49	0.98
305	295	841	52	12.363	0.07	14.12	2.43	0.96
305	295	841	54	12.317	0.10	14.16	2.39	0.94
305	295	841	56	12.27	0.13	14.21	2.34	0.92
305	295	841	58	12.221	0.17	14.26	2.29	0.90
305	295	842	0	12.176	0.20	14.30	2.25	0.88
305	295	842	2	12.133	0.23	14.35	2.20	0.87
305	295	842	4	12.09	0.27	14.39	2.16	0.85
305	295	842	6	12.047	0.30	14.43	2.12	0.83
305	295	842	8	12.005	0.33	14.48	2.08	0.82
305	295	842	10	11.969	0.37	14.51	2.04	0.80
305	295	842	12	11.926	0.40	14.55	2.00	0.78
305	295	842	14	11.888	0.43	14.59	1.96	0.77
305	295	842	16	11.855	0.47	14.63	1.93	0.76
305	295	842	18	11.816	0.50	14.66	1.89	0.74
305	295	842	20	11.785	0.53	14.70	1.86	0.73
305	295	842	22	11.745	0.57	14.74	1.82	0.71
305	295	842	24	11.712	0.60	14.77	1.78	0.70
305	295	842	26	11.683	0.63	14.80	1.75	0.69
305	295	842	28	11.65	0.67	14.83	1.72	0.68
305	295	842	30	11.62	0.70	14.86	1.69	0.66
305	295	842	32	11.592	0.73	14.89	1.66	0.65
305	295	842	34	11.563	0.77	14.92	1.63	0.64

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	842	36	11.532	0.80	14.95	1.60	0.63
305	295	842	38	11.502	0.83	14.98	1.57	0.62
305	295	842	40	11.477	0.87	15.00	1.55	0.61
305	295	842	42	11.447	0.90	15.03	1.52	0.60
305	295	842	44	11.422	0.93	15.06	1.49	0.59
305	295	842	46	11.396	0.97	15.08	1.47	0.58
305	295	842	48	11.366	1.00	15.11	1.44	0.56
305	295	842	50	11.344	1.03	15.14	1.41	0.56
305	295	842	52	11.318	1.07	15.16	1.39	0.55
305	295	842	54	11.29	1.10	15.19	1.36	0.53
305	295	842	56	11.264	1.13	15.22	1.33	0.52
305	295	842	58	11.241	1.17	15.24	1.31	0.52
305	295	843	0	11.22	1.20	15.26	1.29	0.51
305	295	843	2	11.195	1.23	15.29	1.27	0.50
305	295	843	4	11.174	1.27	15.31	1.24	0.49
305	295	843	6	11.152	1.30	15.33	1.22	0.48
305	295	843	20	11.004	1.53	15.48	1.07	0.42
305	295	843	30	10.912	1.70	15.57	0.98	0.39
305	295	843	40	10.822	1.87	15.66	0.89	0.35
305	295	843	50	10.746	2.03	15.73	0.82	0.32
305	295	844	0	10.672	2.20	15.81	0.74	0.29
305	295	844	10	10.608	2.37	15.87	0.68	0.27
305	295	844	20	10.55	2.53	15.93	0.62	0.24
305	295	844	30	10.496	2.70	15.98	0.57	0.22
305	295	844	40	10.439	2.87	16.04	0.51	0.20
305	295	844	50	10.394	3.03	16.09	0.46	0.18
305	295	845	0	10.354	3.20	16.13	0.42	0.17
305	295	845	10	10.314	3.37	16.17	0.38	0.15
305	295	845	20	10.277	3.53	16.20	0.35	0.14
305	295	845	30	10.251	3.70	16.23	0.32	0.13
305	295	845	40	10.212	3.87	16.27	0.28	0.11
305	295	845	50	10.192	4.03	16.29	0.26	0.10
305	295	846	0	10.167	4.20	16.31	0.24	0.09
305	295	846	10	10.145	4.37	16.34	0.22	0.08
305	295	846	20	10.123	4.53	16.36	0.19	0.08
305	295	846	30	10.104	4.70	16.38	0.17	0.07
305	295	846	40	10.089	4.87	16.39	0.16	0.06
305	295	846	50	10.071	5.03	16.41	0.14	0.06
305	295	847	0	10.058	5.20	16.42	0.13	0.05
305	295	847	10	10.045	5.37	16.44	0.11	0.05
305	295	847	20	10.031	5.53	16.45	0.10	0.04
305	295	847	30	10.021	5.70	16.46	0.09	0.04

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	847	40	10.011	5.87	16.47	0.08	0.03
305	295	847	50	10.004	6.03	16.48	0.07	0.03
305	295	848	0	9.994	6.20	16.49	0.06	0.03
305	295	848	10	9.9889	6.37	16.49	0.06	0.02
305	295	848	20	9.9813	6.53	16.50	0.05	0.02
305	295	848	30	9.9767	6.70	16.50	0.05	0.02
305	295	848	40	9.9688	6.87	16.51	0.04	0.02
305	295	848	50	9.9641	7.03	16.52	0.03	0.01
305	295	849	0	9.9593	7.20	16.52	0.03	0.01
305	295	849	10	9.9588	7.37	16.52	0.03	0.01
305	295	849	20	9.9523	7.53	16.53	0.02	0.01
305	295	849	30	9.9478	7.70	16.53	0.02	0.01
305	295	849	40	9.9475	7.87	16.53	0.02	0.01
305	295	849	50	9.9463	8.03	16.53	0.02	0.01
305	295	850	0	9.9377	8.20	16.54	0.01	0.00
305	295	850	30	9.933	8.70	16.55	0.00	0.00
305	295	850	44	9.9316	8.93	16.55	0.00	0.00
305	295	850	46	9.9311	8.97	16.55	0.00	0.00
305	295	850	48	9.931	9.00	16.55	0.00	0.00
305	295	850	50	9.9279	9.03	16.55	0.00	0.00
305	295	850	52	9.9295	9.07	16.55	0.00	0.00
305	295	850	54	9.9298	9.10	16.55	0.00	0.00
305	295	850	56	9.9297	9.13	16.55	0.00	0.00
305	295	850	58	9.929	9.17	16.55	0.00	0.00

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-AD

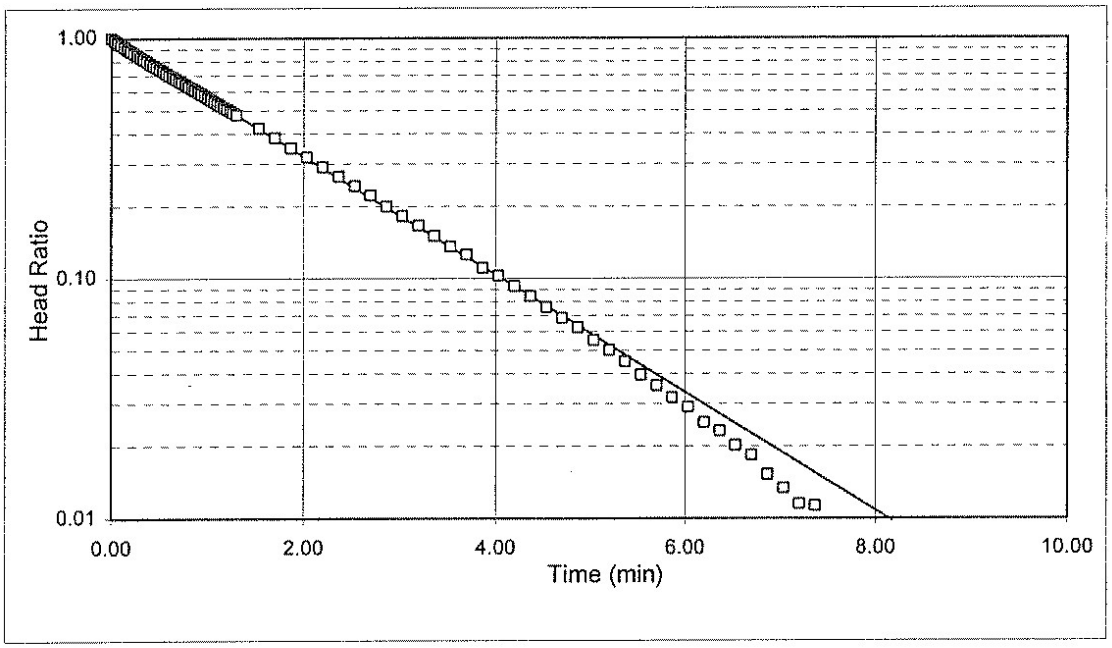
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	8.62
t_1 (min) =	0
t_2 (min) =	8.18
h_1/h_0 =	1.00
h_2/h_0 =	1.00

RESULTS

K=	3.73E-04	cm/sec
K=	1.06E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-AD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

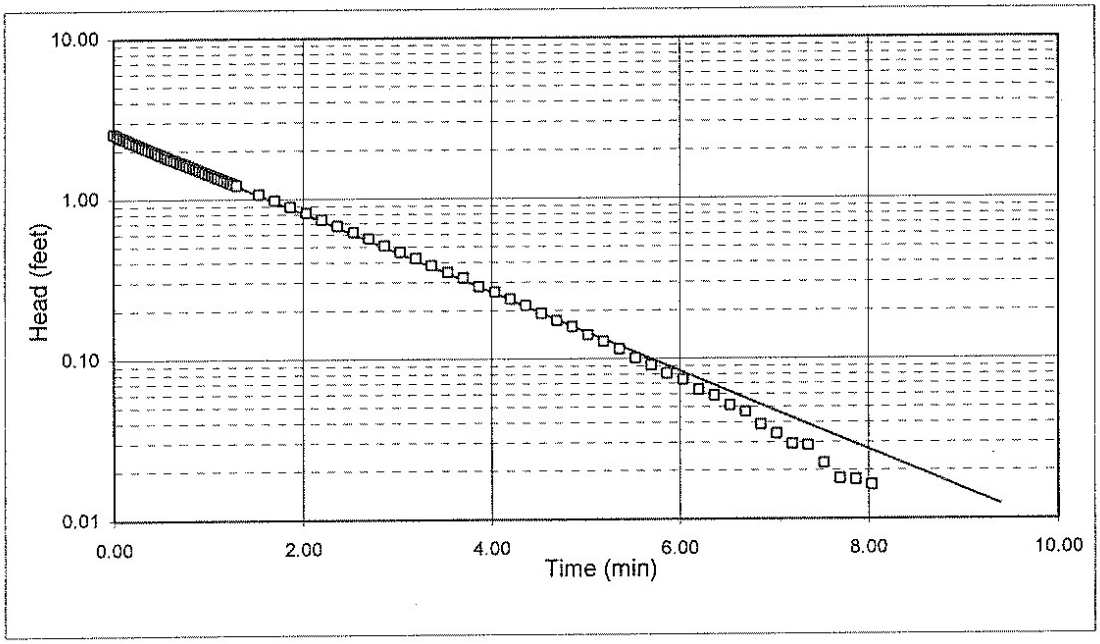
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	8.62
$\ln(R_e/r_w)$	2.35
y_0 =	2.51
y_t =	0.01
t =	9.40

RESULTS

K=	2.72E-04	cm/sec
K=	7.72E-01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-300-AD

WELL NO. PZ-300-AD

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	9.93	FEET H_2O
INITIAL DEPTH TO WATER	16.55	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	35.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	43.7	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	27.15	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8.6	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.13	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	851	2	6.8026	0.00	19.68	3.13	1.00
305	295	851	4	6.8462	0.03	19.63	3.08	0.99
305	295	851	6	6.9483	0.07	19.53	2.98	0.95
305	295	851	8	6.9944	0.10	19.49	2.94	0.94
305	295	851	10	7.0197	0.13	19.46	2.91	0.93
305	295	851	12	7.0565	0.17	19.42	2.87	0.92
305	295	851	14	7.0863	0.20	19.39	2.84	0.91
305	295	851	16	7.1148	0.23	19.37	2.82	0.90
305	295	851	18	7.1418	0.27	19.34	2.79	0.89
305	295	851	20	7.1667	0.30	19.31	2.76	0.88
305	295	851	22	7.1922	0.33	19.29	2.74	0.88
305	295	851	24	7.2145	0.37	19.27	2.72	0.87
305	295	851	26	7.2381	0.40	19.24	2.69	0.86
305	295	851	28	7.2621	0.43	19.22	2.67	0.85
305	295	851	30	7.2825	0.47	19.20	2.65	0.85
305	295	851	32	7.3067	0.50	19.17	2.62	0.84
305	295	851	34	7.3281	0.53	19.15	2.60	0.83
305	295	851	36	7.3481	0.57	19.13	2.58	0.83
305	295	851	38	7.3735	0.60	19.11	2.56	0.82
305	295	851	40	7.3843	0.63	19.10	2.55	0.81
305	295	851	42	7.4092	0.67	19.07	2.52	0.81
305	295	851	44	7.427	0.70	19.05	2.50	0.80
305	295	851	46	7.4521	0.73	19.03	2.48	0.79
305	295	851	48	7.4716	0.77	19.01	2.46	0.79
305	295	851	50	7.4888	0.80	18.99	2.44	0.78
305	295	851	52	7.5094	0.83	18.97	2.42	0.77
305	295	851	54	7.5276	0.87	18.95	2.40	0.77
305	295	851	56	7.5449	0.90	18.94	2.39	0.76
305	295	851	58	7.5651	0.93	18.91	2.36	0.76
305	295	852	0	7.5779	0.97	18.90	2.35	0.75

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	852	2	7.5964	1.00	18.88	2.33	0.75
305	295	852	4	7.6172	1.03	18.86	2.31	0.74
305	295	852	6	7.634	1.07	18.85	2.30	0.73
305	295	852	8	7.6503	1.10	18.83	2.28	0.73
305	295	852	10	7.6672	1.13	18.81	2.26	0.72
305	295	852	12	7.6855	1.17	18.79	2.24	0.72
305	295	852	14	7.702	1.20	18.78	2.23	0.71
305	295	852	16	7.7187	1.23	18.76	2.21	0.71
305	295	852	18	7.7351	1.27	18.74	2.19	0.70
305	295	852	20	7.7513	1.30	18.73	2.18	0.70
305	295	852	22	7.7683	1.33	18.71	2.16	0.69
305	295	852	24	7.7829	1.37	18.70	2.15	0.69
305	295	852	26	7.7991	1.40	18.68	2.13	0.68
305	295	852	28	7.8145	1.43	18.67	2.12	0.68
305	295	852	30	7.8298	1.47	18.65	2.10	0.67
305	295	852	32	7.8455	1.50	18.63	2.08	0.67
305	295	852	34	7.8606	1.53	18.62	2.07	0.66
305	295	852	36	7.8794	1.57	18.60	2.05	0.66
305	295	852	38	7.8948	1.60	18.59	2.04	0.65
305	295	852	40	7.9108	1.63	18.57	2.02	0.65
305	295	852	42	7.9243	1.67	18.56	2.01	0.64
305	295	852	44	7.9407	1.70	18.54	1.99	0.64
305	295	852	46	7.9525	1.73	18.53	1.98	0.63
305	295	852	48	7.9703	1.77	18.51	1.96	0.63
305	295	852	50	7.9841	1.80	18.50	1.95	0.62
305	295	852	52	7.9973	1.83	18.48	1.93	0.62
305	295	852	54	8.0127	1.87	18.47	1.92	0.61
305	295	852	56	8.0307	1.90	18.45	1.90	0.61
305	295	852	58	8.044	1.93	18.44	1.89	0.60
305	295	853	0	8.052	1.97	18.43	1.88	0.60
305	295	853	2	8.0681	2.00	18.41	1.86	0.60
305	295	853	10	8.1272	2.13	18.35	1.80	0.58
305	295	853	20	8.1926	2.30	18.29	1.74	0.56
305	295	853	30	8.2542	2.47	18.23	1.68	0.54
305	295	853	40	8.3159	2.63	18.16	1.61	0.52
305	295	853	50	8.3751	2.80	18.10	1.55	0.50
305	295	854	0	8.4301	2.97	18.05	1.50	0.48
305	295	854	10	8.4846	3.13	18.00	1.45	0.46
305	295	854	20	8.5435	3.30	17.94	1.39	0.44
305	295	854	30	8.5945	3.47	17.89	1.34	0.43
305	295	854	40	8.6398	3.63	17.84	1.29	0.41
305	295	854	50	8.6851	3.80	17.79	1.24	0.40
305	295	855	0	8.7309	3.97	17.75	1.20	0.38
305	295	855	10	8.7786	4.13	17.70	1.15	0.37
305	295	855	20	8.8196	4.30	17.66	1.11	0.36
305	295	855	30	8.8617	4.47	17.62	1.07	0.34
305	295	855	40	8.9019	4.63	17.58	1.03	0.33
305	295	855	50	8.9404	4.80	17.54	0.99	0.32

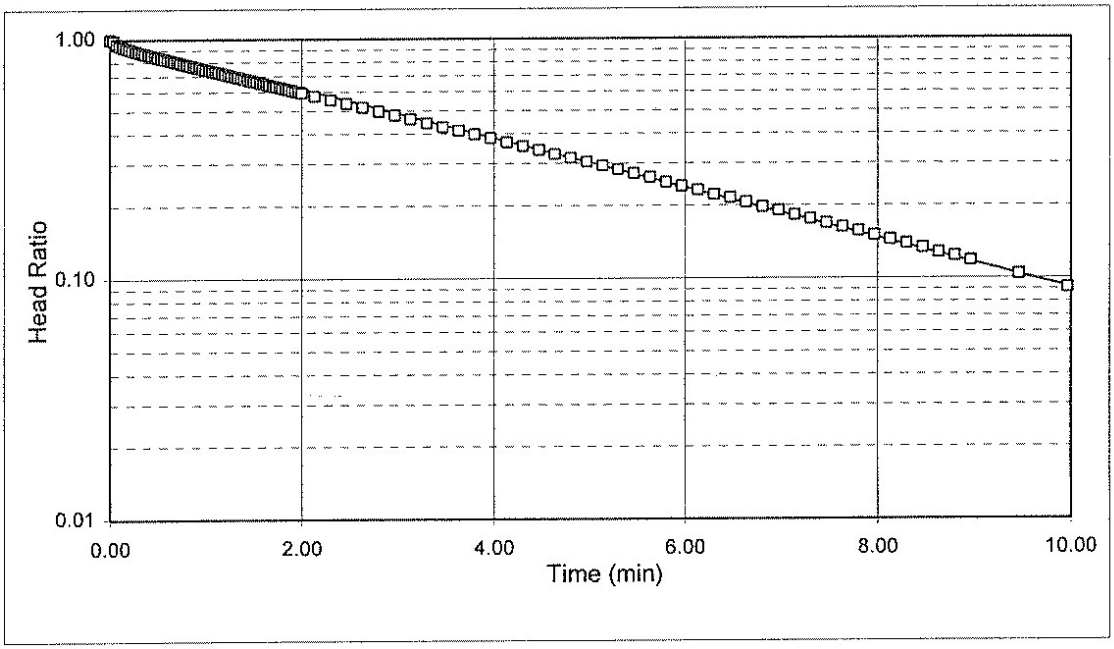
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	856	0	8.9782	4.97	17.50	0.95	0.30
305	295	856	10	9.0138	5.13	17.47	0.92	0.29
305	295	856	20	9.0454	5.30	17.43	0.88	0.28
305	295	856	30	9.0792	5.47	17.40	0.85	0.27
305	295	856	40	9.1093	5.63	17.37	0.82	0.26
305	295	856	50	9.1488	5.80	17.33	0.78	0.25
305	295	857	0	9.1761	5.97	17.30	0.75	0.24
305	295	857	10	9.2054	6.13	17.27	0.72	0.23
305	295	857	20	9.2345	6.30	17.25	0.70	0.22
305	295	857	30	9.2554	6.47	17.22	0.67	0.22
305	295	857	40	9.2843	6.63	17.20	0.65	0.21
305	295	857	50	9.3116	6.80	17.17	0.62	0.20
305	295	858	0	9.3325	6.97	17.15	0.60	0.19
305	295	858	10	9.3577	7.13	17.12	0.57	0.18
305	295	858	20	9.3798	7.30	17.10	0.55	0.18
305	295	858	30	9.4009	7.47	17.08	0.53	0.17
305	295	858	40	9.4203	7.63	17.06	0.51	0.16
305	295	858	50	9.4399	7.80	17.04	0.49	0.16
305	295	859	0	9.459	7.97	17.02	0.47	0.15
305	295	859	10	9.4773	8.13	17.00	0.45	0.14
305	295	859	20	9.4948	8.30	16.99	0.44	0.14
305	295	859	30	9.5117	8.47	16.97	0.42	0.13
305	295	859	40	9.5297	8.63	16.95	0.40	0.13
305	295	859	50	9.5437	8.80	16.94	0.39	0.12
305	295	900	0	9.5594	8.97	16.92	0.37	0.12
305	295	900	30	9.6053	9.47	16.87	0.32	0.10
305	295	901	0	9.644	9.97	16.84	0.29	0.09
305	295	901	30	9.6756	10.47	16.80	0.25	0.08
305	295	902	0	9.7028	10.97	16.78	0.23	0.07
305	295	902	30	9.7316	11.47	16.75	0.20	0.06
305	295	903	0	9.7594	11.97	16.72	0.17	0.05
305	295	903	30	9.7817	12.47	16.70	0.15	0.05
305	295	904	0	9.7995	12.97	16.68	0.13	0.04
305	295	904	30	9.8121	13.47	16.67	0.12	0.04
305	295	905	0	9.8268	13.97	16.65	0.10	0.03
305	295	905	30	9.8384	14.47	16.64	0.09	0.03
305	295	906	0	9.85	14.97	16.63	0.08	0.03
305	295	906	30	9.8624	15.47	16.62	0.07	0.02
305	295	907	0	9.8725	15.97	16.61	0.06	0.02
305	295	907	30	9.8824	16.47	16.60	0.05	0.02
305	295	908	0	9.8892	16.97	16.59	0.04	0.01
305	295	908	30	9.8959	17.47	16.58	0.03	0.01
305	295	909	0	9.8989	17.97	16.58	0.03	0.01
305	295	909	30	9.9022	18.47	16.58	0.03	0.01
305	295	910	0	9.9109	18.97	16.57	0.02	0.01
305	295	910	30	9.9113	19.47	16.57	0.02	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-300-AD

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	8.6	K=	1.58E-04	cm/sec
t_1 (win) =	0	K=	4.48E-01	ft/day
t_2 (win) =	10.00			
h_1/h_0 =	1.00			
h_2/h_0 =	0.09			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-300-AD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

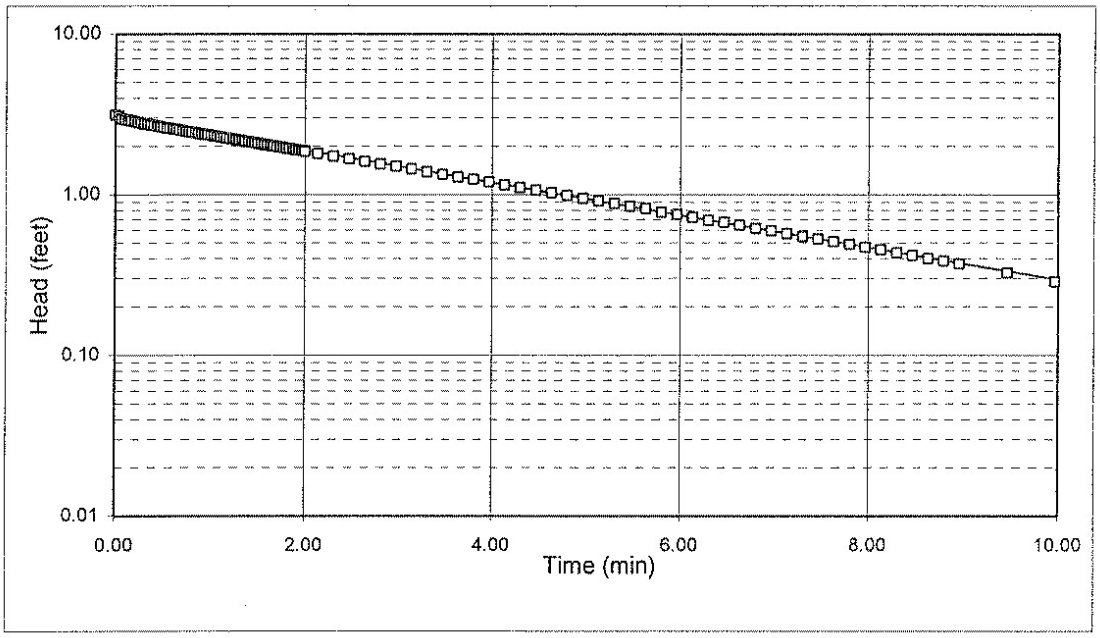
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	8.6
$\ln(R_e/r_w)$	2.35
y_0 =	3.02
y_t =	0.30
t =	10.00

RESULTS

K=	1.12E-04	cm/sec
K=	3.18E-01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-300-SS

WELL NO. PZ-300-SS

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	9.81	FEET H_2O
INITIAL DEPTH TO WATER	21.1	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	81.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	95.7	FEET (btoc)
SATURATED THICKNESS	160	FEET
WATER TABLE TO BOTTOM OF SCREEN	74.6	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.22	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1407	34	14.032	0.00	16.88	4.22	1.00
305	295	1407	36	13.028	0.03	17.88	3.22	0.76
305	295	1407	38	12.925	0.07	17.99	3.12	0.74
305	295	1407	40	12.913	0.10	18.00	3.10	0.73
305	295	1407	42	12.902	0.13	18.01	3.09	0.73
305	295	1407	44	12.891	0.17	18.02	3.08	0.73
305	295	1407	46	12.879	0.20	18.03	3.07	0.73
305	295	1407	48	12.868	0.23	18.04	3.06	0.72
305	295	1407	50	12.861	0.27	18.05	3.05	0.72
305	295	1407	52	12.849	0.30	18.06	3.04	0.72
305	295	1407	54	12.843	0.33	18.07	3.03	0.72
305	295	1407	56	12.833	0.37	18.08	3.02	0.72
305	295	1407	58	12.824	0.40	18.09	3.01	0.71
305	295	1408	0	12.816	0.43	18.09	3.01	0.71
305	295	1408	2	12.807	0.47	18.10	3.00	0.71
305	295	1408	4	12.799	0.50	18.11	2.99	0.71
305	295	1408	6	12.791	0.53	18.12	2.98	0.71
305	295	1408	8	12.783	0.57	18.13	2.97	0.70
305	295	1408	10	12.778	0.60	18.13	2.97	0.70
305	295	1408	12	12.767	0.63	18.14	2.96	0.70
305	295	1408	14	12.762	0.67	18.15	2.95	0.70
305	295	1408	16	12.753	0.70	18.16	2.94	0.70
305	295	1408	18	12.747	0.73	18.16	2.94	0.70
305	295	1408	20	12.739	0.77	18.17	2.93	0.69
305	295	1408	22	12.732	0.80	18.18	2.92	0.69
305	295	1408	24	12.727	0.83	18.18	2.92	0.69
305	295	1408	26	12.716	0.87	18.19	2.91	0.69
305	295	1408	28	12.714	0.90	18.20	2.90	0.69
305	295	1408	30	12.709	0.93	18.20	2.90	0.69
305	295	1408	32	12.702	0.97	18.21	2.89	0.68

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1408	34	12.696	1.00	18.21	2.89	0.68
305	295	1408	36	12.69	1.03	18.22	2.88	0.68
305	295	1408	38	12.684	1.07	18.23	2.87	0.68
305	295	1408	40	12.677	1.10	18.23	2.87	0.68
305	295	1408	42	12.669	1.13	18.24	2.86	0.68
305	295	1408	44	12.663	1.17	18.25	2.85	0.68
305	295	1408	46	12.655	1.20	18.26	2.85	0.67
305	295	1408	48	12.649	1.23	18.26	2.84	0.67
305	295	1408	50	12.643	1.27	18.27	2.83	0.67
305	295	1408	52	12.637	1.30	18.27	2.83	0.67
305	295	1409	0	12.616	1.43	18.29	2.81	0.66
305	295	1409	10	12.598	1.60	18.31	2.79	0.66
305	295	1409	20	12.568	1.77	18.34	2.76	0.65
305	295	1409	30	12.544	1.93	18.37	2.73	0.65
305	295	1409	40	12.529	2.10	18.38	2.72	0.64
305	295	1409	50	12.521	2.27	18.39	2.71	0.64
305	295	1410	0	12.505	2.43	18.41	2.70	0.64
305	295	1410	10	12.495	2.60	18.42	2.69	0.64
305	295	1410	20	12.479	2.77	18.43	2.67	0.63
305	295	1410	30	12.47	2.93	18.44	2.66	0.63
305	295	1410	40	12.46	3.10	18.45	2.65	0.63
305	295	1410	50	12.456	3.27	18.45	2.65	0.63
305	295	1411	0	12.45	3.43	18.46	2.64	0.63
305	295	1412	0	12.425	4.43	18.49	2.62	0.62
305	295	1413	0	12.403	5.43	18.51	2.59	0.61
305	295	1414	0	12.38	6.43	18.53	2.57	0.61
305	295	1415	0	12.361	7.43	18.55	2.55	0.60
305	295	1416	0	12.338	8.43	18.57	2.53	0.60
305	295	1417	0	12.317	9.43	18.59	2.51	0.59
305	295	1418	0	12.296	10.43	18.61	2.49	0.59
305	295	1419	0	12.278	11.43	18.63	2.47	0.58
305	295	1420	0	12.261	12.43	18.65	2.45	0.58
305	295	1421	0	12.244	13.43	18.67	2.43	0.58
305	295	1422	0	12.228	14.43	18.68	2.42	0.57
305	295	1423	0	12.21	15.43	18.70	2.40	0.57
305	295	1424	0	12.197	16.43	18.71	2.39	0.57
305	295	1425	0	12.18	17.43	18.73	2.37	0.56
305	295	1426	0	12.169	18.43	18.74	2.36	0.56
305	295	1427	0	12.148	19.43	18.76	2.34	0.55
305	295	1430	0	12.109	22.43	18.80	2.30	0.54
305	295	1440	0	12	32.43	18.91	2.19	0.52
305	295	1450	0	11.907	42.43	19.00	2.10	0.50
305	295	1500	0	11.822	52.43	19.09	2.01	0.48
305	295	1510	0	11.746	62.43	19.16	1.94	0.46
305	295	1519	40	11.678	72.10	19.23	1.87	0.44
305	295	1519	50	11.682	72.27	19.23	1.87	0.44
305	295	1520	0	11.683	72.43	19.23	1.87	0.44
305	295	1520	10	11.68	72.60	19.23	1.87	0.44

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1520	20	11.681	72.77	19.23	1.87	0.44
305	295	1520	30	11.68	72.93	19.23	1.87	0.44
305	295	1520	40	11.677	73.10	19.23	1.87	0.44
305	295	1520	50	11.679	73.27	19.23	1.87	0.44
305	295	1521	0	11.675	73.43	19.24	1.87	0.44
305	295	1521	10	11.67	73.60	19.24	1.86	0.44
305	295	1521	20	11.671	73.77	19.24	1.86	0.44
305	295	1521	30	11.67	73.93	19.24	1.86	0.44
305	295	1521	40	11.669	74.10	19.24	1.86	0.44
305	295	1521	50	11.672	74.27	19.24	1.86	0.44
305	295	1522	0	11.672	74.43	19.24	1.86	0.44
305	295	1522	10	11.67	74.60	19.24	1.86	0.44
305	295	1522	20	11.668	74.77	19.24	1.86	0.44
305	295	1522	30	11.667	74.93	19.24	1.86	0.44
305	295	1522	40	11.666	75.10	19.24	1.86	0.44
305	295	1522	50	11.666	75.27	19.24	1.86	0.44
305	295	1523	0	11.664	75.43	19.25	1.85	0.44
305	295	1523	10	11.662	75.60	19.25	1.85	0.44
305	295	1523	20	11.662	75.77	19.25	1.85	0.44
305	295	1523	30	11.66	75.93	19.25	1.85	0.44
305	295	1523	40	11.659	76.10	19.25	1.85	0.44
305	295	1523	50	11.658	76.27	19.25	1.85	0.44
305	295	1524	0	11.657	76.43	19.25	1.85	0.44
305	295	1524	10	11.656	76.60	19.25	1.85	0.44
305	295	1524	20	11.655	76.77	19.26	1.85	0.44
305	295	1524	30	11.653	76.93	19.26	1.84	0.44
305	295	1524	40	11.652	77.10	19.26	1.84	0.44
305	295	1524	50	11.65	77.27	19.26	1.84	0.44
305	295	1525	0	11.65	77.43	19.26	1.84	0.44
305	295	1525	10	11.649	77.60	19.26	1.84	0.44
305	295	1525	20	11.647	77.77	19.26	1.84	0.44
305	295	1525	30	11.646	77.93	19.26	1.84	0.43
305	295	1525	40	11.645	78.10	19.27	1.84	0.43
305	295	1525	50	11.644	78.27	19.27	1.83	0.43
305	295	1526	0	11.644	78.43	19.27	1.83	0.43
305	295	1526	10	11.641	78.60	19.27	1.83	0.43
305	295	1526	20	11.64	78.77	19.27	1.83	0.43
305	295	1526	30	11.639	78.93	19.27	1.83	0.43
305	295	1526	40	11.637	79.10	19.27	1.83	0.43
305	295	1526	50	11.636	79.27	19.27	1.83	0.43
305	295	1527	0	11.636	79.43	19.27	1.83	0.43
305	295	1527	10	11.636	79.60	19.27	1.83	0.43
305	295	1527	20	11.637	79.77	19.27	1.83	0.43
305	295	1527	30	11.633	79.93	19.28	1.82	0.43
305	295	1527	40	11.631	80.10	19.28	1.82	0.43
305	295	1527	50	11.632	80.27	19.28	1.82	0.43
305	295	1528	0	11.631	80.43	19.28	1.82	0.43
305	295	1528	10	11.629	80.60	19.28	1.82	0.43

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1528	20	11.625	80.77	19.29	1.82	0.43
305	295	1528	30	11.628	80.93	19.28	1.82	0.43
305	295	1528	40	11.624	81.10	19.29	1.81	0.43
305	295	1528	50	11.624	81.27	19.29	1.81	0.43
305	295	1529	0	11.624	81.43	19.29	1.81	0.43
305	295	1529	10	11.622	81.60	19.29	1.81	0.43
305	295	1529	20	11.621	81.77	19.29	1.81	0.43
305	295	1529	30	11.621	81.93	19.29	1.81	0.43
305	295	1529	40	11.619	82.10	19.29	1.81	0.43
305	295	1529	50	11.616	82.27	19.29	1.81	0.43
305	295	1530	0	11.617	82.43	19.29	1.81	0.43
305	295	1530	10	11.616	82.60	19.29	1.81	0.43
305	295	1530	20	11.616	82.77	19.29	1.81	0.43
305	295	1600	0	11.46	112.43	19.45	1.65	0.39
305	295	1630	0	11.345	142.43	19.57	1.54	0.36
305	295	1700	0	11.241	172.43	19.67	1.43	0.34
305	295	1730	0	11.146	202.43	19.76	1.34	0.32
305	295	1800	0	11.077	232.43	19.83	1.27	0.30
305	295	1900	0	10.951	292.43	19.96	1.14	0.27
305	295	2000	0	10.832	352.43	20.08	1.02	0.24
305	295	2100	0	10.734	412.43	20.18	0.92	0.22
305	295	2200	0	10.637	472.43	20.27	0.83	0.20
305	295	2300	0	10.557	532.43	20.35	0.75	0.18
305	296	0	0	10.475	592.43	20.44	0.66	0.16
305	296	100	0	10.403	652.43	20.51	0.59	0.14
305	296	200	0	10.361	712.43	20.55	0.55	0.13
305	296	300	0	10.316	772.43	20.59	0.51	0.12
305	296	400	0	10.279	832.43	20.63	0.47	0.11
305	296	500	0	10.258	892.43	20.65	0.45	0.11
305	296	600	0	10.213	952.43	20.70	0.40	0.10
305	296	700	0	10.188	1012.43	20.72	0.38	0.09
305	296	800	0	10.21	1072.43	20.70	0.40	0.09

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-SS

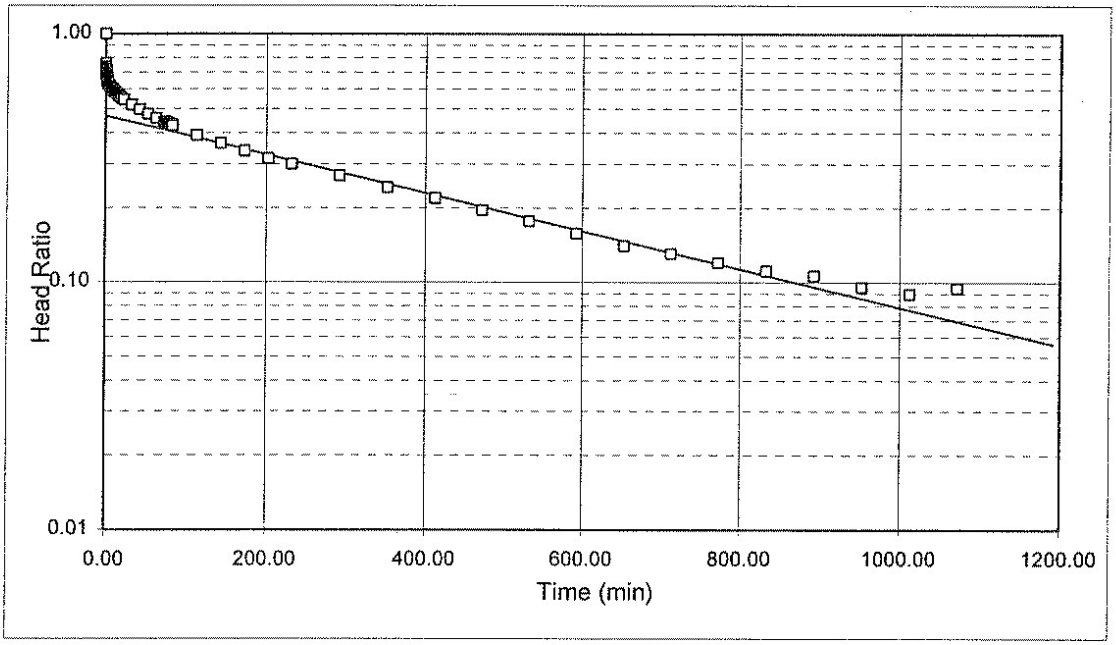
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2-t1)}\right]30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	14
t_1 (min) =	0
t_2 (min) =	1192.00
h_1/h_0 =	0.47
h_2/h_0 =	0.06

RESULTS

K=	9.01E-07	cm/sec
K=	2.55E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

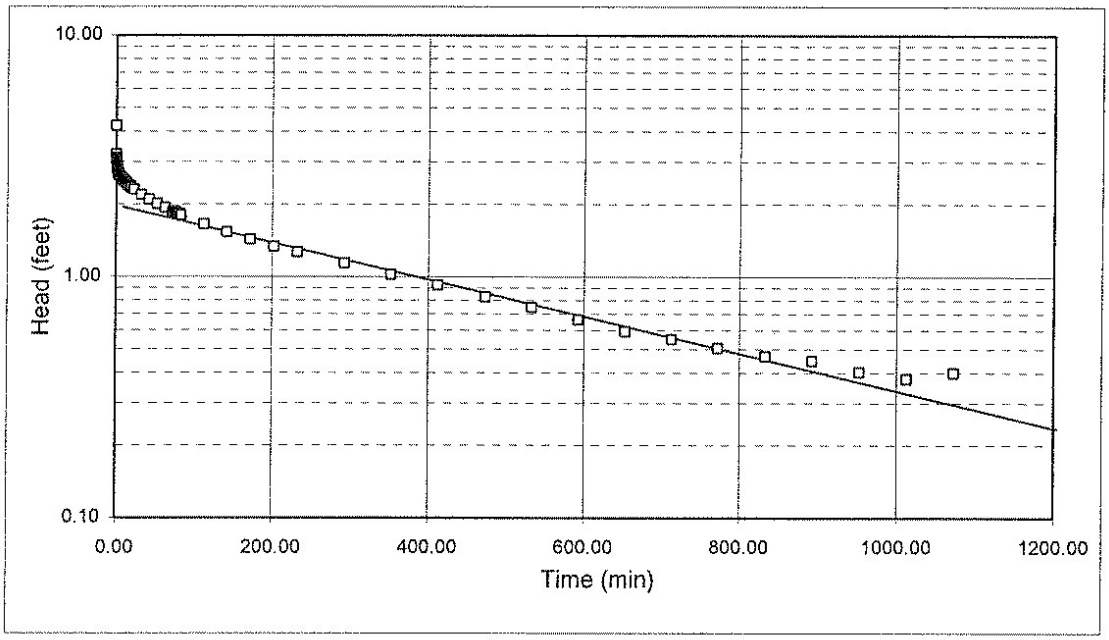
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.25
L_e =	14
$\ln(R_e/r_w)$	3.48
y_0 =	1.96
y_t =	0.23
t =	1204.00

RESULTS

K=	7.73E-07 cm/sec
K=	2.19E-03 ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-301-SS

WELL NO. PZ-301-SS

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	na	FEET H_2O
INITIAL DEPTH TO WATER	157.56	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	148.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	163.1	FEET (btoc)
SATURATED THICKNESS	100	FEET
WATER TABLE TO BOTTOM OF SCREEN	5.54	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	5.54	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	2.11	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1444	0	159.67	0.00	159.67	2.11	1.00
305	295	1444	30	159.16	0.50	159.16	1.60	0.76
305	295	1445	0	159.08	1.00	159.08	1.52	0.72
305	295	1445	30	158.98	1.50	158.98	1.42	0.67
305	295	1446	0	158.93	2.00	158.93	1.37	0.65
305	295	1446	30	158.9	2.50	158.9	1.34	0.64
305	295	1447	0	158.88	3.00	158.88	1.32	0.63
305	295	1447	30	158.84	3.50	158.84	1.28	0.61
305	295	1448	0	158.84	4.00	158.84	1.28	0.61
305	295	1448	30	158.82	4.50	158.82	1.26	0.60
305	295	1449	0	158.8	5.00	158.8	1.24	0.59
305	295	1449	30	158.79	5.50	158.79	1.23	0.58
305	295	1450	0	158.78	6.00	158.78	1.22	0.58
305	295	1451	0	158.78	7.00	158.78	1.22	0.58
305	295	1452	0	158.74	8.00	158.74	1.18	0.56
305	295	1453	0	158.73	9.00	158.73	1.17	0.55
305	295	1454	0	158.71	10.00	158.71	1.15	0.55
305	295	1455	0	158.7	11.00	158.7	1.14	0.54
305	295	1500	0	158.68	16.00	158.68	1.12	0.53
305	295	1552	0	158.56	68.00	158.56	1.00	0.47
305	295	1643	0	158.54	119.00	158.54	0.98	0.46
305	295	1744	0	158.51	180.00	158.51	0.95	0.45
305	295	2023	0	158.46	339.00	158.46	0.90	0.43
305	296	705	0	158.04	981.00	158.04	0.48	0.23

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-301-SS

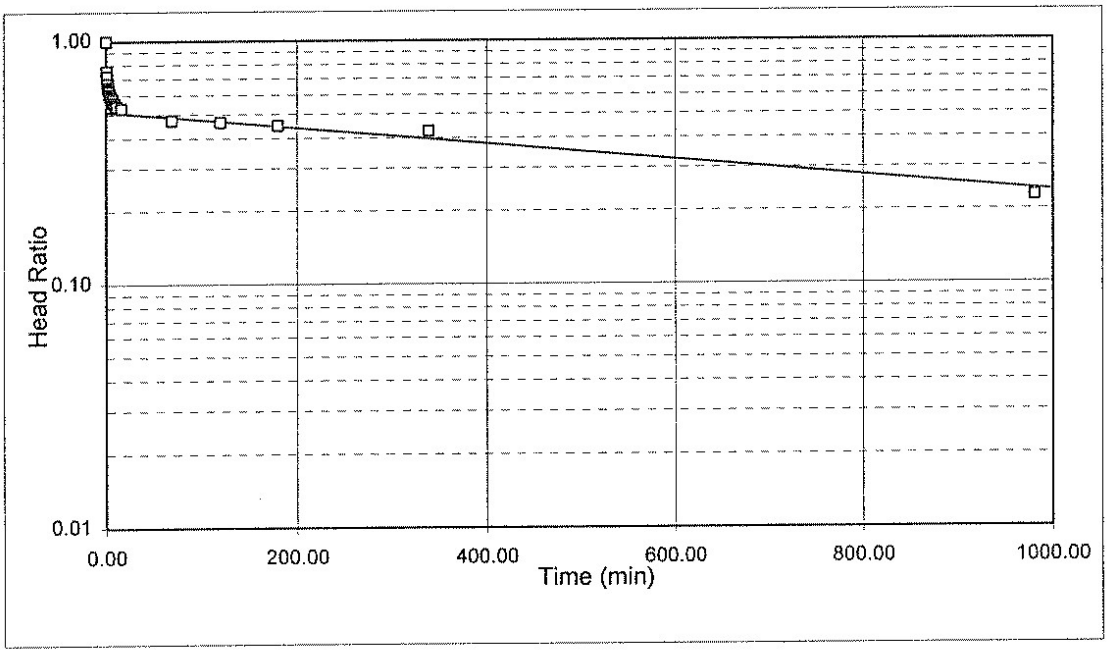
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.25
L_e =	5.54
t_1 (min) =	0
t_2 (min) =	997.00
h_1/h_0 =	0.51
h_2/h_0 =	0.24

RESULTS

K=	7.52E-07	cm/sec
K=	2.13E-03	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-302-AS

WELL NO. PZ-302-AS

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	5.25	FEET H_2O
INITIAL DEPTH TO WATER	18.97	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	10.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	24.2	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	5.25	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	5.25	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.89	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1301	14	6.1448	0.00	18.08	0.89	1.00
305	298	1301	16	6.0465	0.03	18.17	0.80	0.89
305	298	1301	18	6.0451	0.07	18.17	0.80	0.89
305	298	1301	20	6.0416	0.10	18.18	0.79	0.88
305	298	1301	22	6.0347	0.13	18.19	0.78	0.88
305	298	1301	24	6.032	0.17	18.19	0.78	0.87
305	298	1301	26	6.032	0.20	18.19	0.78	0.87
305	298	1301	28	6.028	0.23	18.19	0.78	0.87
305	298	1301	30	6.0219	0.27	18.20	0.77	0.86
305	298	1301	32	6.0193	0.30	18.20	0.77	0.86
305	298	1301	34	6.0163	0.33	18.20	0.77	0.86
305	298	1301	36	6.0116	0.37	18.21	0.76	0.85
305	298	1301	38	6.0074	0.40	18.21	0.76	0.85
305	298	1301	40	6.0035	0.43	18.22	0.75	0.84
305	298	1301	42	5.9986	0.47	18.22	0.75	0.84
305	298	1301	44	5.9934	0.50	18.23	0.74	0.83
305	298	1301	46	5.9895	0.53	18.23	0.74	0.83
305	298	1301	48	5.9852	0.57	18.23	0.74	0.82
305	298	1301	50	5.9795	0.60	18.24	0.73	0.82
305	298	1301	52	5.9767	0.63	18.24	0.73	0.81
305	298	1301	54	5.972	0.67	18.25	0.72	0.81
305	298	1302	0	5.9613	0.77	18.26	0.71	0.79
305	298	1302	10	5.9406	0.93	18.28	0.69	0.77
305	298	1302	20	5.9185	1.10	18.30	0.67	0.75

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1302	30	5.9028	1.27	18.32	0.65	0.73
305	298	1302	40	5.8839	1.43	18.34	0.63	0.71
305	298	1302	50	5.8677	1.60	18.35	0.62	0.69
305	298	1303	0	5.8535	1.77	18.37	0.60	0.67
305	298	1303	10	5.8368	1.93	18.38	0.59	0.66
305	298	1303	20	5.8208	2.10	18.40	0.57	0.64
305	298	1303	30	5.8092	2.27	18.41	0.56	0.62
305	298	1303	40	5.7968	2.43	18.42	0.55	0.61
305	298	1303	50	5.7858	2.60	18.43	0.54	0.60
305	298	1304	30	5.7469	3.27	18.47	0.50	0.56
305	298	1305	0	5.7202	3.77	18.50	0.47	0.53
305	298	1305	30	5.6898	4.27	18.53	0.44	0.49
305	298	1306	0	5.6727	4.77	18.55	0.42	0.47
305	298	1306	30	5.645	5.27	18.58	0.40	0.44
305	298	1307	0	5.6225	5.77	18.60	0.37	0.42
305	298	1307	30	5.6014	6.27	18.62	0.35	0.39
305	298	1308	0	5.5873	6.77	18.63	0.34	0.38
305	298	1308	30	5.5613	7.27	18.66	0.31	0.35
305	298	1309	0	5.541	7.77	18.68	0.29	0.33
305	298	1309	30	5.5296	8.27	18.69	0.28	0.31
305	298	1310	0	5.5112	8.77	18.71	0.26	0.29
305	298	1310	30	5.4965	9.27	18.72	0.25	0.28
305	298	1311	0	5.4883	9.77	18.73	0.24	0.27
305	298	1311	30	5.4754	10.27	18.74	0.23	0.25
305	298	1312	0	5.4562	10.77	18.76	0.21	0.23
305	298	1312	30	5.4405	11.27	18.78	0.19	0.21
305	298	1313	0	5.4343	11.77	18.79	0.18	0.21
305	298	1315	0	5.4005	13.77	18.82	0.15	0.17
305	298	1320	0	5.3411	18.77	18.88	0.09	0.10

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-302-AS

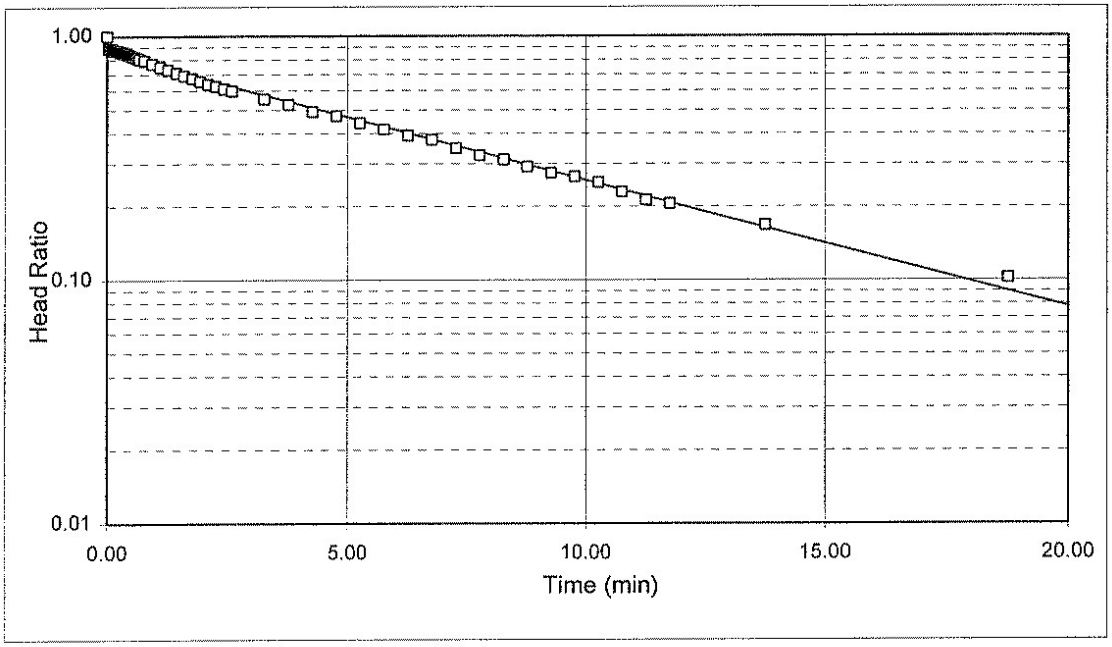
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	5.25
t_1 (min) =	0
t_2 (min) =	20.00
h_1/h_0 =	0.85
h_2/h_0 =	0.08

RESULTS

K=	1.10E-04	cm/sec
K=	3.11E-01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-302-AS

WELL NO. PZ-302-AS

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	5.25	FEET H_2O
INITIAL DEPTH TO WATER	18.97	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	10.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	24.2	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	5.25	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	5.25	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.98	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1321	2	3.2668	0.00	20.95	1.98	1.00
305	298	1321	4	3.3596	0.03	20.86	1.89	0.95
305	298	1321	6	3.4169	0.07	20.80	1.83	0.92
305	298	1321	8	3.4495	0.10	20.77	1.80	0.91
305	298	1321	10	3.4796	0.13	20.74	1.77	0.89
305	298	1321	12	3.5151	0.17	20.70	1.73	0.87
305	298	1321	14	3.5516	0.20	20.67	1.70	0.86
305	298	1321	16	3.5814	0.23	20.64	1.67	0.84
305	298	1321	18	3.6061	0.27	20.61	1.64	0.83
305	298	1321	20	3.637	0.30	20.58	1.61	0.81
305	298	1321	22	3.6609	0.33	20.56	1.59	0.80
305	298	1321	24	3.6831	0.37	20.54	1.57	0.79
305	298	1321	26	3.7066	0.40	20.51	1.54	0.78
305	298	1321	28	3.731	0.43	20.49	1.52	0.77
305	298	1321	30	3.7522	0.47	20.47	1.50	0.76
305	298	1321	32	3.7779	0.50	20.44	1.47	0.74
305	298	1321	34	3.7976	0.53	20.42	1.45	0.73
305	298	1321	36	3.8146	0.57	20.41	1.44	0.72
305	298	1321	38	3.8337	0.60	20.39	1.42	0.71
305	298	1321	40	3.851	0.63	20.37	1.40	0.71
305	298	1321	42	3.8669	0.67	20.35	1.38	0.70
305	298	1321	44	3.8807	0.70	20.34	1.37	0.69
305	298	1321	46	3.8964	0.73	20.32	1.35	0.68
305	298	1321	48	3.9103	0.77	20.31	1.34	0.68

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1321	50	3.9252	0.80	20.29	1.32	0.67
305	298	1321	52	3.9371	0.83	20.28	1.31	0.66
305	298	1321	54	3.9497	0.87	20.27	1.30	0.66
305	298	1321	56	3.9632	0.90	20.26	1.29	0.65
305	298	1321	58	3.9799	0.93	20.24	1.27	0.64
305	298	1322	0	3.9929	0.97	20.23	1.26	0.63
305	298	1322	2	4.0024	1.00	20.22	1.25	0.63
305	298	1322	4	4.0122	1.03	20.21	1.24	0.62
305	298	1322	6	4.0211	1.07	20.20	1.23	0.62
305	298	1322	8	4.0303	1.10	20.19	1.22	0.62
305	298	1322	20	4.0851	1.30	20.13	1.16	0.59
305	298	1322	30	4.1325	1.47	20.09	1.12	0.56
305	298	1322	40	4.1745	1.63	20.05	1.08	0.54
305	298	1322	50	4.2057	1.80	20.01	1.04	0.53
305	298	1323	0	4.2387	1.97	19.98	1.01	0.51
305	298	1323	10	4.2652	2.13	19.95	0.98	0.50
305	298	1323	20	4.2926	2.30	19.93	0.96	0.48
305	298	1323	30	4.3195	2.47	19.90	0.93	0.47
305	298	1323	40	4.3498	2.63	19.87	0.90	0.45
305	298	1323	50	4.373	2.80	19.85	0.88	0.44
305	298	1324	0	4.3936	2.97	19.83	0.86	0.43
305	298	1324	10	4.4141	3.13	19.81	0.84	0.42
305	298	1325	0	4.5115	3.97	19.71	0.74	0.37
305	298	1326	0	4.6081	4.97	19.61	0.64	0.32
305	298	1327	0	4.6884	5.97	19.53	0.56	0.28
305	298	1328	0	4.7512	6.97	19.47	0.50	0.25
305	298	1329	0	4.814	7.97	19.41	0.44	0.22
305	298	1330	0	4.8557	8.97	19.36	0.39	0.20
305	298	1335	0	4.9976	13.97	19.22	0.25	0.13
305	298	1340	0	5.0548	18.97	19.17	0.20	0.10

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-302-AS

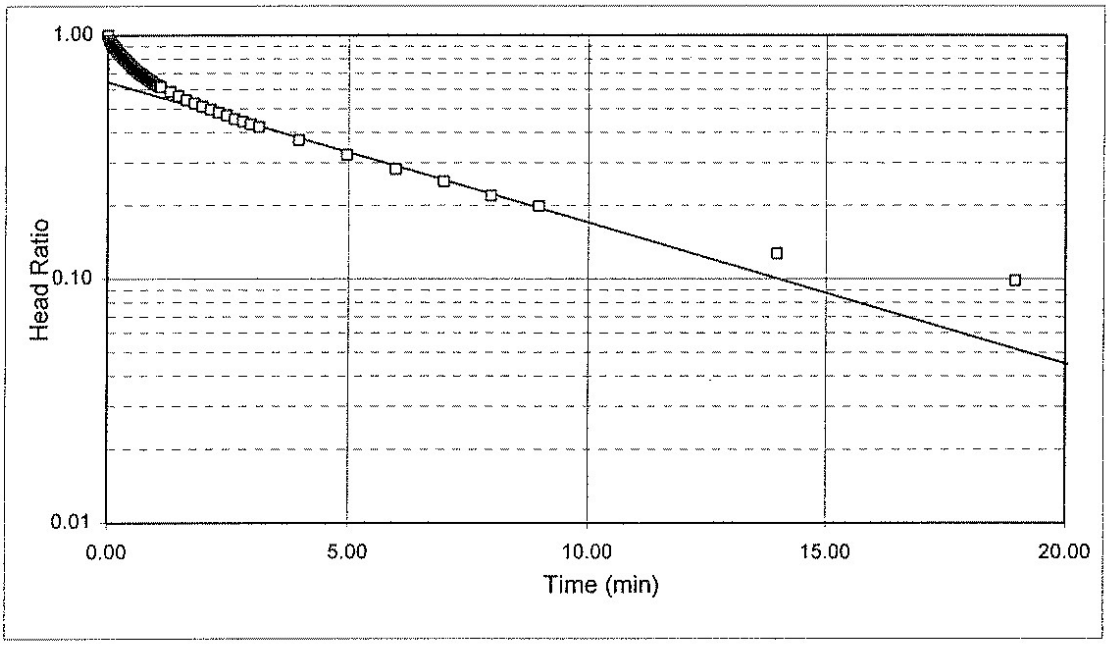
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	5.25
t_1 (min) =	0
t_2 (min) =	20.06
h_1/h_0 =	0.65
h_2/h_0 =	0.04

RESULTS

K=	1.22E-04	cm/sec
K=	3.46E-01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-302-AI

WELL NO. PZ-302-AI

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	10.1	FEET H_2O
INITIAL DEPTH TO WATER	18.90	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	28.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	44.2	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	25.25	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	16	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	0.94	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1108	58	11.035	0.00	17.97	0.94	1.00
305	298	1109	0	10.369	0.03	18.63	0.27	0.29
305	298	1109	2	10.203	0.07	18.80	0.10	0.11
305	298	1109	4	10.129	0.10	18.87	0.03	0.03
305	298	1109	6	10.107	0.13	18.89	0.01	0.01
305	298	1109	8	10.09	0.17	18.89	0.01	0.01

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-302-AI

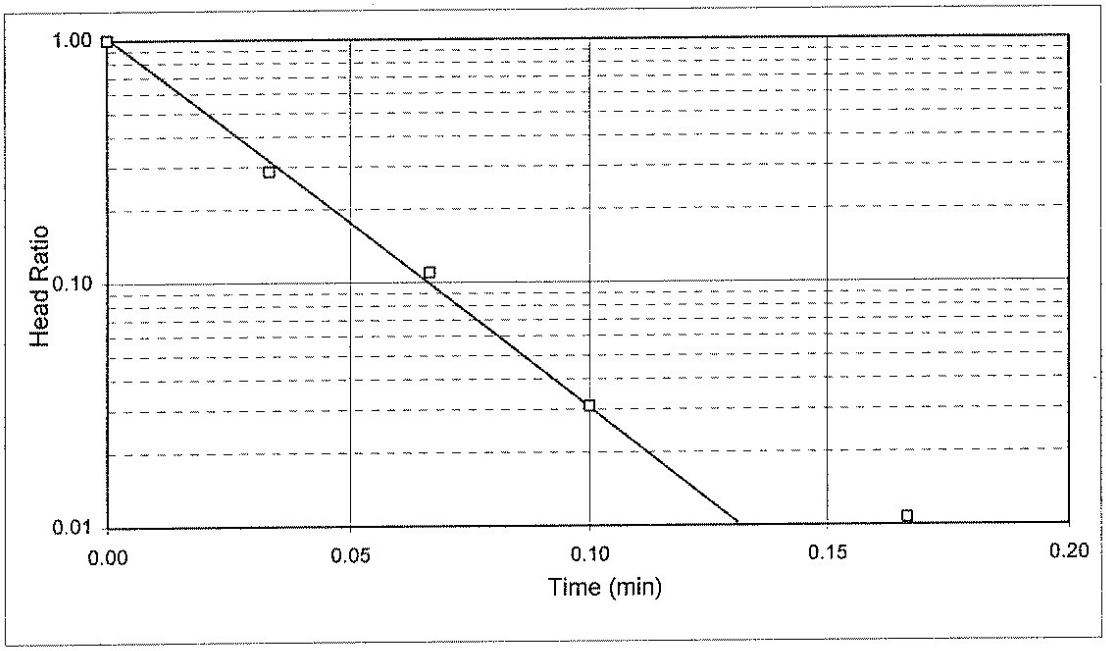
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	16
t_1 (min) =	0
t_2 (min) =	0.13
h_1/h_0 =	1.02
h_2/h_0 =	0.01

RESULTS

K=	1.48E-02	cm/sec
K=	4.21E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-302-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

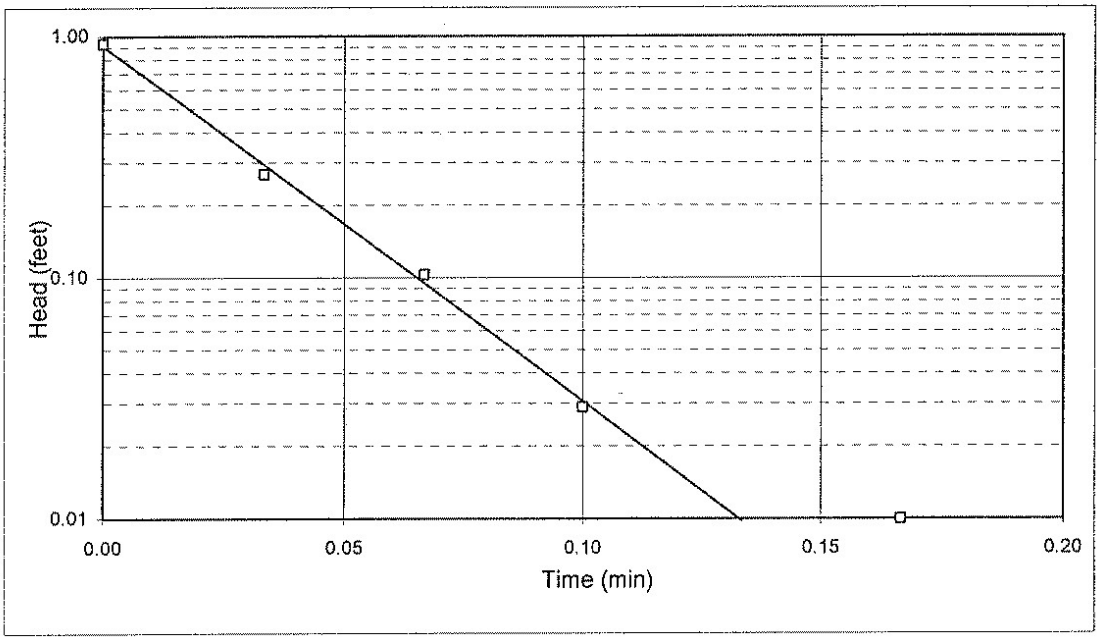
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	16
$\ln(R_e/r_w)$	2.61
y_0 =	0.91
y_t =	0.01
t =	0.13

RESULTS

K=	9.78E-03	cm/sec
K=	2.77E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-302-AI

WELL NO. PZ-302-AI

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	10.1	FEET H_2O
INITIAL DEPTH TO WATER	18.90	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	28.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	44.2	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	25.25	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	16	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.59	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1111	28	5.5104	0.00	23.49	4.59	1.00
305	298	1111	30	9.1419	0.03	19.86	0.96	0.21
305	298	1111	32	9.8217	0.07	19.18	0.28	0.06
305	298	1111	34	10.013	0.10	18.99	0.09	0.02
305	298	1111	36	10.071	0.13	18.93	0.03	0.01
305	298	1111	38	10.088	0.17	18.91	0.01	0.00

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-302-AI

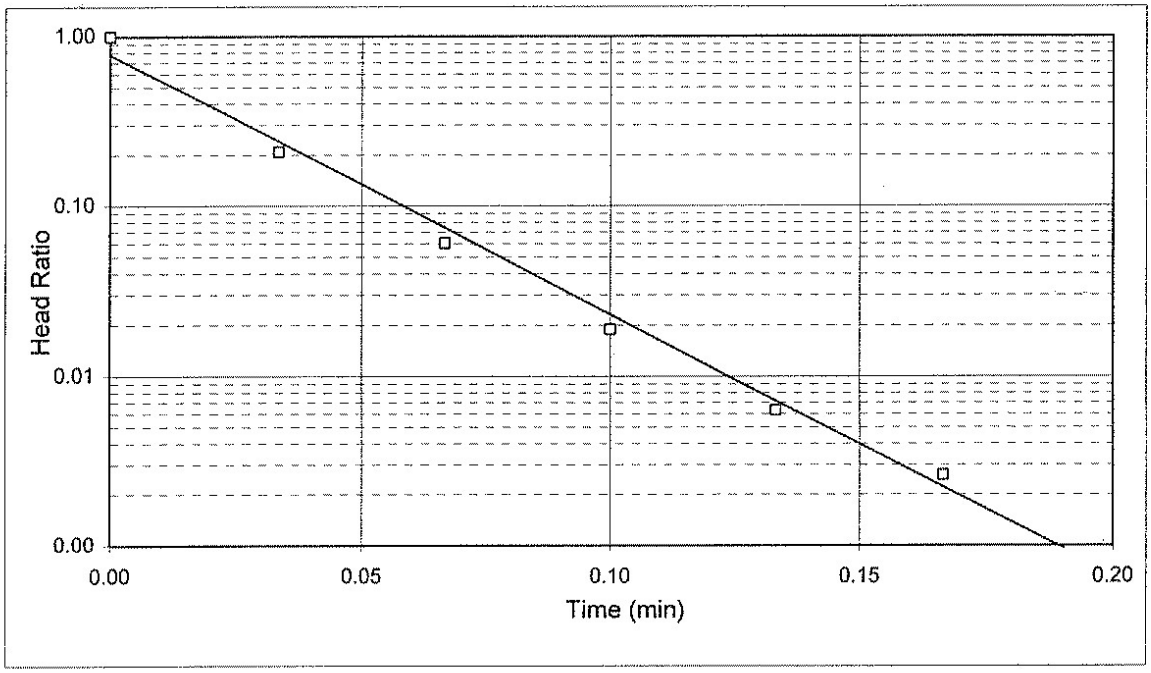
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	16
t_1 (min) =	0
t_2 (min) =	0.19
h_1/h_0 =	0.78
h_2/h_0 =	0.00

RESULTS

K=	1.49E-02	cm/sec
K=	4.22E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

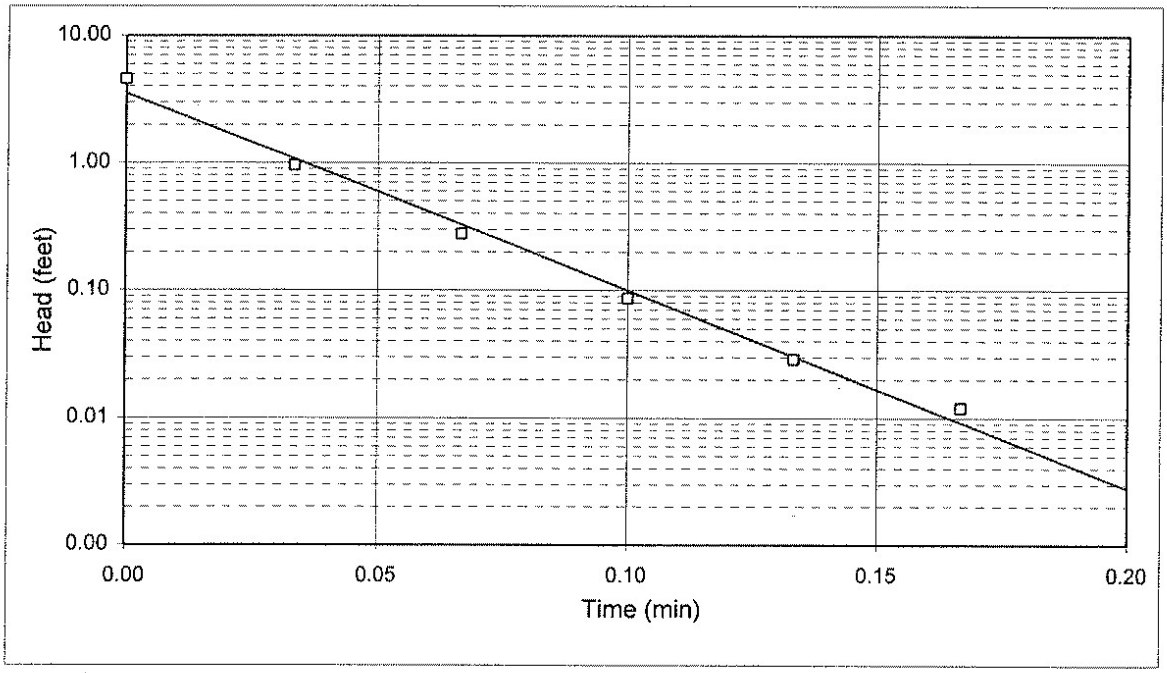
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-302-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	16	K=	1.03E-02	cm/sec
$\ln(R_e/r_w)$	2.61	K=	2.92E+01	ft/day
y_0 =	3.55			
y_t =	0.00			
t =	0.20			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-303-AS

WELL NO. PZ-303-AS

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	6.3	FEET H_2O
INITIAL DEPTH TO WATER	20.96	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	14.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	28.9	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.92	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	7.92	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.71	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1140	28	7.0117	0.00	20.25	0.71	1.00
305	305	1140	29	6.9891	0.02	20.27	0.69	0.97
305	305	1140	30	6.9531	0.03	20.31	0.65	0.92
305	305	1140	31	6.9387	0.05	20.32	0.64	0.90
305	305	1140	32	7.1578	0.07	20.10	0.86	1.21
305	305	1140	33	6.895	0.08	20.37	0.59	0.84
305	305	1140	34	6.886	0.10	20.37	0.59	0.82
305	305	1140	35	6.8729	0.12	20.39	0.57	0.80
305	305	1140	36	6.8633	0.13	20.40	0.56	0.79
305	305	1140	37	6.8573	0.15	20.40	0.56	0.78
305	305	1140	38	6.8517	0.17	20.41	0.55	0.78
305	305	1140	39	6.8446	0.18	20.42	0.54	0.77
305	305	1140	40	6.8373	0.20	20.42	0.54	0.75
305	305	1140	41	6.8337	0.22	20.43	0.53	0.75
305	305	1140	42	6.8085	0.23	20.45	0.51	0.71
305	305	1140	43	6.8229	0.25	20.44	0.52	0.73
305	305	1140	44	6.8224	0.27	20.44	0.52	0.73
305	305	1140	45	6.8238	0.28	20.44	0.52	0.74
305	305	1140	46	6.8204	0.30	20.44	0.52	0.73
305	305	1140	47	6.8155	0.32	20.44	0.52	0.72
305	305	1140	48	6.8113	0.33	20.45	0.51	0.72
305	305	1140	49	6.8054	0.35	20.45	0.51	0.71
305	305	1140	50	6.7971	0.37	20.46	0.50	0.70
305	305	1140	51	6.7896	0.38	20.47	0.49	0.69
305	305	1140	52	6.7825	0.40	20.48	0.48	0.68
305	305	1140	53	6.775	0.42	20.49	0.48	0.67
305	305	1140	54	6.7641	0.43	20.50	0.46	0.65

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1140	55	6.7626	0.45	20.50	0.46	0.65
305	305	1140	56	6.7508	0.47	20.51	0.45	0.63
305	305	1140	57	6.7435	0.48	20.52	0.44	0.62
305	305	1140	58	6.7383	0.50	20.52	0.44	0.62
305	305	1140	59	6.7318	0.52	20.53	0.43	0.61
305	305	1141	0	6.7263	0.53	20.53	0.43	0.60
305	305	1141	1	6.7197	0.55	20.54	0.42	0.59
305	305	1141	2	6.7188	0.57	20.54	0.42	0.59
305	305	1141	3	6.7093	0.58	20.55	0.41	0.58
305	305	1141	4	6.7377	0.60	20.52	0.44	0.62
305	305	1141	5	6.6657	0.62	20.59	0.37	0.51
305	305	1141	6	6.7052	0.63	20.55	0.41	0.57
305	305	1141	7	6.6993	0.65	20.56	0.40	0.56
305	305	1141	8	6.6973	0.67	20.56	0.40	0.56
305	305	1141	9	6.6889	0.68	20.57	0.39	0.55
305	305	1141	10	6.6878	0.70	20.57	0.39	0.54
305	305	1141	11	6.6792	0.72	20.58	0.38	0.53
305	305	1141	12	6.6761	0.73	20.58	0.38	0.53
305	305	1141	13	6.5809	0.75	20.68	0.28	0.39
305	305	1141	14	6.6627	0.77	20.60	0.36	0.51
305	305	1141	15	6.6697	0.78	20.59	0.37	0.52
305	305	1141	16	6.6812	0.80	20.58	0.38	0.54
305	305	1141	17	6.6623	0.82	20.60	0.36	0.51
305	305	1141	18	6.6551	0.83	20.60	0.36	0.50
305	305	1141	19	6.6509	0.85	20.61	0.35	0.49
305	305	1141	20	6.6471	0.87	20.61	0.35	0.49
305	305	1141	21	6.6438	0.88	20.62	0.34	0.48
305	305	1141	22	6.6388	0.90	20.62	0.34	0.48
305	305	1141	23	6.6354	0.92	20.62	0.34	0.47
305	305	1141	24	6.6342	0.93	20.63	0.33	0.47
305	305	1141	25	6.6295	0.95	20.63	0.33	0.46
305	305	1141	26	6.626	0.97	20.63	0.33	0.46
305	305	1141	27	6.6214	0.98	20.64	0.32	0.45
305	305	1141	28	6.6204	1.00	20.64	0.32	0.45
305	305	1141	29	6.6156	1.02	20.64	0.32	0.44
305	305	1141	30	6.6127	1.03	20.65	0.31	0.44
305	305	1141	31	6.6108	1.05	20.65	0.31	0.44
305	305	1141	32	6.6086	1.07	20.65	0.31	0.43
305	305	1141	33	6.6054	1.08	20.65	0.31	0.43
305	305	1141	34	6.6033	1.10	20.66	0.30	0.43
305	305	1141	35	6.6011	1.12	20.66	0.30	0.42
305	305	1141	36	6.599	1.13	20.66	0.30	0.42
305	305	1141	37	6.5973	1.15	20.66	0.30	0.42
305	305	1141	38	6.5935	1.17	20.67	0.29	0.41
305	305	1141	39	6.5912	1.18	20.67	0.29	0.41

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1141	40	6.5877	1.20	20.67	0.29	0.40
305	305	1141	41	6.5863	1.22	20.67	0.29	0.40
305	305	1141	42	6.5828	1.23	20.68	0.28	0.40
305	305	1141	43	6.58	1.25	20.68	0.28	0.39
305	305	1141	44	6.577	1.27	20.68	0.28	0.39
305	305	1141	45	6.578	1.28	20.68	0.28	0.39
305	305	1141	46	6.5716	1.30	20.69	0.27	0.38
305	305	1141	47	6.5696	1.32	20.69	0.27	0.38
305	305	1141	48	6.572	1.33	20.69	0.27	0.38
305	305	1141	49	6.5659	1.35	20.69	0.27	0.37
305	305	1141	50	6.5612	1.37	20.70	0.26	0.37
305	305	1141	51	6.5629	1.38	20.70	0.26	0.37
305	305	1141	52	6.5616	1.40	20.70	0.26	0.37
305	305	1141	53	6.5557	1.42	20.70	0.26	0.36
305	305	1141	54	6.5571	1.43	20.70	0.26	0.36
305	305	1141	55	6.5538	1.45	20.71	0.25	0.36
305	305	1141	56	6.5524	1.47	20.71	0.25	0.35
305	305	1141	57	6.55	1.48	20.71	0.25	0.35
305	305	1141	58	6.5479	1.50	20.71	0.25	0.35
305	305	1141	59	6.5453	1.52	20.71	0.25	0.34
305	305	1142	0	6.5402	1.53	20.72	0.24	0.34
305	305	1142	1	6.5368	1.55	20.72	0.24	0.33
305	305	1142	2	6.5352	1.57	20.72	0.24	0.33
305	305	1142	3	6.5338	1.58	20.73	0.23	0.33
305	305	1142	4	6.5305	1.60	20.73	0.23	0.32
305	305	1142	5	6.529	1.62	20.73	0.23	0.32
305	305	1142	6	6.5257	1.63	20.73	0.23	0.32
305	305	1142	7	6.5235	1.65	20.74	0.22	0.31
305	305	1142	8	6.5211	1.67	20.74	0.22	0.31
305	305	1142	9	6.5197	1.68	20.74	0.22	0.31
305	305	1142	10	6.5164	1.70	20.74	0.22	0.30
305	305	1142	11	6.516	1.72	20.74	0.22	0.30
305	305	1142	12	6.5144	1.73	20.75	0.21	0.30
305	305	1142	13	6.5123	1.75	20.75	0.21	0.30
305	305	1142	14	6.5126	1.77	20.75	0.21	0.30
305	305	1142	15	6.51	1.78	20.75	0.21	0.30
305	305	1142	16	6.5082	1.80	20.75	0.21	0.29
305	305	1142	17	6.5071	1.82	20.75	0.21	0.29
305	305	1142	18	6.505	1.83	20.76	0.20	0.29
305	305	1142	19	6.5032	1.85	20.76	0.20	0.29
305	305	1142	20	6.4996	1.87	20.76	0.20	0.28
305	305	1142	21	6.4979	1.88	20.76	0.20	0.28
305	305	1142	22	6.4969	1.90	20.76	0.20	0.28
305	305	1142	23	6.4955	1.92	20.76	0.20	0.27
305	305	1142	24	6.4939	1.93	20.77	0.19	0.27

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1142	25	6.4926	1.95	20.77	0.19	0.27
305	305	1142	26	6.4912	1.97	20.77	0.19	0.27
305	305	1142	27	6.4895	1.98	20.77	0.19	0.27
305	305	1142	28	6.4883	2.00	20.77	0.19	0.26
305	305	1142	29	6.4871	2.02	20.77	0.19	0.26
305	305	1142	30	6.4858	2.03	20.77	0.19	0.26
305	305	1142	31	6.4844	2.05	20.78	0.18	0.26
305	305	1142	32	6.4839	2.07	20.78	0.18	0.26
305	305	1142	33	6.483	2.08	20.78	0.18	0.26
305	305	1142	34	6.4806	2.10	20.78	0.18	0.25
305	305	1142	35	6.4791	2.12	20.78	0.18	0.25
305	305	1142	36	6.4781	2.13	20.78	0.18	0.25
305	305	1142	37	6.4771	2.15	20.78	0.18	0.25
305	305	1142	38	6.4759	2.17	20.78	0.18	0.25
305	305	1142	39	6.4746	2.18	20.79	0.17	0.25
305	305	1142	40	6.4744	2.20	20.79	0.17	0.25
305	305	1142	41	6.4731	2.22	20.79	0.17	0.24
305	305	1142	42	6.4721	2.23	20.79	0.17	0.24
305	305	1142	43	6.4708	2.25	20.79	0.17	0.24
305	305	1142	44	6.4701	2.27	20.79	0.17	0.24
305	305	1142	45	6.4689	2.28	20.79	0.17	0.24
305	305	1142	46	6.4677	2.30	20.79	0.17	0.24
305	305	1142	47	6.4668	2.32	20.79	0.17	0.23
305	305	1142	48	6.4652	2.33	20.79	0.17	0.23
305	305	1142	49	6.4645	2.35	20.80	0.16	0.23
305	305	1142	50	6.4631	2.37	20.80	0.16	0.23
305	305	1142	51	6.4631	2.38	20.80	0.16	0.23
305	305	1142	52	6.4636	2.40	20.80	0.16	0.23
305	305	1142	53	6.4609	2.42	20.80	0.16	0.23
305	305	1142	54	6.4606	2.43	20.80	0.16	0.23
305	305	1142	55	6.4597	2.45	20.80	0.16	0.22
305	305	1142	56	6.4596	2.47	20.80	0.16	0.22
305	305	1142	57	6.4589	2.48	20.80	0.16	0.22
305	305	1142	58	6.4579	2.50	20.80	0.16	0.22
305	305	1142	59	6.4576	2.52	20.80	0.16	0.22
305	305	1143	0	6.4576	2.53	20.80	0.16	0.22
305	305	1143	1	6.455	2.55	20.81	0.16	0.22
305	305	1143	2	6.4553	2.57	20.80	0.16	0.22
305	305	1143	3	6.4542	2.58	20.81	0.15	0.22
305	305	1143	4	6.4546	2.60	20.81	0.15	0.22
305	305	1143	5	6.4535	2.62	20.81	0.15	0.22
305	305	1143	6	6.4534	2.63	20.81	0.15	0.22
305	305	1143	7	6.4522	2.65	20.81	0.15	0.21
305	305	1143	8	6.4517	2.67	20.81	0.15	0.21
305	305	1143	9	6.4514	2.68	20.81	0.15	0.21

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1143	10	6.4494	2.70	20.81	0.15	0.21
305	305	1143	11	6.4501	2.72	20.81	0.15	0.21
305	305	1143	12	6.4497	2.73	20.81	0.15	0.21
305	305	1143	13	6.4487	2.75	20.81	0.15	0.21
305	305	1143	14	6.4477	2.77	20.81	0.15	0.21
305	305	1143	15	6.4472	2.78	20.81	0.15	0.21
305	305	1143	16	6.4472	2.80	20.81	0.15	0.21
305	305	1143	17	6.4455	2.82	20.81	0.15	0.20
305	305	1143	18	6.4453	2.83	20.81	0.15	0.20
305	305	1143	19	6.4438	2.85	20.82	0.14	0.20
305	305	1143	20	6.4435	2.87	20.82	0.14	0.20
305	305	1143	21	6.4426	2.88	20.82	0.14	0.20
305	305	1143	22	6.4417	2.90	20.82	0.14	0.20
305	305	1143	23	6.4414	2.92	20.82	0.14	0.20
305	305	1143	24	6.4415	2.93	20.82	0.14	0.20
305	305	1143	25	6.4411	2.95	20.82	0.14	0.20
305	305	1143	26	6.4404	2.97	20.82	0.14	0.20
305	305	1143	27	6.4402	2.98	20.82	0.14	0.20
305	305	1143	28	6.4398	3.00	20.82	0.14	0.20
305	305	1143	29	6.4385	3.02	20.82	0.14	0.19
305	305	1143	30	6.4388	3.03	20.82	0.14	0.20
305	305	1143	31	6.4376	3.05	20.82	0.14	0.19
305	305	1143	32	6.4355	3.07	20.82	0.14	0.19
305	305	1143	31	6.4376	3.05	20.82	0.14	0.19
305	305	1143	32	6.4355	3.07	20.82	0.14	0.19

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-303-AS

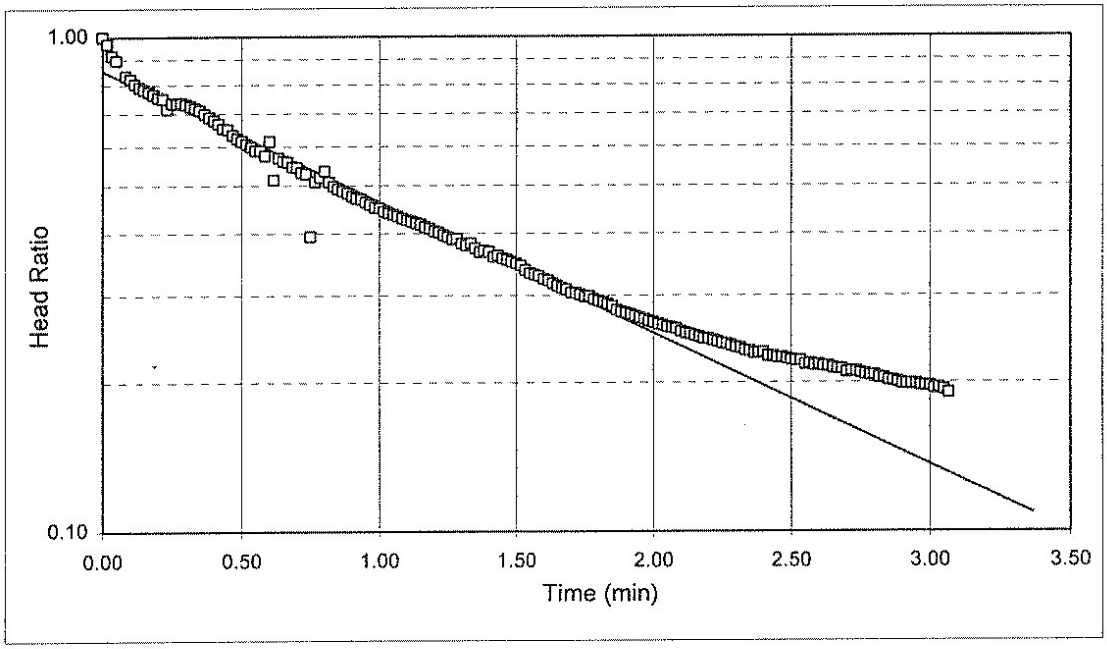
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.43
L_e =	7.92
t_1 (min) =	0
t_2 (min) =	3.37
h_1/h_0 =	0.86
h_2/h_0 =	0.11

RESULTS

K=	3.98E-04	cm/sec
K=	1.13E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-303-AS

WELL NO. PZ-303-AS

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	6.3	FEET H_2O
INITIAL DEPTH TO WATER	20.96	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	14.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	28.9	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.92	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	7.92	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.24	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1143	34	5.0619	0.00	22.20	1.24	1.00
305	305	1143	35	5.2636	0.02	22.00	1.04	0.84
305	305	1143	36	5.399	0.03	21.86	0.90	0.73
305	305	1143	37	5.4883	0.05	21.77	0.81	0.66
305	305	1143	38	5.5617	0.07	21.70	0.74	0.60
305	305	1143	39	5.6208	0.08	21.64	0.68	0.55
305	305	1143	40	5.6747	0.10	21.59	0.63	0.51
305	305	1143	41	5.7239	0.12	21.54	0.58	0.47
305	305	1143	42	5.7655	0.13	21.49	0.53	0.43
305	305	1143	43	5.8101	0.15	21.45	0.49	0.40
305	305	1143	44	5.8564	0.17	21.40	0.44	0.36
305	305	1143	45	5.8925	0.18	21.37	0.41	0.33
305	305	1143	46	5.9307	0.20	21.33	0.37	0.30
305	305	1143	47	5.9607	0.22	21.30	0.34	0.27
305	305	1143	48	5.9848	0.23	21.28	0.32	0.25
305	305	1143	49	6.0136	0.25	21.25	0.29	0.23
305	305	1143	50	6.0444	0.27	21.22	0.26	0.21
305	305	1143	51	6.0691	0.28	21.19	0.23	0.19
305	305	1143	52	6.0926	0.30	21.17	0.21	0.17
305	305	1143	53	6.1123	0.32	21.15	0.19	0.15
305	305	1143	54	6.1324	0.33	21.13	0.17	0.14
305	305	1143	55	6.1497	0.35	21.11	0.15	0.12
305	305	1143	56	6.1703	0.37	21.09	0.13	0.10
305	305	1143	57	6.1853	0.38	21.07	0.11	0.09

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1143	58	6.2013	0.40	21.06	0.10	0.08
305	305	1143	59	6.2144	0.42	21.05	0.09	0.07
305	305	1144	0	6.2249	0.43	21.04	0.08	0.06
305	305	1144	1	6.2366	0.45	21.02	0.06	0.05
305	305	1144	2	6.2443	0.47	21.02	0.06	0.04
305	305	1144	3	6.2565	0.48	21.00	0.04	0.04
305	305	1144	4	6.2603	0.50	21.00	0.04	0.03
305	305	1144	5	6.2707	0.52	20.99	0.03	0.02
305	305	1144	6	6.2768	0.53	20.98	0.02	0.02
305	305	1144	7	6.2828	0.55	20.98	0.02	0.01
305	305	1144	8	6.2889	0.57	20.97	0.01	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-303-AS

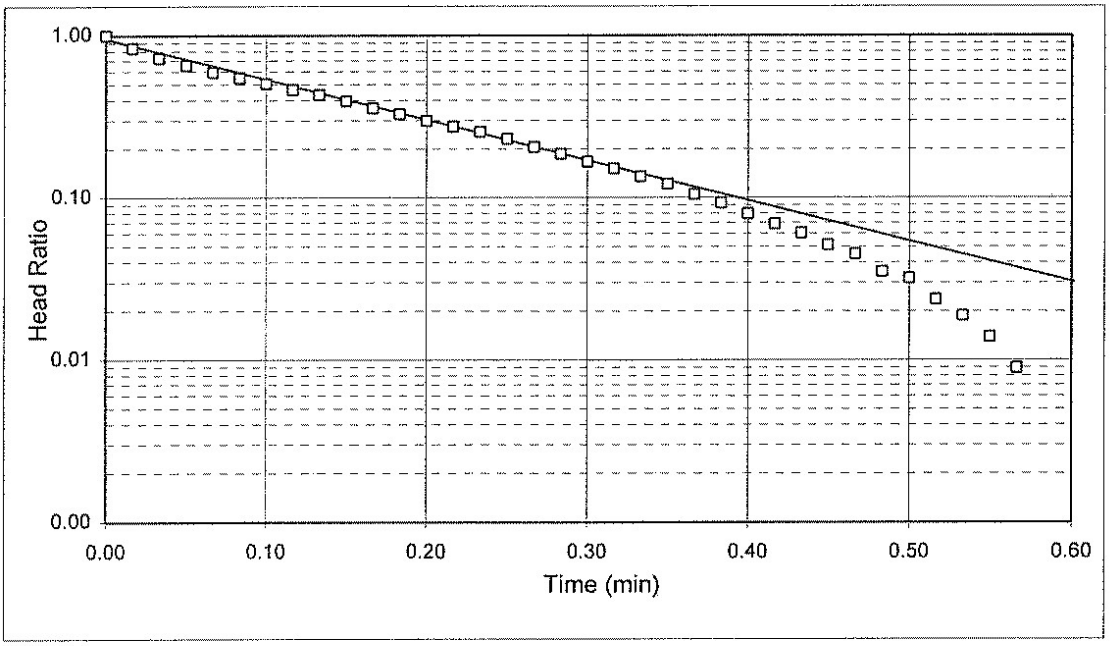
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.43
L_e =	7.92
t_1 (min) =	0
t_2 (min) =	0.60
h_1/h_0 =	0.95
h_2/h_0 =	0.03

RESULTS

K=	3.73E-03	cm/sec
K=	1.06E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-303-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

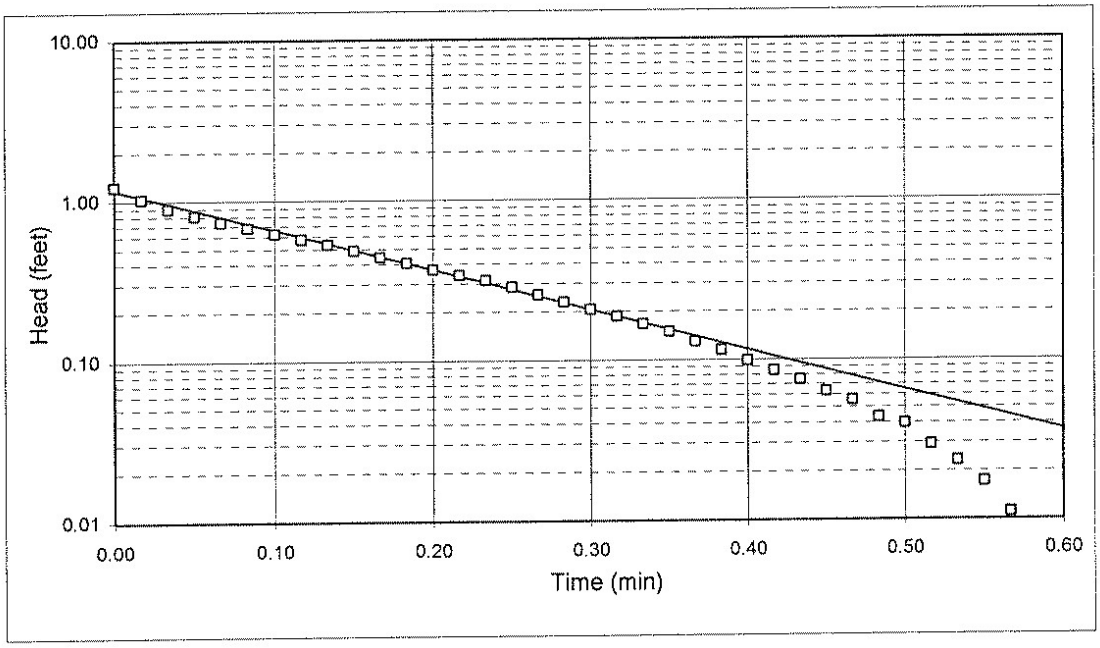
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.24
r_w =	0.43
L_e =	7.92
$\ln(R_e/r_w)$	1.34
y_0 =	1.17
y_t =	0.04
t =	0.60

RESULTS

K=	1.48E-02	cm/sec
K=	4.20E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-304-AS

WELL NO. PZ-304-AS

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	7.28	FEET H_2O
INITIAL DEPTH TO WATER	21.35	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	13.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	30.3	FEET (btoc)
SATURATED THICKNESS	140	FEET
WATER TABLE TO BOTTOM OF SCREEN	8.96	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8.96	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.39	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1438	44	7.6689	0.00	20.96	0.39	1.00
305	298	1438	46	7.5014	0.03	21.13	0.22	0.57
305	298	1438	48	7.4805	0.07	21.15	0.20	0.52
305	298	1438	50	7.4567	0.10	21.17	0.18	0.45
305	298	1438	52	7.4413	0.13	21.19	0.16	0.41
305	298	1438	54	7.5322	0.17	21.10	0.25	0.65
305	298	1438	56	7.4344	0.20	21.20	0.15	0.40
305	298	1438	58	7.4224	0.23	21.21	0.14	0.37
305	298	1439	0	7.4117	0.27	21.22	0.13	0.34
305	298	1439	2	7.409	0.30	21.22	0.13	0.33
305	298	1439	4	7.3946	0.33	21.24	0.11	0.29
305	298	1439	6	7.3879	0.37	21.24	0.11	0.28
305	298	1439	8	7.3814	0.40	21.25	0.10	0.26
305	298	1439	10	7.3773	0.43	21.25	0.10	0.25
305	298	1439	12	7.3724	0.47	21.26	0.09	0.24
305	298	1439	14	7.3658	0.50	21.26	0.09	0.22
305	298	1439	16	7.3609	0.53	21.27	0.08	0.21
305	298	1439	18	7.3603	0.57	21.27	0.08	0.21
305	298	1439	20	7.3566	0.60	21.27	0.08	0.20
305	298	1439	22	7.3524	0.63	21.28	0.07	0.19
305	298	1439	24	7.3498	0.67	21.28	0.07	0.18
305	298	1439	26	7.3429	0.70	21.29	0.06	0.16
305	298	1439	28	7.3438	0.73	21.29	0.06	0.16
305	298	1439	30	7.3411	0.77	21.29	0.06	0.16
305	298	1439	32	7.3355	0.80	21.29	0.06	0.14
305	298	1439	34	7.3354	0.83	21.29	0.06	0.14
305	298	1439	36	7.3322	0.87	21.30	0.05	0.13
305	298	1439	38	7.3297	0.90	21.30	0.05	0.13
305	298	1439	40	7.3275	0.93	21.30	0.05	0.12
305	298	1439	42	7.326	0.97	21.30	0.05	0.12

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1439	44	7.3246	1.00	21.31	0.04	0.11
305	298	1439	46	7.3223	1.03	21.31	0.04	0.11
305	298	1439	55	7.3194	1.18	21.31	0.04	0.10
305	298	1439	56	7.3154	1.20	21.31	0.04	0.09
305	298	1439	57	7.3155	1.22	21.31	0.04	0.09
305	298	1439	58	7.3138	1.23	21.32	0.03	0.09
305	298	1439	59	7.3133	1.25	21.32	0.03	0.09
305	298	1440	0	7.3121	1.27	21.32	0.03	0.08
305	298	1440	1	7.3119	1.28	21.32	0.03	0.08
305	298	1440	2	7.3102	1.30	21.32	0.03	0.08
305	298	1440	3	7.3103	1.32	21.32	0.03	0.08
305	298	1440	4	7.3099	1.33	21.32	0.03	0.08
305	298	1440	5	7.3085	1.35	21.32	0.03	0.07
305	298	1440	6	7.3081	1.37	21.32	0.03	0.07
305	298	1440	7	7.3072	1.38	21.32	0.03	0.07
305	298	1440	8	7.3086	1.40	21.32	0.03	0.07
305	298	1440	9	7.3053	1.42	21.32	0.03	0.07
305	298	1440	10	7.3056	1.43	21.32	0.03	0.07
305	298	1440	11	7.3048	1.45	21.33	0.02	0.06
305	298	1440	12	7.3038	1.47	21.33	0.02	0.06
305	298	1440	13	7.3028	1.48	21.33	0.02	0.06
305	298	1440	14	7.3035	1.50	21.33	0.02	0.06
305	298	1440	15	7.3017	1.52	21.33	0.02	0.06
305	298	1440	16	7.3012	1.53	21.33	0.02	0.05
305	298	1440	17	7.3019	1.55	21.33	0.02	0.06
305	298	1440	18	7.3004	1.57	21.33	0.02	0.05
305	298	1440	19	7.2996	1.58	21.33	0.02	0.05
305	298	1440	20	7.2972	1.60	21.33	0.02	0.04
305	298	1440	21	7.2977	1.62	21.33	0.02	0.05
305	298	1440	22	7.2968	1.63	21.33	0.02	0.04
305	298	1440	23	7.2963	1.65	21.33	0.02	0.04
305	298	1440	24	7.2967	1.67	21.33	0.02	0.04
305	298	1440	25	7.2954	1.68	21.33	0.02	0.04
305	298	1440	26	7.2946	1.70	21.34	0.01	0.04
305	298	1440	27	7.2944	1.72	21.34	0.01	0.04
305	298	1440	28	7.2944	1.73	21.34	0.01	0.04
305	298	1440	29	7.2925	1.75	21.34	0.01	0.03
305	298	1440	30	7.2921	1.77	21.34	0.01	0.03
305	298	1440	31	7.2906	1.78	21.34	0.01	0.03
305	298	1440	32	7.2898	1.80	21.34	0.01	0.03
305	298	1440	33	7.2899	1.82	21.34	0.01	0.03
305	298	1440	34	7.2888	1.83	21.34	0.01	0.02
305	298	1440	35	7.2893	1.85	21.34	0.01	0.02
305	298	1440	36	7.2889	1.87	21.34	0.01	0.02
305	298	1440	37	7.289	1.88	21.34	0.01	0.02
305	298	1440	38	7.2872	1.90	21.34	0.01	0.02

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-304-AS

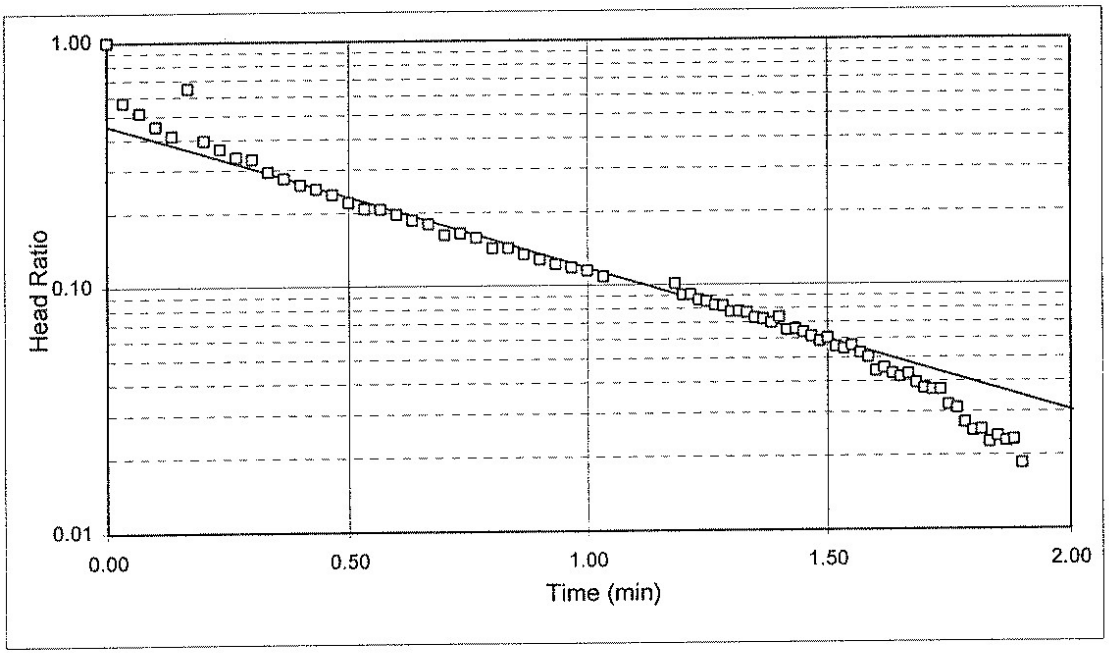
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	8.96
t_1 (min) =	0
t_2 (min) =	2.01
h_1/h_0 =	0.46
h_2/h_0 =	0.03

RESULTS

K=	8.69E-04	cm/sec
K=	2.46E+00	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-304-AS

WELL NO. PZ-304-AS

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	7.28	FEET H_2O
INITIAL DEPTH TO WATER	21.35	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	13.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	30.3	FEET (btoc)
SATURATED THICKNESS	140	FEET
WATER TABLE TO BOTTOM OF SCREEN	8.96	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8.96	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	2.48	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1442	36	4.797	0.00	23.83	2.48	1.00
305	298	1442	38	5.555	0.03	23.08	1.73	0.69
305	298	1442	40	6.0565	0.07	22.57	1.22	0.49
305	298	1442	42	6.3892	0.10	22.24	0.89	0.36
305	298	1442	44	6.6299	0.13	22.00	0.65	0.26
305	298	1442	46	6.8063	0.17	21.82	0.47	0.19
305	298	1442	48	6.9305	0.20	21.70	0.35	0.14
305	298	1442	50	7.0198	0.23	21.61	0.26	0.10
305	298	1442	52	7.0945	0.27	21.54	0.19	0.07
305	298	1442	54	7.1446	0.30	21.49	0.14	0.05
305	298	1442	56	7.1798	0.33	21.45	0.10	0.04
305	298	1442	58	7.204	0.37	21.43	0.08	0.03
305	298	1443	0	7.2242	0.40	21.41	0.06	0.02
305	298	1443	2	7.2386	0.43	21.39	0.04	0.02
305	298	1443	4	7.2479	0.47	21.38	0.03	0.01
305	298	1443	6	7.261	0.50	21.37	0.02	0.01
305	298	1443	8	7.2662	0.53	21.36	0.01	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-304-AS

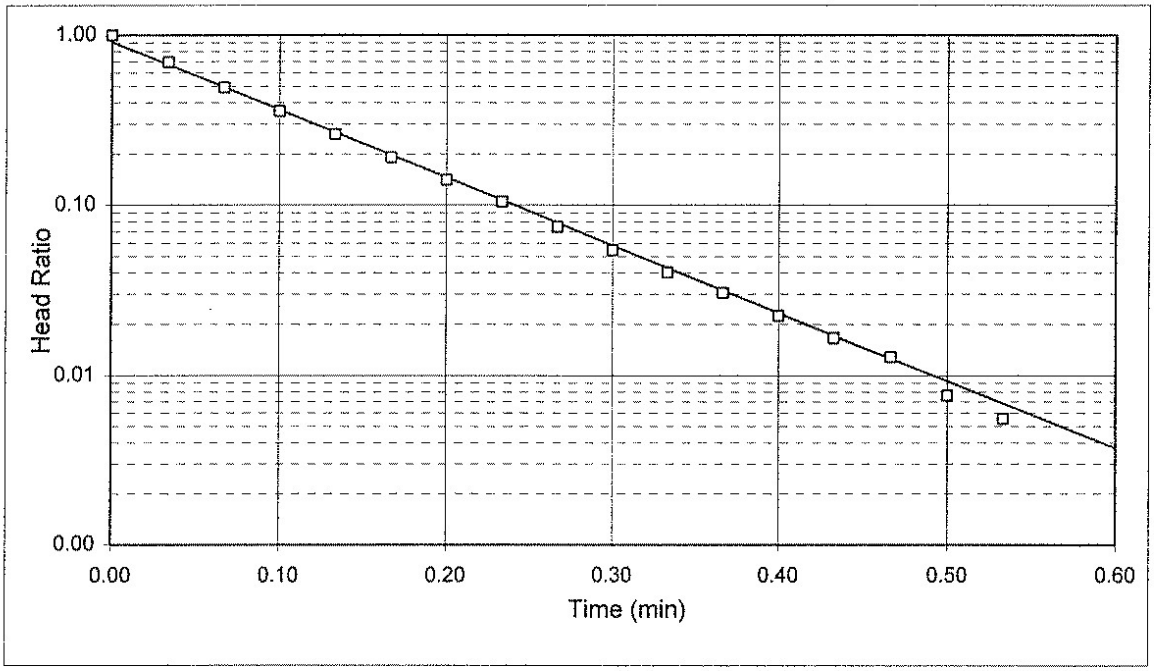
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	8.96
t_1 (min) =	0
t_2 (min) =	0.60
h_1/h_0 =	0.91
h_2/h_0 =	0.00

RESULTS

K=	5.89E-03	cm/sec
K=	1.67E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

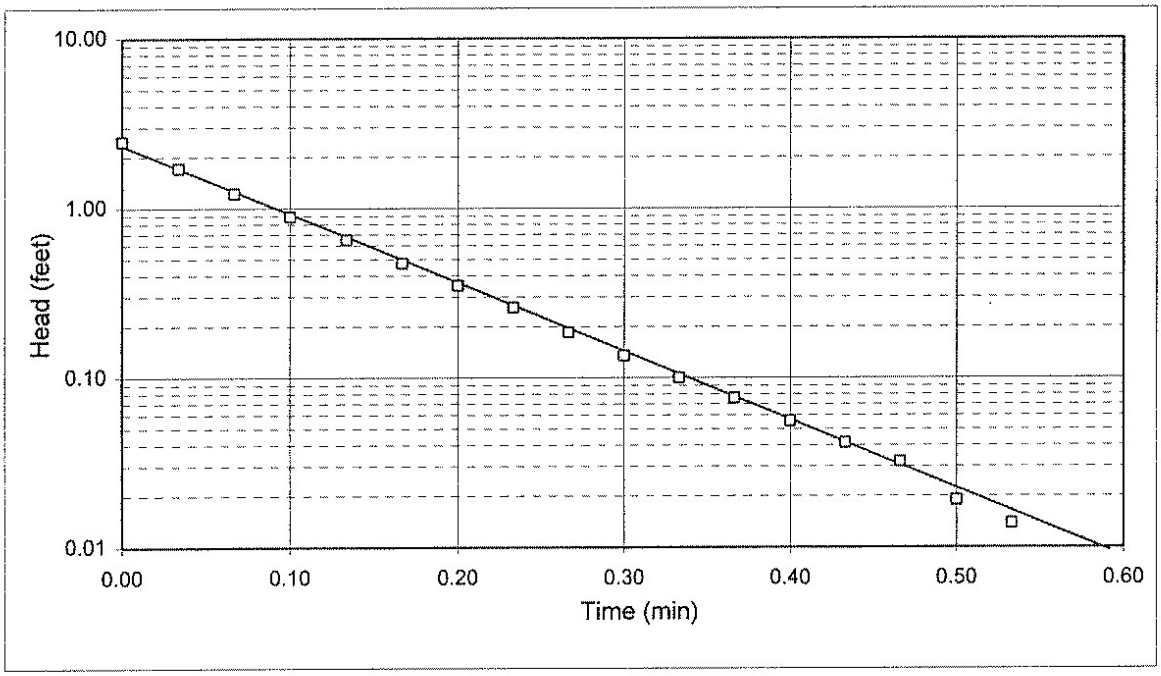
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-304-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS	
r_c =	0.20		
r_w =	0.34		
L_e =	8.96	K=	1.84E-02 cm/sec
$\ln(R_e/r_w)$	1.73	K=	5.22E+01 ft/day
y_0 =	2.34		
y_t =	0.01		
t =	0.59		



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-304-AI

WELL NO. PZ-304-AI

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	9.9	FEET H_2O
INITIAL DEPTH TO WATER	21.72	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	38.3	FEET (btoc)
BOTTOM OF OPEN INTERVAL	52.4	FEET (btoc)
SATURATED THICKNESS	140	FEET
WATER TABLE TO BOTTOM OF SCREEN	30.7	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	14.1	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.48	FEET
MAX. HEAD IN SCREEN?	N	

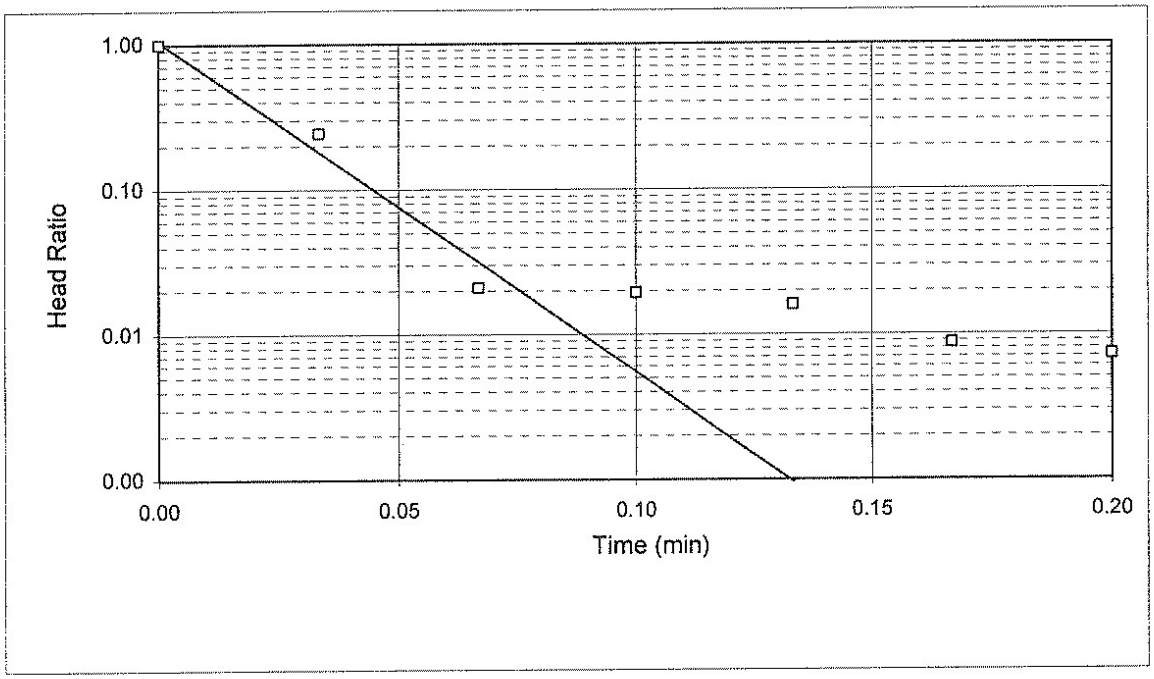
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1414	6	12.383	0.00	19.24	2.48	1.00
305	298	1414	8	9.2916	0.03	21.11	0.61	0.25
305	298	1414	10	9.8479	0.07	21.67	0.05	0.02
305	298	1414	12	9.9482	0.10	21.67	0.05	0.02
305	298	1414	14	9.9399	0.13	21.68	0.04	0.02
305	298	1414	16	9.9217	0.17	21.70	0.02	0.01
305	298	1414	18	9.9179	0.20	21.70	0.02	0.01

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-304-AI

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	14.1	K=	2.44E-02	cm/sec
t_1 (min) =	0	K=	6.91E+01	ft/day
t_2 (min) =	0.13			
h_1/h_0 =	1.00			
h_2/h_0 =	0.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-304-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

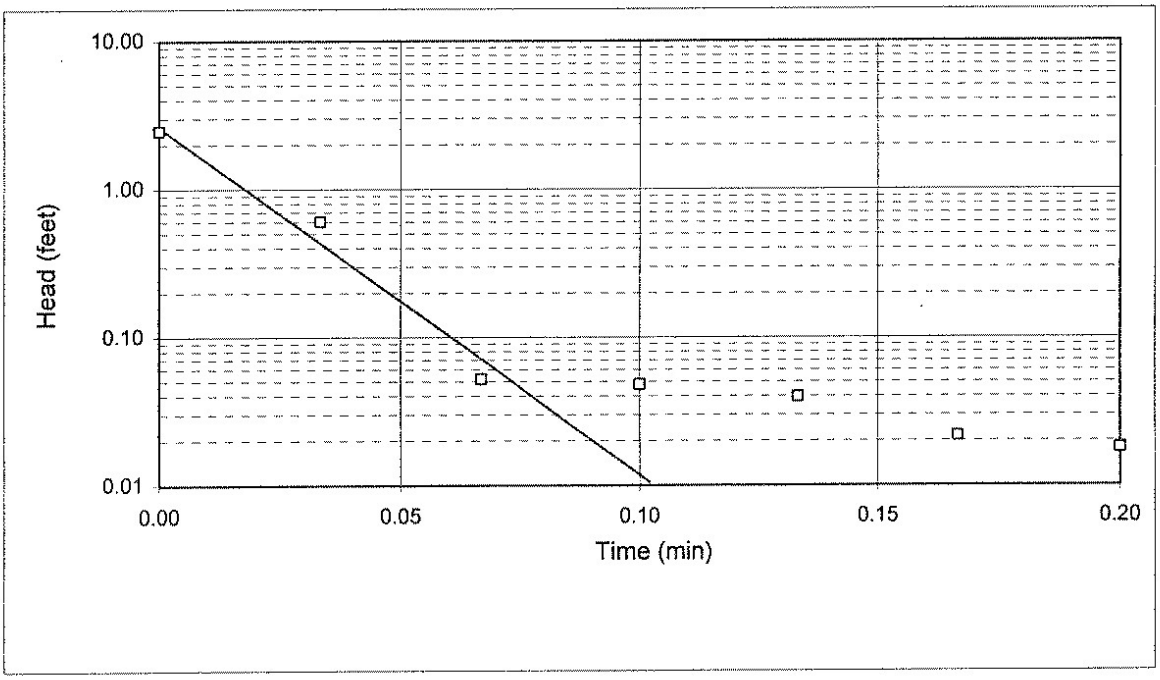
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	14.1
$\ln(R_e/r_w)$	2.53
y_0 =	2.63
y_t =	0.01
t =	0.10

RESULTS

K=	1.71E-02	cm/sec
K=	4.86E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-305-AI

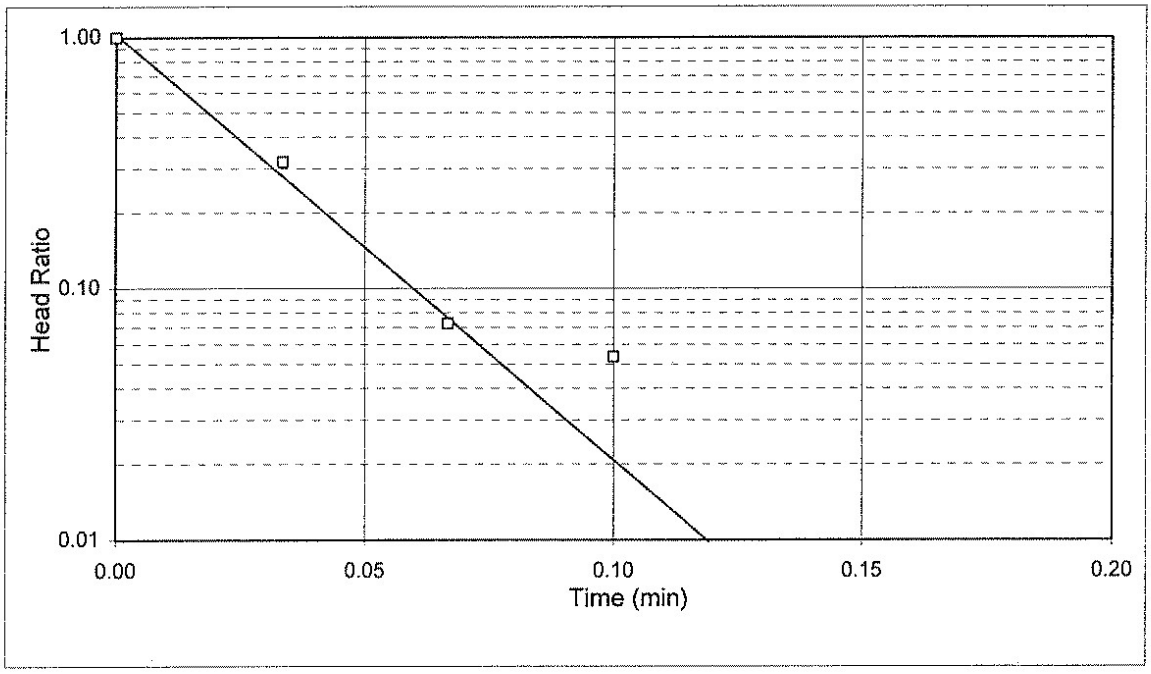
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	14.1
t_1 (min) =	0
t_2 (min) =	0.12
h_1/h_0 =	1.02
h_2/h_0 =	0.01

RESULTS

K=	1.81E-02	cm/sec
K=	5.13E+01	ft/day



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

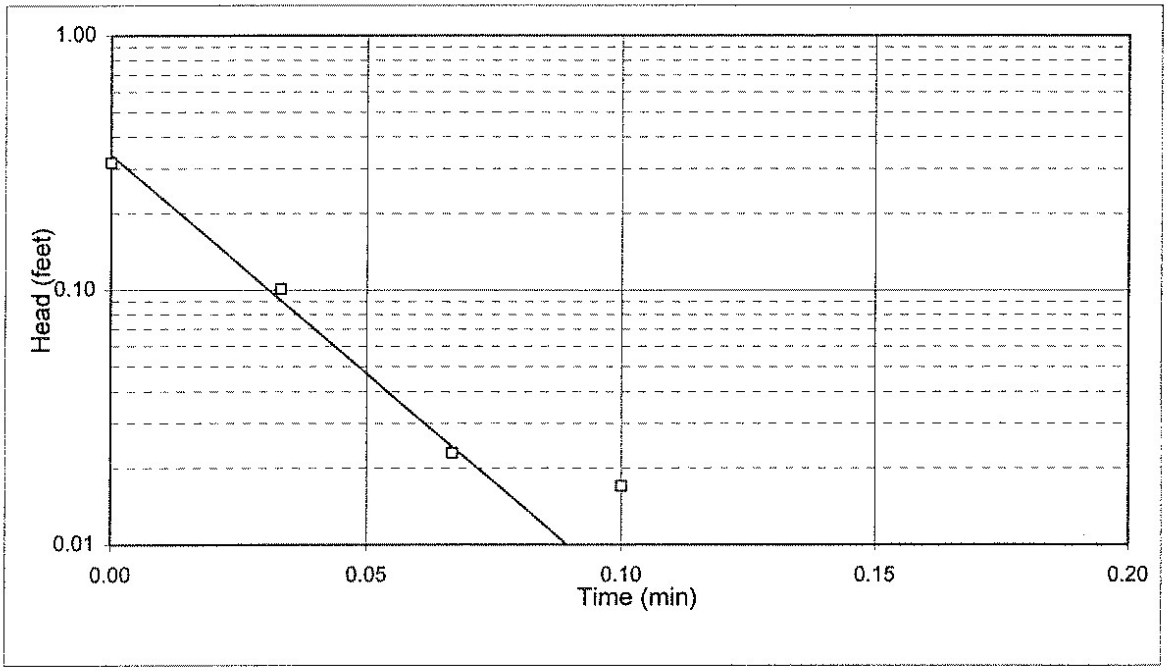
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-305-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	14.1	K=	1.38E-02	cm/sec
$\ln(R_e/r_w)$	2.80	K=	3.92E+01	ft/day
y_0 =	0.34			
y_t =	0.01			
t =	0.09			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-305-AI

WELL NO. PZ-305-AI

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	10.74	FEET H_2O
INITIAL DEPTH TO WATER	27.18	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	50.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	65.0	FEET (btoc)
SATURATED THICKNESS	500	FEET
WATER TABLE TO BOTTOM OF SCREEN	37.8	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	14.1	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.52	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	957	30	13.26	0.00	24.66	2.52	1.00
305	305	957	32	10.474	0.03	26.91	0.27	0.11
305	305	957	34	10.707	0.07	27.15	0.03	0.01
305	305	957	36	10.817	0.10	27.10	0.08	0.03
305	305	957	38	10.765	0.13	27.16	0.02	0.01
305	305	957	40	10.744	0.17	27.18	0.00	0.00
305	305	957	42	10.75	0.20	27.17	0.01	0.00
305	305	957	44	10.752	0.23	27.17	0.01	0.00
305	305	957	46	10.749	0.27	27.17	0.01	0.00
305	305	957	48	10.748	0.30	27.17	0.01	0.00
305	305	957	50	10.748	0.33	27.17	0.01	0.00
305	305	957	52	10.748	0.37	27.17	0.01	0.00
305	305	957	54	10.748	0.40	27.17	0.01	0.00
305	305	957	56	10.748	0.43	27.17	0.01	0.00
305	305	957	58	10.747	0.47	27.17	0.01	0.00
305	305	958	34	11.057	1.07	26.86	0.32	0.13
305	305	958	36	10.639	1.10	27.08	0.10	0.04
305	305	958	38	10.717	1.13	27.16	0.02	0.01
305	305	958	40	10.757	1.17	27.16	0.02	0.01
305	305	958	42	10.739	1.20	27.18	0.00	0.00
305	305	958	44	10.739	1.23	27.18	0.00	0.00
305	305	959	51	10.926	2.35	26.99	0.19	0.07
305	305	959	52	10.425	2.37	26.87	0.31	0.12
305	305	959	53	10.604	2.38	27.04	0.14	0.05
305	305	959	54	10.741	2.40	27.18	0.00	0.00
305	305	959	55	10.79	2.42	27.13	0.05	0.02
305	305	959	56	10.804	2.43	27.12	0.06	0.03
305	305	959	57	10.781	2.45	27.14	0.04	0.02
305	305	959	58	10.753	2.47	27.17	0.01	0.01
305	305	959	59	10.741	2.48	27.18	0.00	0.00

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1000	0	10.741	2.50	27.18	0.00	0.00
305	305	1001	21	9.8456	3.85	28.07	0.89	0.35
305	305	1001	22	11.004	3.87	27.44	0.26	0.10
305	305	1001	23	11.242	3.88	27.68	0.50	0.20
305	305	1001	24	10.981	3.90	27.42	0.24	0.10
305	305	1001	25	10.723	3.92	27.20	0.02	0.01
305	305	1001	26	10.636	3.93	27.28	0.10	0.04
305	305	1001	27	10.669	3.95	27.25	0.07	0.03
305	305	1001	28	10.726	3.97	27.19	0.01	0.01
305	305	1001	29	10.754	3.98	27.19	0.01	0.01
305	305	1001	30	10.756	4.00	27.20	0.02	0.01
305	305	1001	31	10.746	4.02	27.19	0.01	0.00
305	305	1001	32	10.738	4.03	27.18	0.00	0.00
305	305	1001	33	10.739	4.05	27.18	0.00	0.00
305	305	1001	34	10.739	4.07	27.18	0.00	0.00
305	305	1002	41	11.331	5.18	26.59	0.59	0.23
305	305	1002	42	10.251	5.20	26.69	0.49	0.19
305	305	1002	43	10.521	5.22	26.96	0.22	0.09
305	305	1002	44	10.672	5.23	27.11	0.07	0.03
305	305	1002	45	10.779	5.25	27.14	0.04	0.02
305	305	1002	46	10.812	5.27	27.11	0.07	0.03
305	305	1002	47	10.803	5.28	27.12	0.06	0.03
305	305	1002	48	10.77	5.30	27.15	0.03	0.01
305	305	1002	49	10.749	5.32	27.17	0.01	0.00
305	305	1002	50	10.745	5.33	27.18	0.00	0.00
305	305	1002	51	10.745	5.35	27.18	0.00	0.00
305	305	1003	25	4.5032	5.92	33.42	6.24	2.47
305	305	1003	26	10.801	5.93	27.24	0.06	0.02
305	305	1003	27	11.451	5.95	27.89	0.71	0.28
305	305	1003	28	11.212	5.97	27.65	0.47	0.19
305	305	1003	29	10.806	5.98	27.25	0.07	0.03
305	305	1003	30	10.616	6.00	27.30	0.12	0.05
305	305	1003	31	10.624	6.02	27.30	0.12	0.05
305	305	1003	32	10.703	6.03	27.22	0.04	0.01
305	305	1003	33	10.753	6.05	27.19	0.01	0.01
305	305	1003	34	10.762	6.07	27.20	0.02	0.01
305	305	1003	35	10.751	6.08	27.19	0.01	0.00
305	305	1003	36	10.74	6.10	27.18	0.00	0.00
305	305	1003	37	10.736	6.12	27.18	0.00	0.00
305	305	1003	38	10.74	6.13	27.18	0.00	0.00
305	305	1003	39	10.742	6.15	27.18	0.00	0.00
305	305	1003	40	10.743	6.17	27.18	0.00	0.00
305	305	1003	41	10.745	6.18	27.19	0.00	0.00
305	305	1003	42	10.745	6.20	27.19	0.00	0.00
305	305	1003	43	10.741	6.22	27.18	0.00	0.00
305	305	1003	44	10.742	6.23	27.18	0.00	0.00
305	305	1003	45	10.744	6.25	27.18	0.00	0.00
305	305	1003	46	10.742	6.27	27.18	0.00	0.00

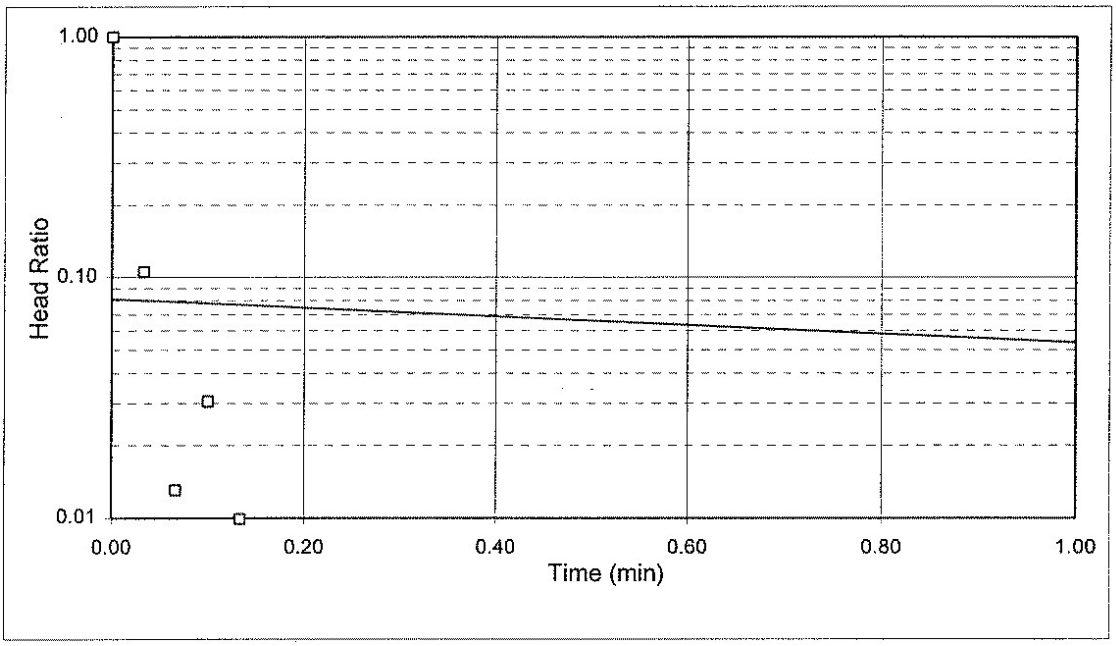
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1003	47	10.744	6.28	27.18	0.00	0.00
305	305	1003	48	10.745	6.30	27.19	0.00	0.00
305	305	1003	49	10.744	6.32	27.18	0.00	0.00
305	305	1003	50	10.743	6.33	27.18	0.00	0.00
305	305	1003	51	10.745	6.35	27.19	0.00	0.00
305	305	1003	52	10.745	6.37	27.19	0.00	0.00
305	305	1003	53	10.745	6.38	27.19	0.00	0.00
305	305	1003	54	10.744	6.40	27.18	0.00	0.00
305	305	1003	55	10.745	6.42	27.19	0.00	0.00
305	305	1003	56	10.744	6.43	27.18	0.00	0.00
305	305	1003	57	10.743	6.45	27.18	0.00	0.00
305	305	1003	58	10.744	6.47	27.18	0.00	0.00
305	305	1003	59	10.744	6.48	27.18	0.00	0.00
305	305	1004	0	10.745	6.50	27.19	0.00	0.00
305	305	1004	1	10.745	6.52	27.19	0.00	0.00
305	305	1004	2	10.745	6.53	27.19	0.00	0.00
305	305	1004	3	10.745	6.55	27.19	0.00	0.00
305	305	1004	4	10.743	6.57	27.18	0.00	0.00
305	305	1004	5	10.744	6.58	27.18	0.00	0.00
305	305	1004	6	10.745	6.60	27.19	0.00	0.00
305	305	1004	7	10.746	6.62	27.19	0.01	0.00
305	305	1004	8	10.745	6.63	27.19	0.00	0.00

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-305-AI

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where: r_c = casing radius (feet);
R_e = equivalent radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	14.1	K=	1.93E-04	cm/sec
t_1 (min) =	0	K=	5.46E-01	ft/day
t_2 (min) =	1.00			
h_1/h_0 =	0.08			
h_2/h_0 =	0.05			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By:
Analysis Date: 1/22/96

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-305-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

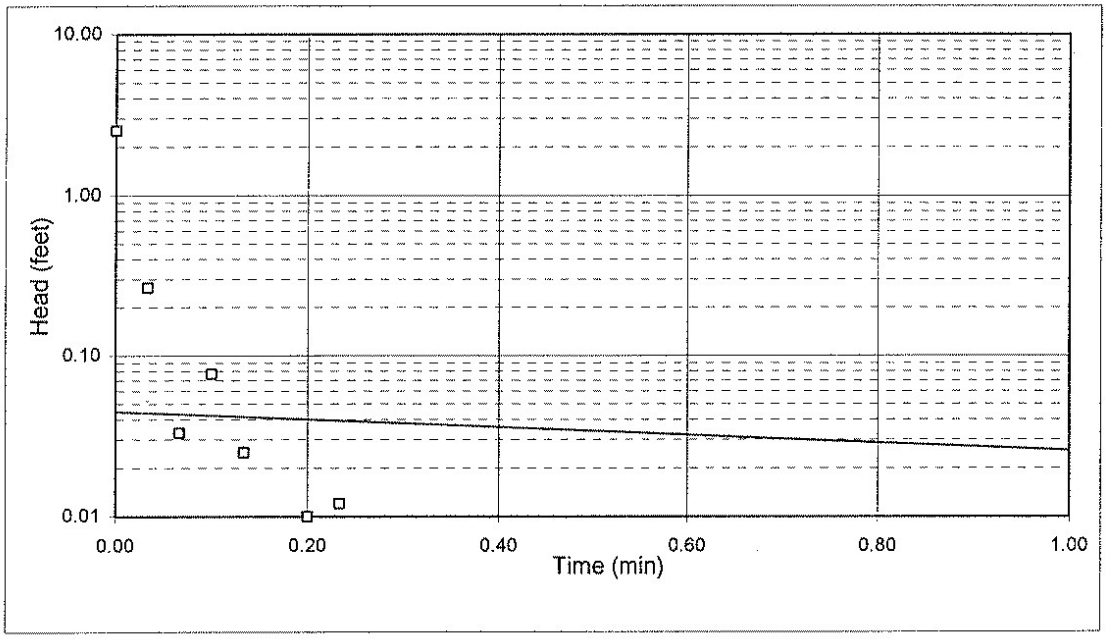
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	14.1
$\ln(R_e/r_w)$	2.49
y_0 =	0.04
y_t =	0.03
t =	1.00

RESULTS

K=	1.72E-04	cm/sec
K=	4.89E-01	ft/day

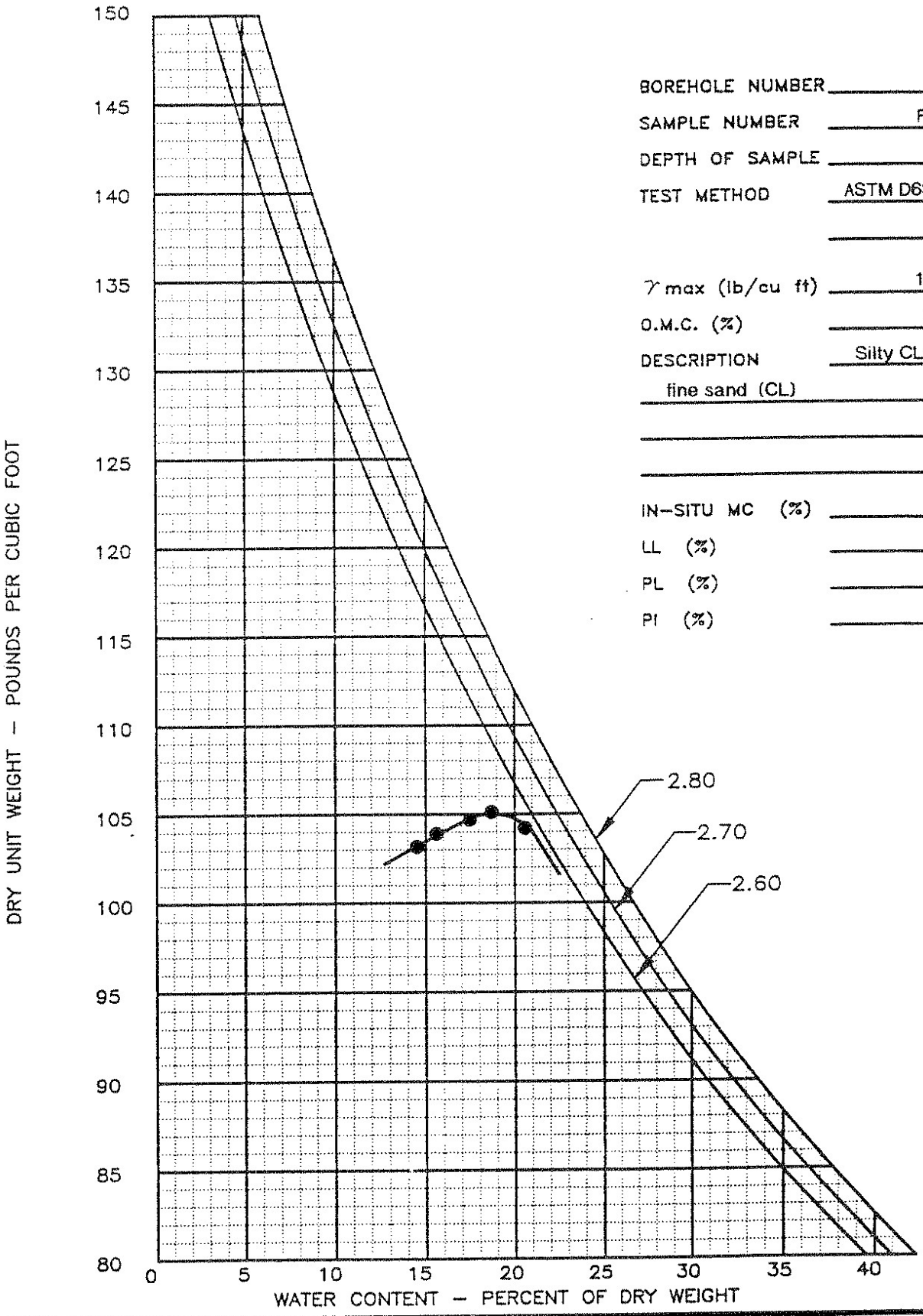


Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By:
Analysis Date: 1/22/96

APPENDIX D

GEOTECHNICAL TEST DATA



BOREHOLE NUMBER

SAMPLE NUMBER PS-1

DEPTH OF SAMPLE

TEST METHOD ASTM D698 METHOD A

γ max (lb/cu ft) 105.0

O.M.C. (%) 19.0

DESCRIPTION Silty CLAY with trace fine sand (CL)

IN-SITU MC (%) 23.0

LL (%) 47

PL (%) 17

PI (%) 30

Golder Associates Denver, Colorado

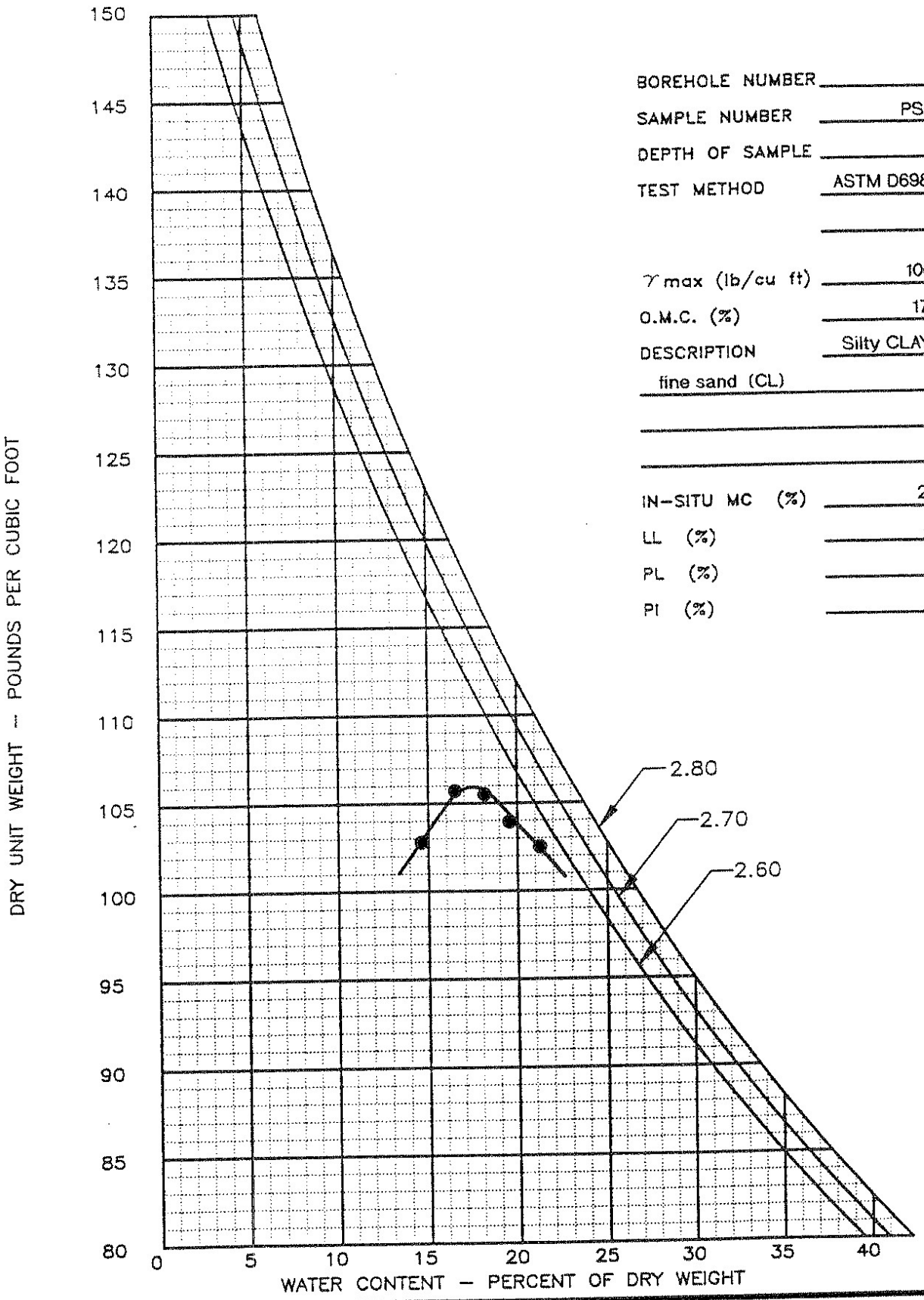
CLIENT/PROJECT

LAIDLAW/OU2 RIFS/MO

TITLE

PROCTOR CURVE SAMPLE #PS-1

DRAWN	ASF	DATE	JULY 1995	JOB NO.	943-2848.202
CHECKED	KMR	SCALE	AS SHOWN	DWG NO./REV. NO.	
REVIEWED		FILE NO.	WATER.DWG	FIGURE NO.	



BOREHOLE NUMBER	
SAMPLE NUMBER	PS-2
DEPTH OF SAMPLE	
TEST METHOD	ASTM D698 METHOD A
γ max (lb/cu ft)	106.0
O.M.C. (%)	17.5
DESCRIPTION	Silty CLAY with trace fine sand (CL)
IN-SITU MC (%)	25.9
LL (%)	39
PL (%)	22
PI (%)	17

Golder Associates — Denver, Colorado

CLIENT/PROJECT

LAIDLAW/OU2 RIFS/MO

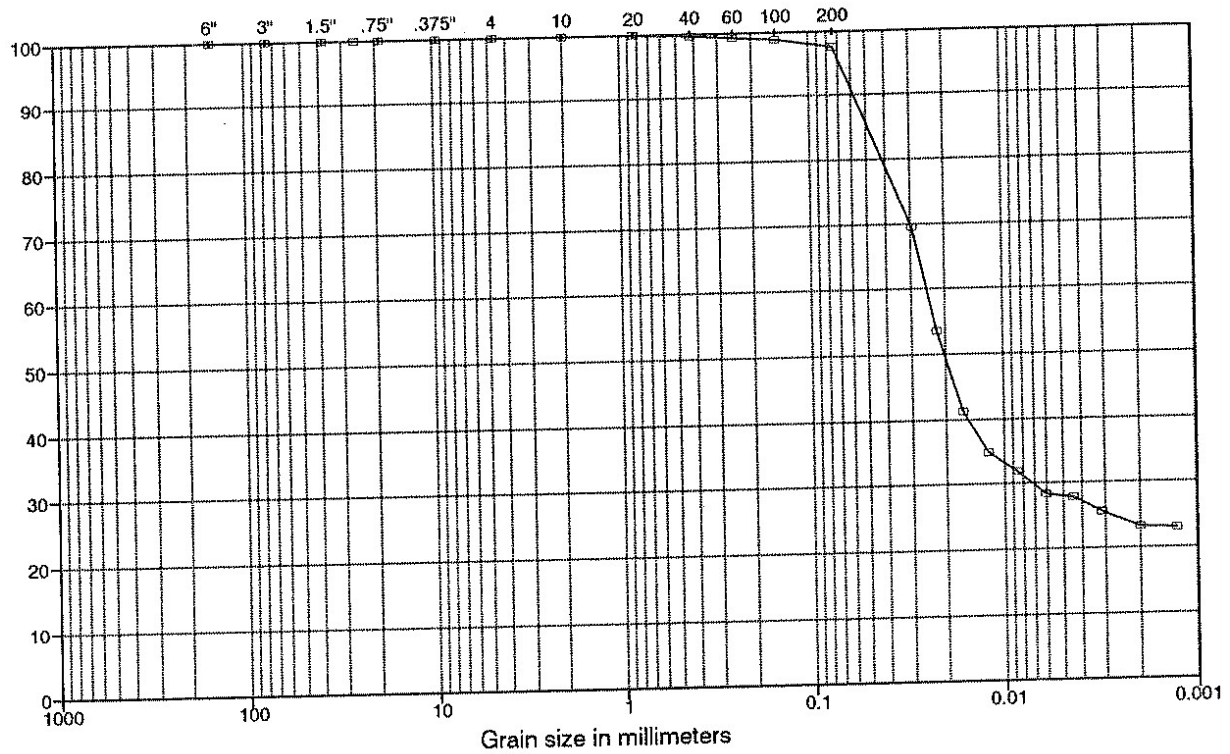
TITLE

PROCTOR CURVE
SAMPLE #PS-2

DRAWN	ASF	DATE	JULY 1995	JOB NO.	943-2848.202
CHECKED	KMR	SCALE	AS SHOWN	DWG NO./REV. NO.	
REVIEWED		FILE NO.	WATER.DWG	FIGURE NO.	

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID	W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE SAMPLE NO. PS-2 DEPTH	25.9	39	22	17	2.81	Silty CLAY with trace fine sand

Sample Type: Date Tested: 6/28/95 USCS: CL

TECH: BRB
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

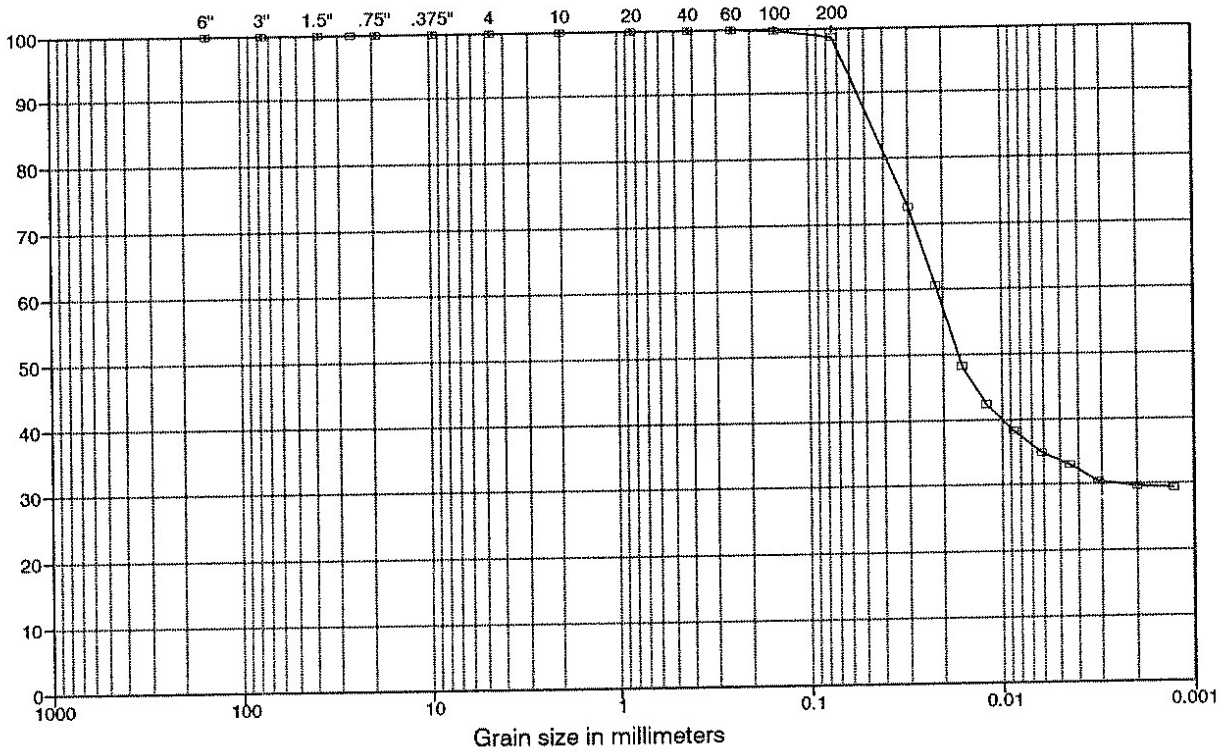
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848PS2

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
	Coarse	Fine	Cor	Med	Fine	

SAMPLE ID	W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE SAMPLE NO. PS-1 DEPTH	23.0	47	17	30	2.74	Silty CLAY with trace fine sand

Sample Type: Date Tested: 6/28/95 USCS: CL

TECH: BRB
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

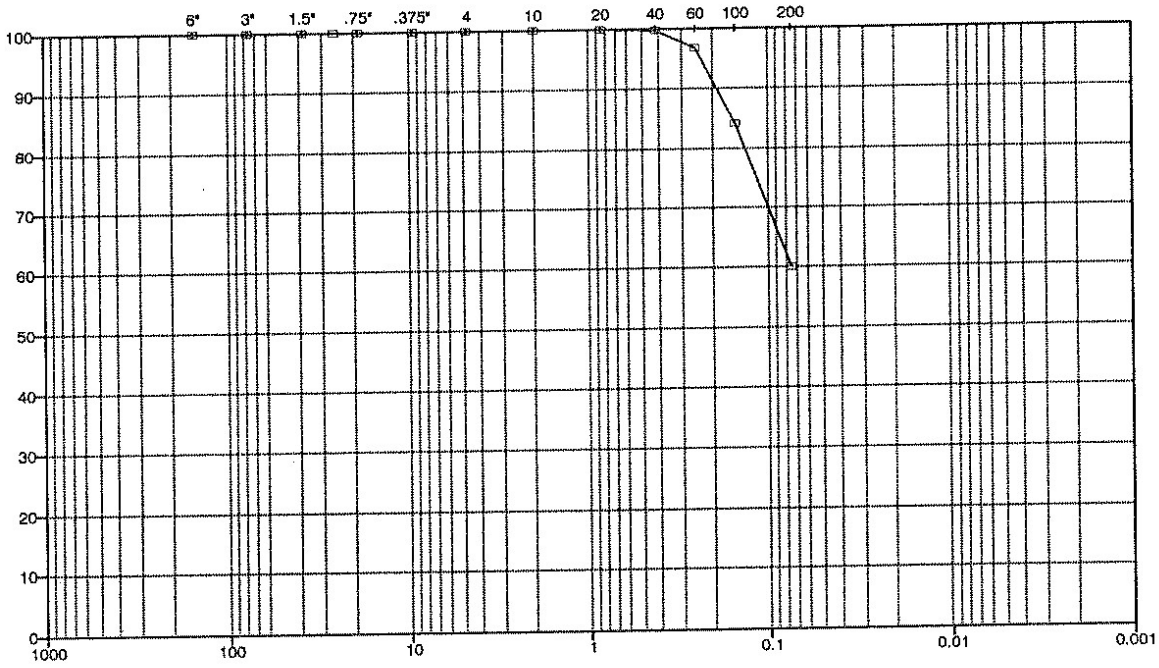
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848PS1

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

	Coarse	Fine	C	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-208-SS	--	--	--	--	--	FINES and fine SAND
SAMPLE NO.							
DEPTH (FT.)	10-12'						
Sample Type:		Date Tested: 6/29/95					USCS: --

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

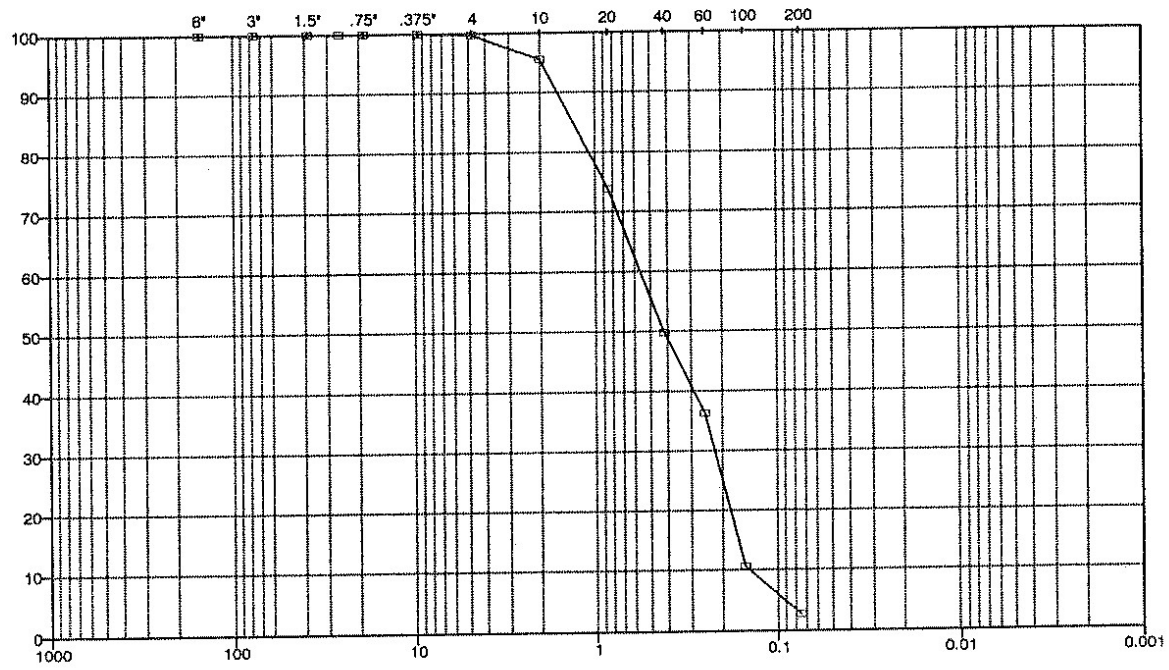
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848206

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

	Coarse	Fine	C	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		17.0%	--	--	--	--	Coarse to fine SAND with trace fines
SAMPLE NO.	PZ-207AS						
DEPTH (FT.)	36.0-38.0						

Sample Type: Date Tested: 4/28/95 USCS: SP

TECH: KRF
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

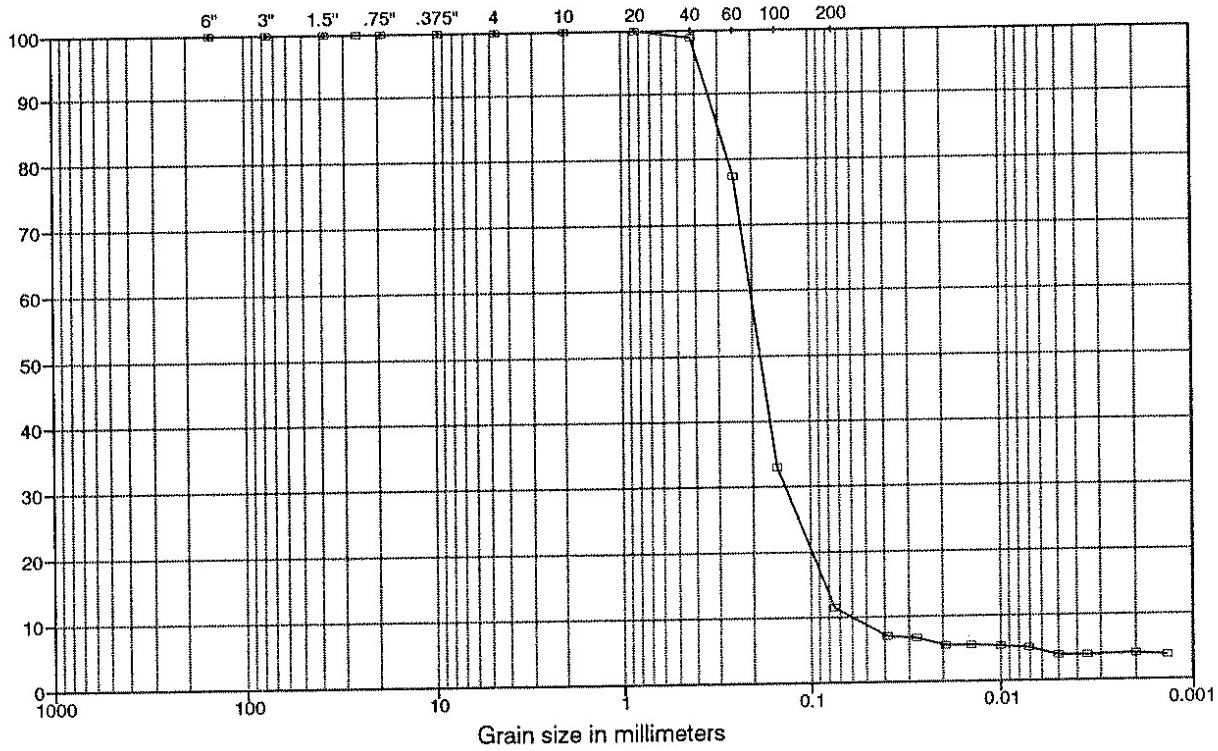
FILENAME: 2848207

LAIDLAW/OU2 RIFS/MO
943-2848.202

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



% PASSING

USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	NP	NP	2.62	Medium to fine SAND with little silt
SAMPLE NO.	PZ-206-SS						
DEPTH	8-10,32-34						

Sample Type: Date Tested: 4/6/95 USCS: SP-SM

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

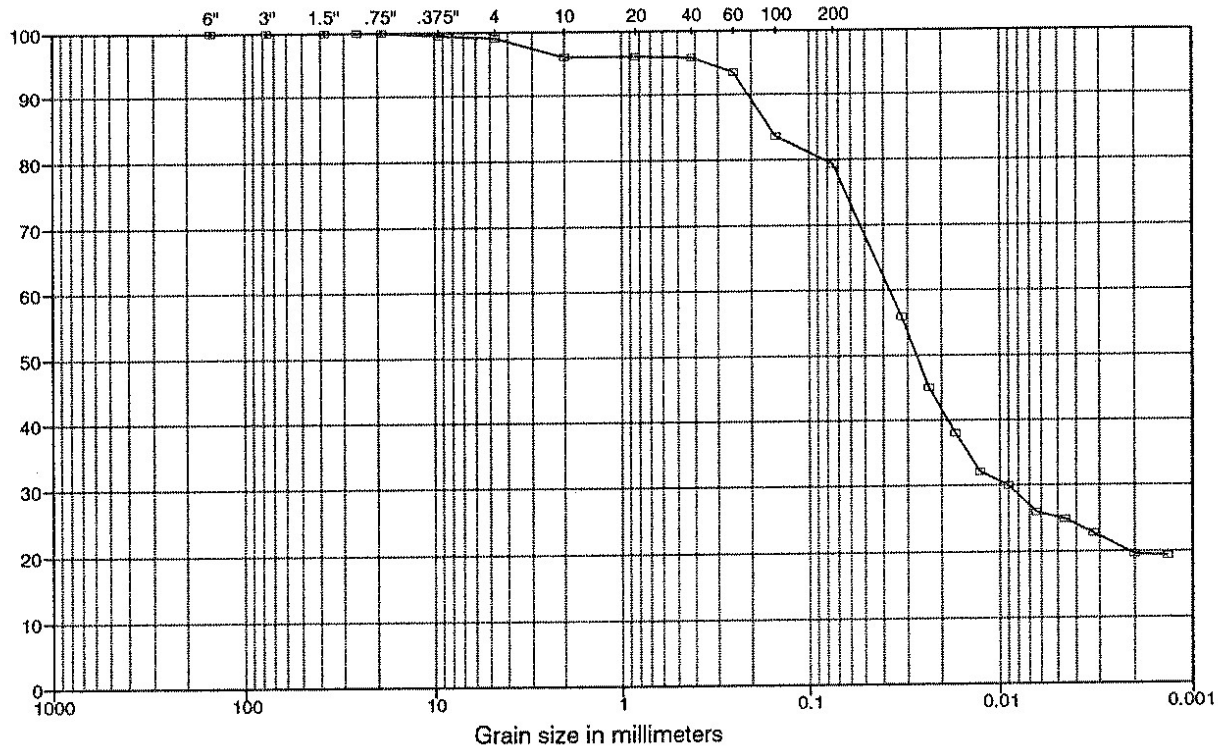
FILENAME: 2844206

LAIDLAW/OU2 RIFS/MO
943-2848.202

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-205-AS	--	--	--	--	2.68	SILT with some coarse to fine sand, trace fine gravel
SAMPLE NO.							
DEPTH	31-33'						

Sample Type: Date Tested: 6/28/95 USCS: ML

TECH: BRB
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

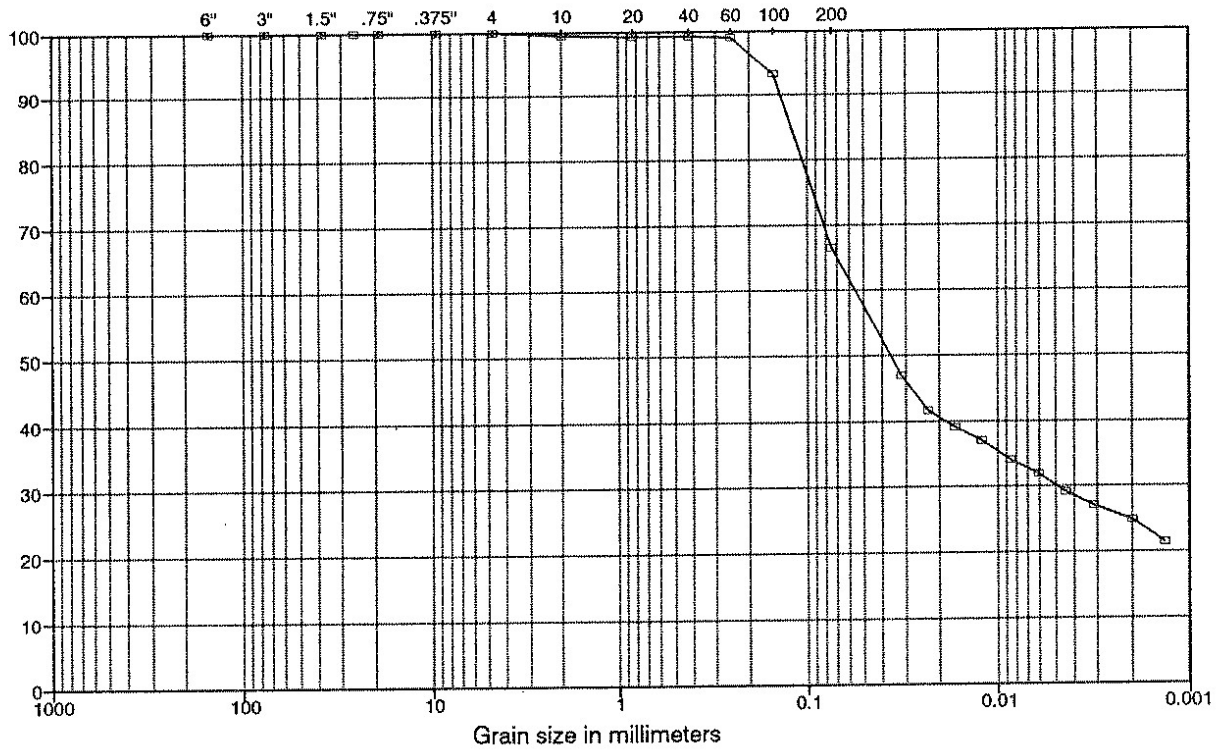
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848205B

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-205-AS	--	--	--	--	2.81	FINES and coarse to fine SAND
SAMPLE NO.							
DEPTH	41-43'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

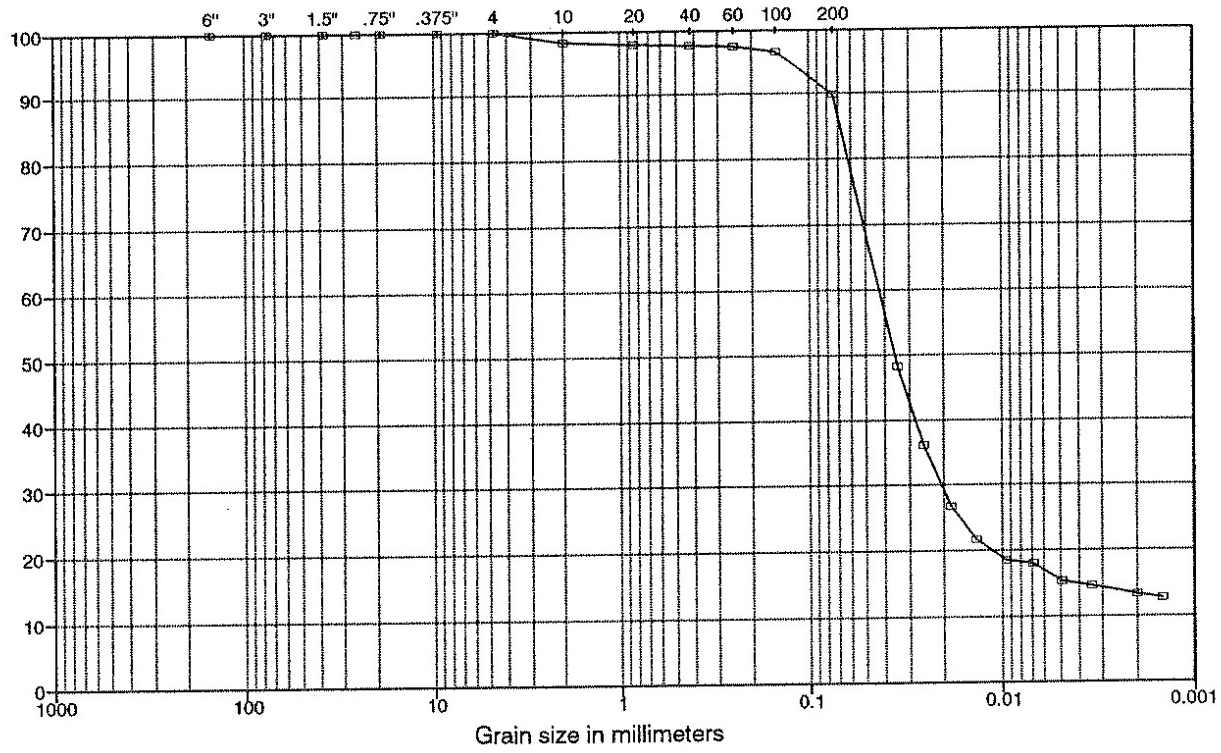
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848205A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS							
		Coarse	Fine	Cor	Med	Fine	
	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	--	--	2.64	FINES with little coarse to fine sand
SAMPLE NO.	PZ-205-SS						
DEPTH	28-30						
Sample Type:		Date Tested: 4/9/95					USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

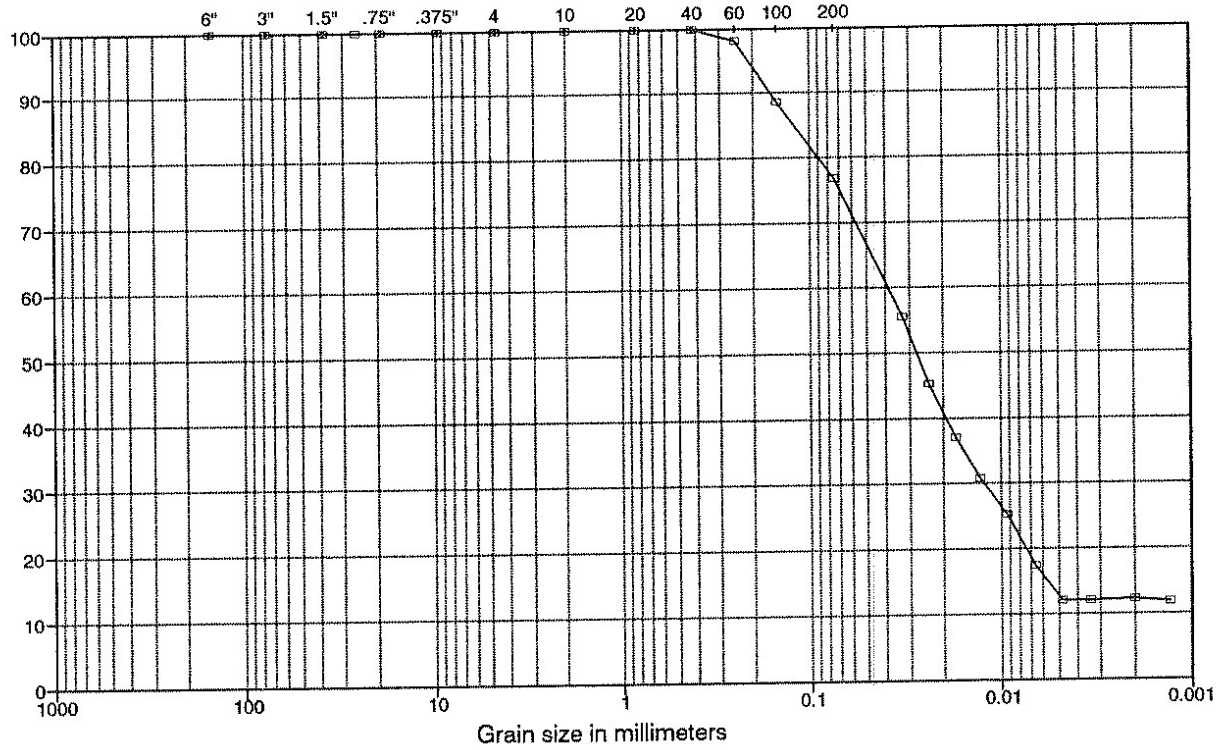
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848205

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



% PASSING

USCS

COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
	Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	NP	NP	2.68	SILT with some fine sand
SAMPLE NO.	PZ-204-SS						
DEPTH	8-10,10-12						

Sample Type: Date Tested: 4/6/95 USCS: ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

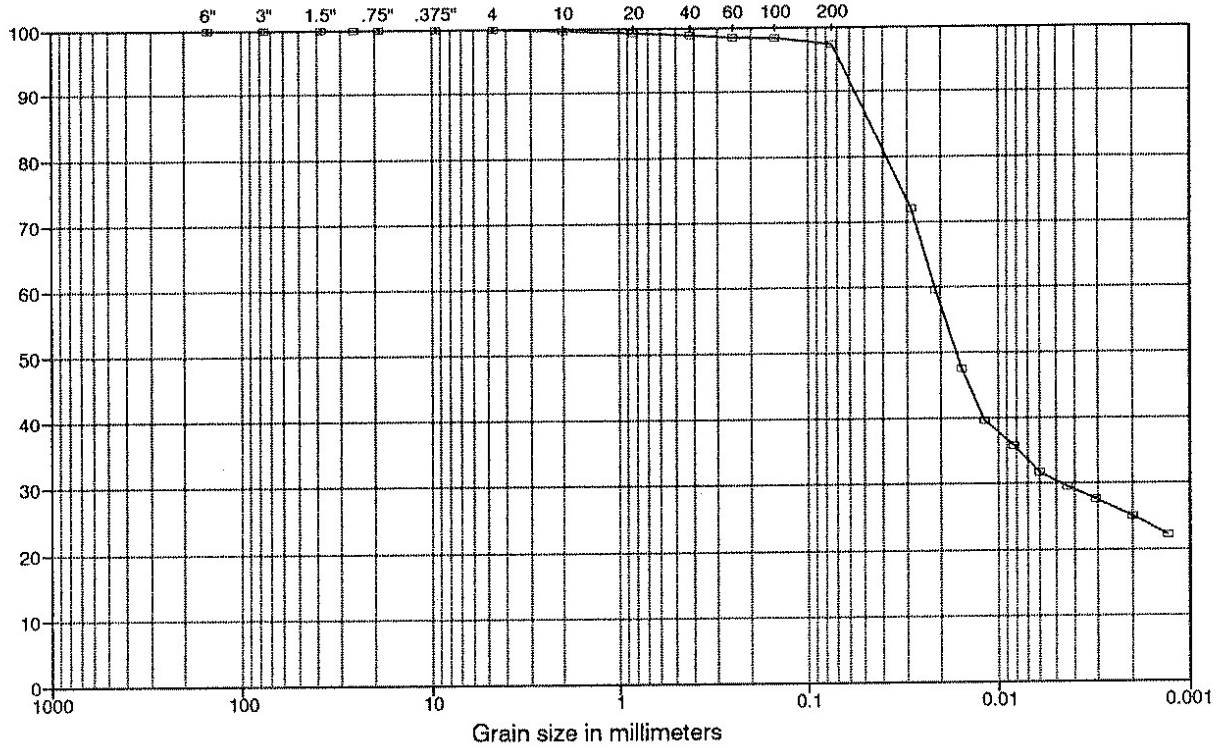
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2845204

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-203-SS	--	--	--	--	2.85	FINES with trace medium to fine sand
SAMPLE NO.							
DEPTH	8-10'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

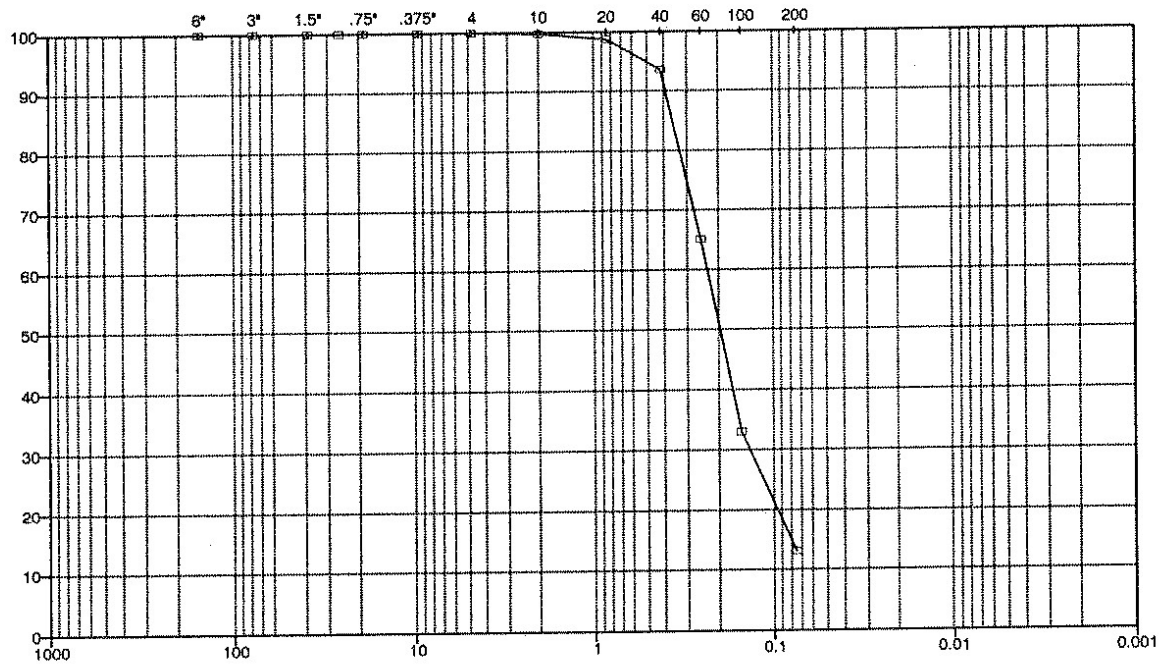
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848203A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-203-SS	--	--	--	--	--	Medium to fine SAND with some fines
SAMPLE NO.							
DEPTH (FT.)	38-40'						

Sample Type: Date Tested: 6/26/95 USCS: --

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

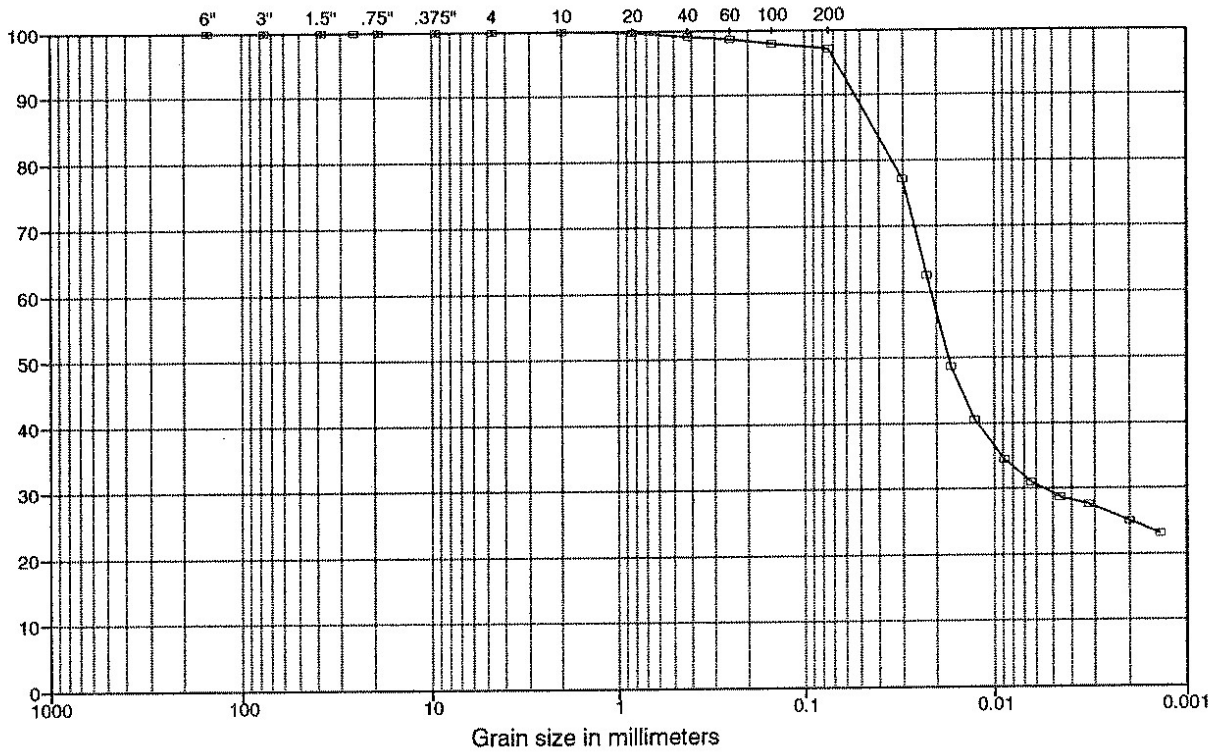
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2648203

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		26.7	45	24	21	2.74	Silty CLAY with trace medium to fine sand
SAMPLE NO.	PZ-202-SS						
DEPTH	6-8,8-10						

Sample Type: Date Tested: 4/9/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

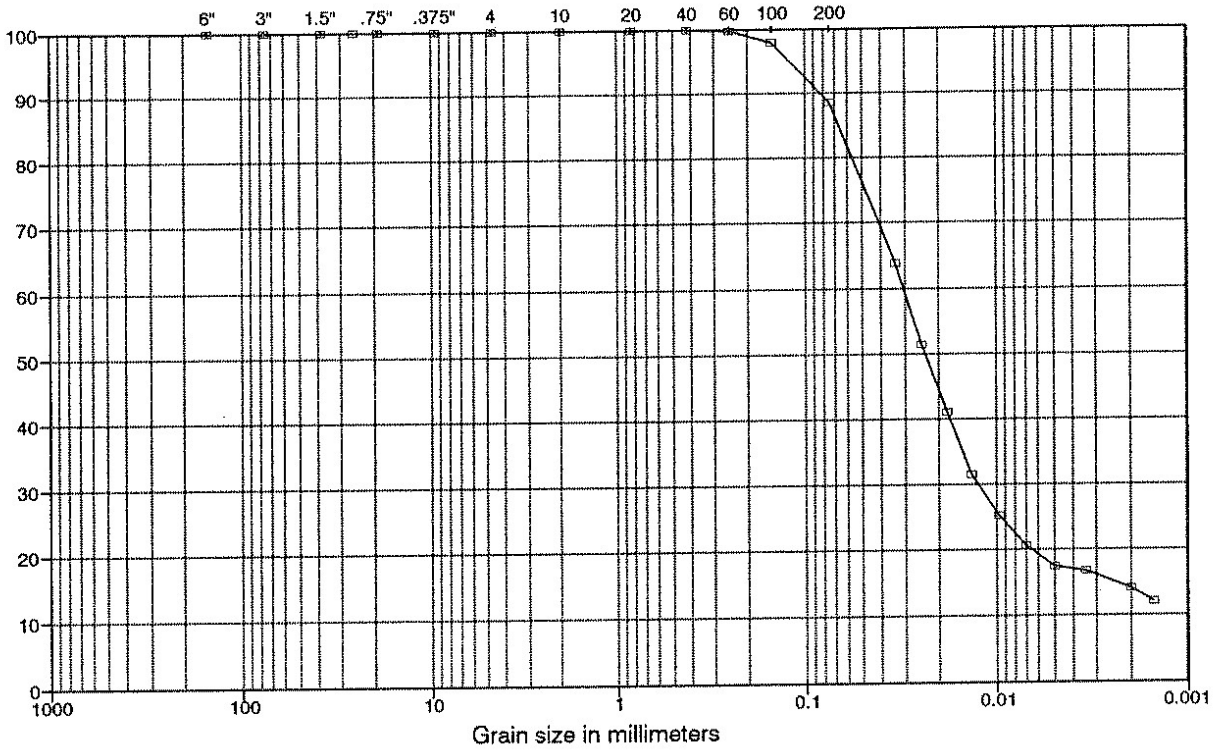
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848202

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		34.5	--	NP	NP	2.62	SILT with little fine sand
SAMPLE NO.	PZ-201-SS						
DEPTH	24-26,26-28						

Sample Type: Date Tested: 4/9/95 USCS: ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

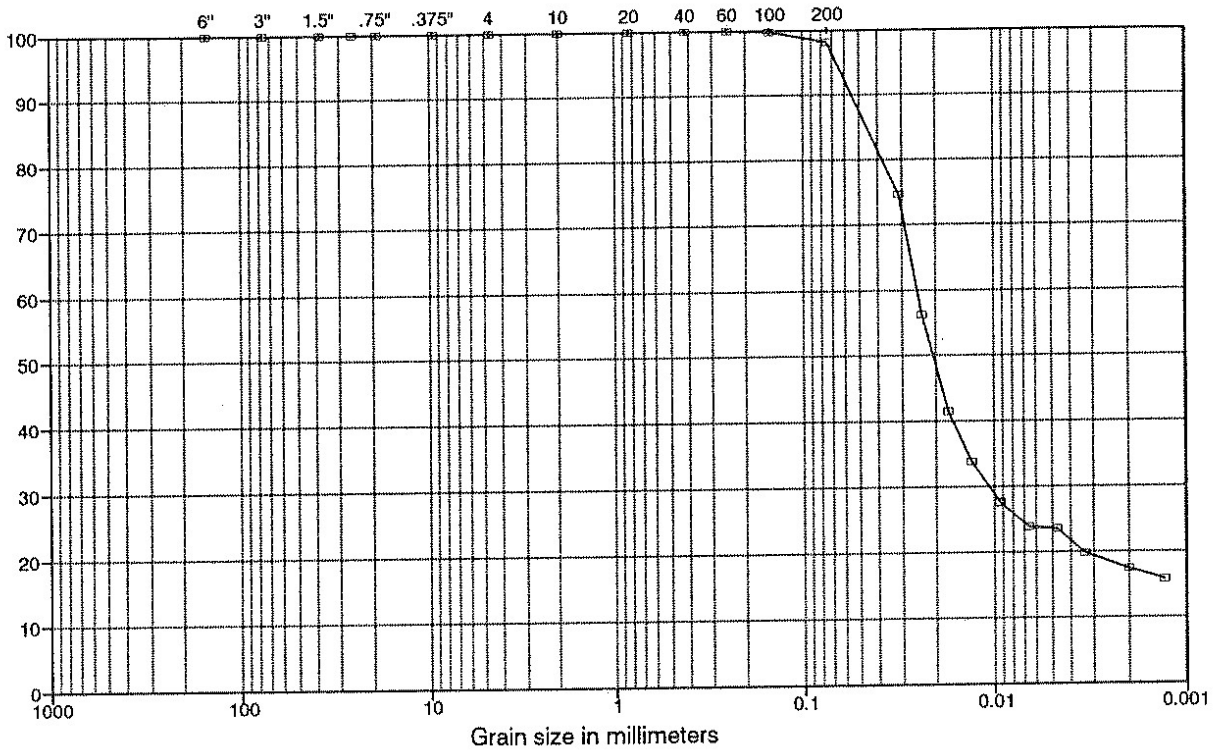
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848201

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	Coarse	Fine	Cor	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		27.5	36	24	12	2.64	Clayey SILT with trace fine sand
SAMPLE NO.	PZ-200-SS						
DEPTH	6-8,8-10						

Sample Type: Date Tested: 04/06/95 USCS: CL-ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

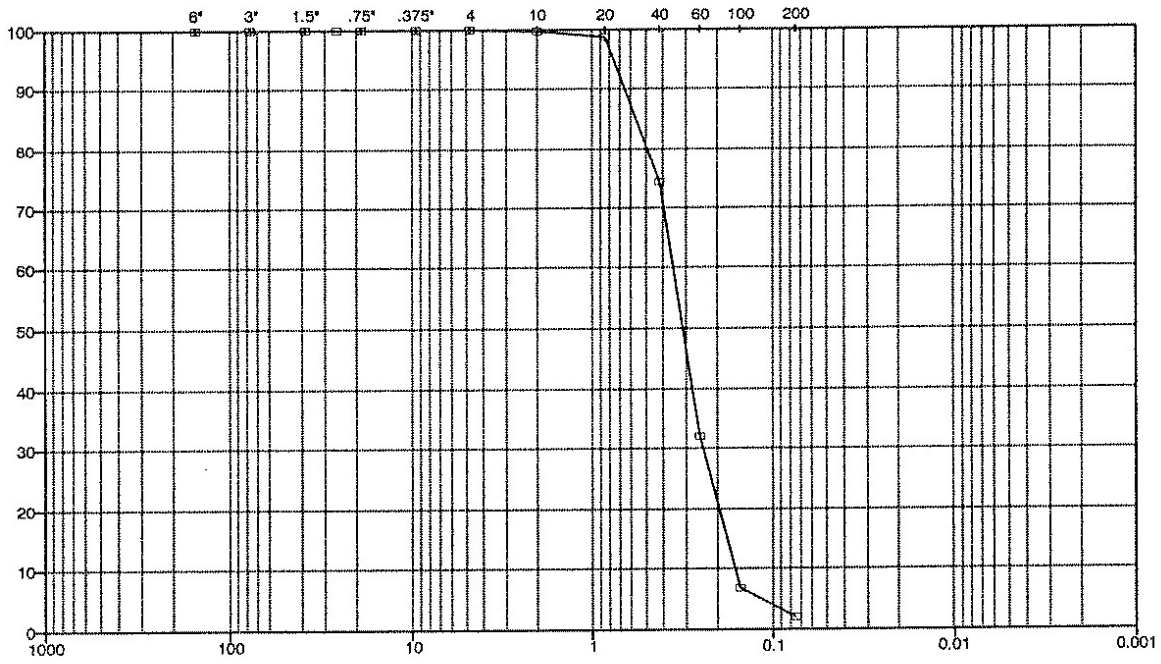
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848200

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-116-SS	--	--	--	--	--	Medium to fine SAND with trace fines
SAMPLE NO.							
DEPTH (FT.)	29-31'						
Sample Type:		Date Tested: 6/26/95					USCS: SP

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

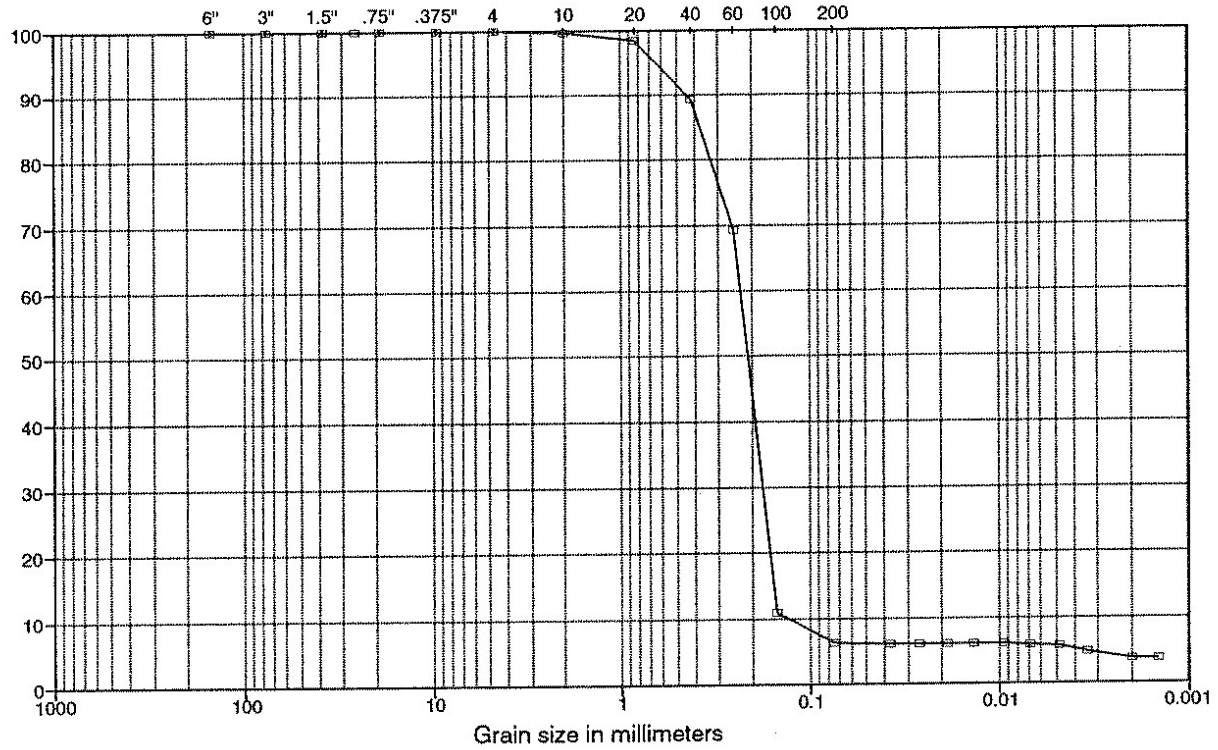
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848116

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	Coarse	Fine	Cor	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-115-SS	--	--	--	--	2.72	Medium to fine SAND with little fines
SAMPLE NO.							
DEPTH	30-32'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

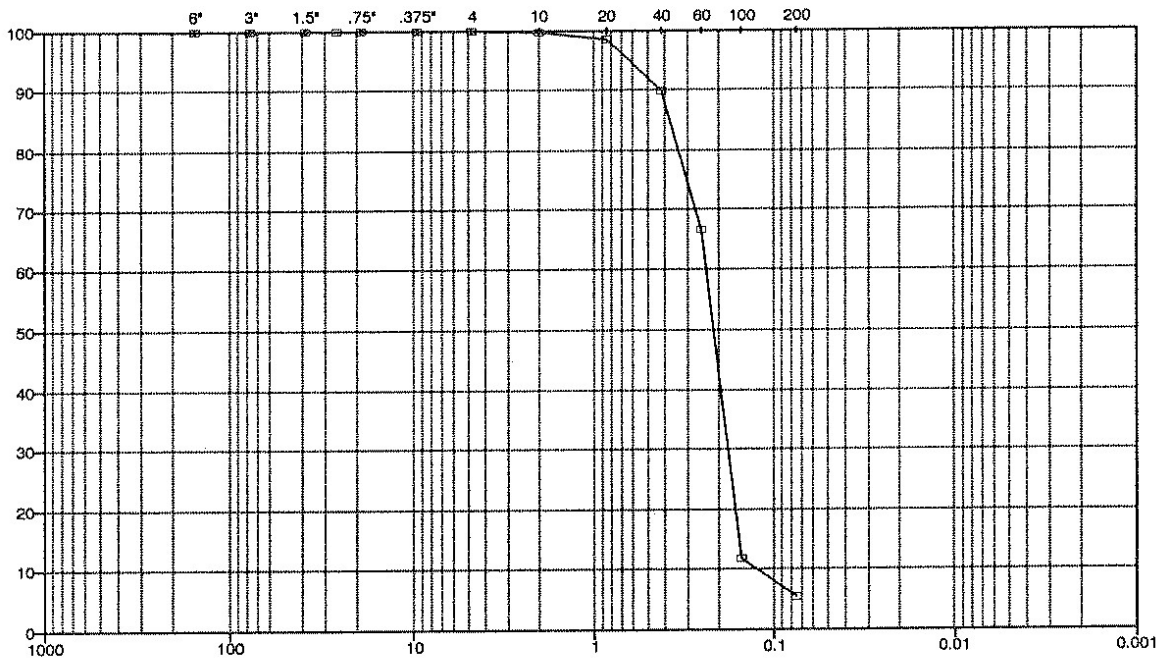
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: [illegible]

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		17.0%				--	
SAMPLE NO.	PZ-115-SS						
DEPTH (FT.)	30-32'						
Sample Type:		Date Tested:	6/26/95				USCS:

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

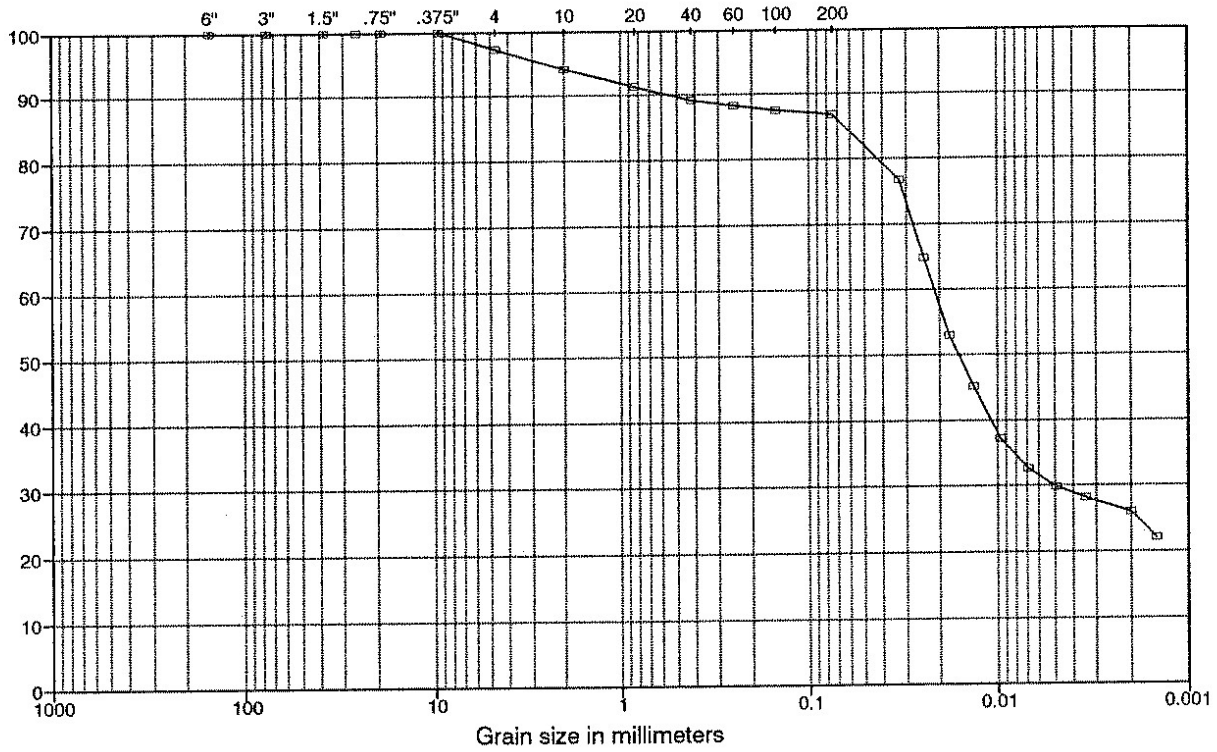
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848115

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
		GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		33.2	40	24	16	2.51	Silty CLAY with little coarse to fine sand, trace fine gravel
SAMPLE NO.	PZ-114-AS						
DEPTH	12.0-14.0						

Sample Type: Date Tested: 4/29/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

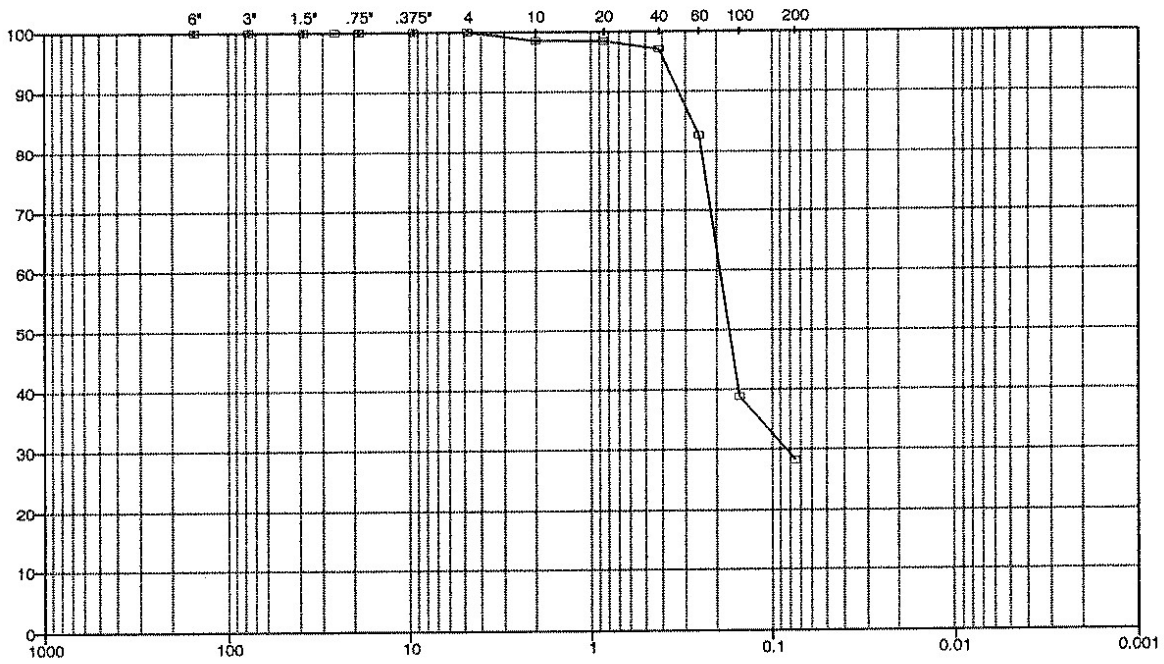
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848114A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		20.3%	--	--	--	--	Coarse to fine SAND with some fines
SAMPLE NO.	PZ-114AS						
DEPTH (FT.)	24.0-26.0						
Sample Type:		Date Tested: 4/28/95					USCS: --

TECH: KRF
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

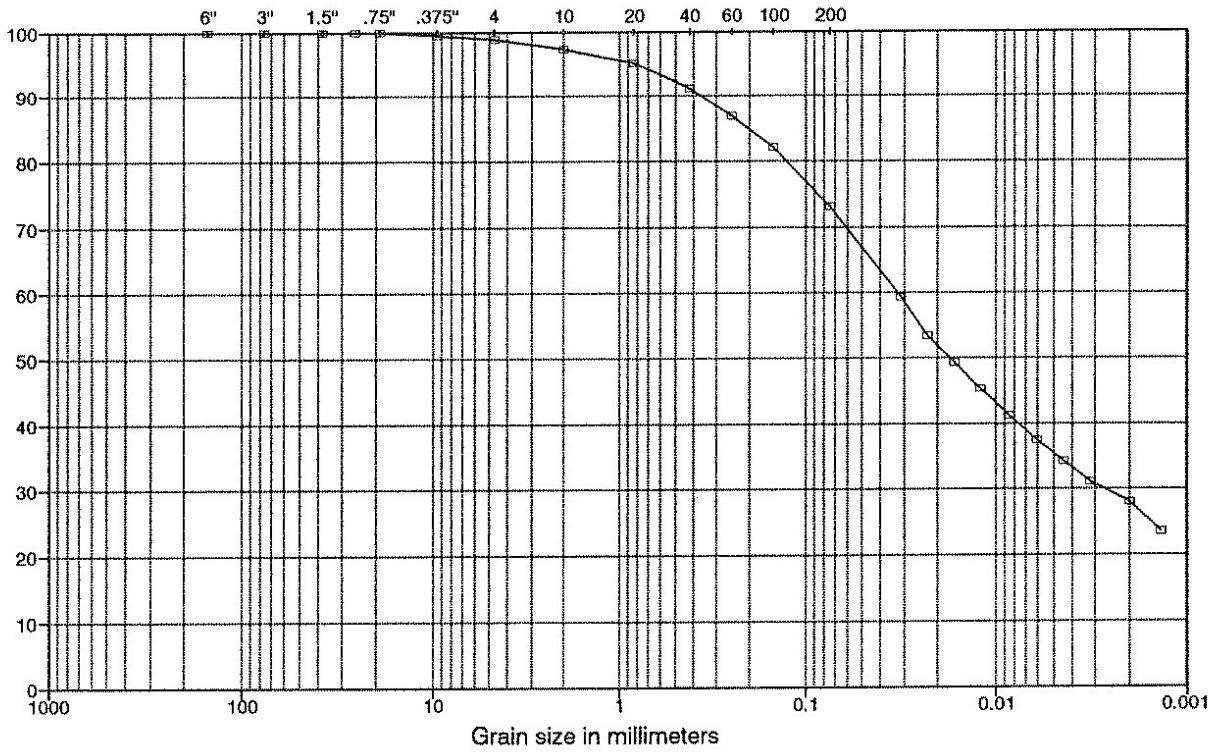
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848114

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	Coarse	Fine	Cor	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-113-AS	--	--	--	--	2.69	FINES with some coarse to fine sand
SAMPLE NO.							
DEPTH	8-10'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

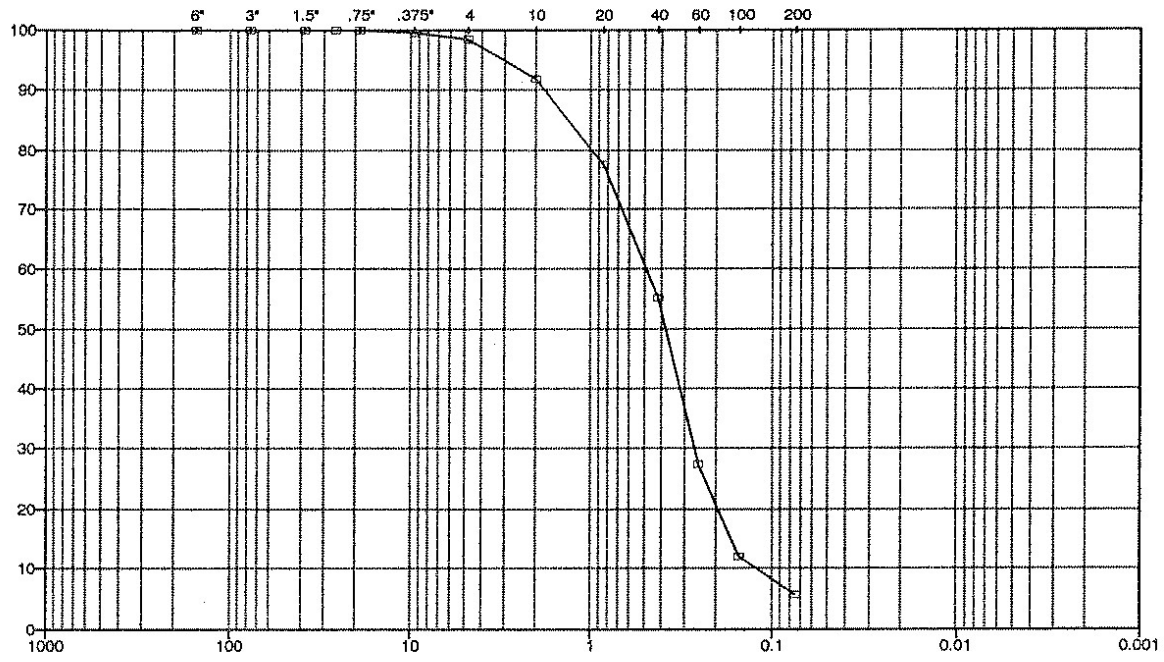
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848130

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL: Coarse	GRAVEL: Fine	SAND: C	SAND: Med	SAND: Fine	FINES (Silt or Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-113-AS	--	--	--	--	--	Coarse to fine SAND with little fines,
SAMPLE NO.							trace fine gravel
DEPTH (FT.)	94-96'						
Sample Type:		Date Tested: 6/26/95					USCS: --

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

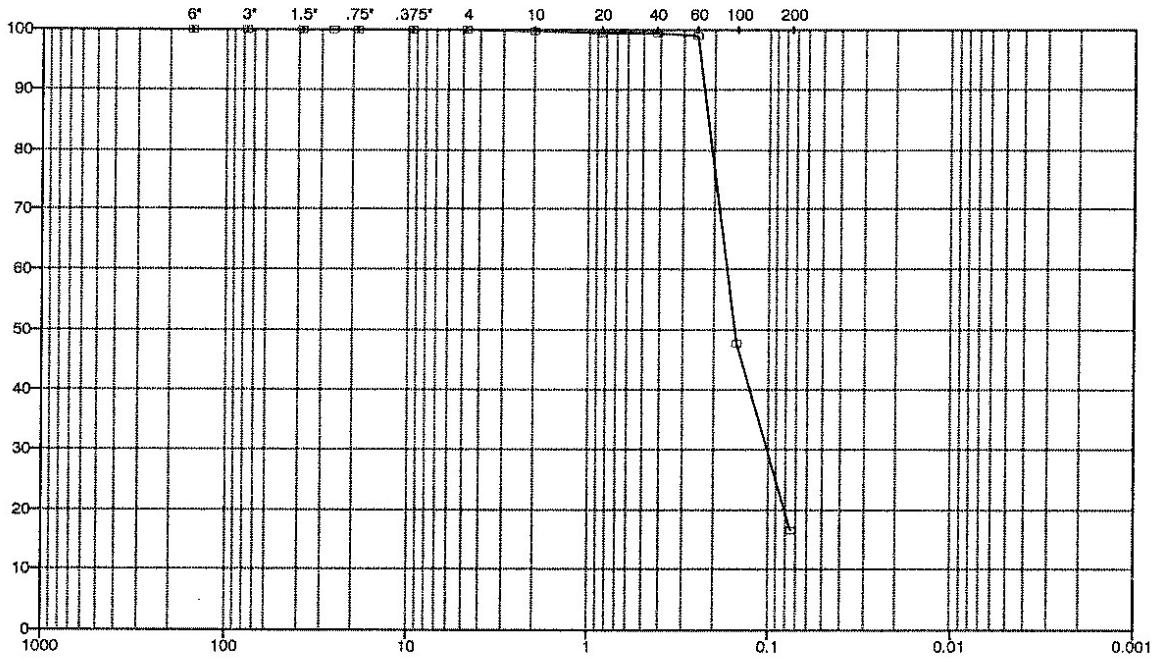
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113C

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

	Coarse	Fine	C	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-113-AS	--	--	--	--	--	Fine SAND with some fines
SAMPLE NO.							
DEPTH (FT.)	28-30'						

Sample Type: Date Tested: 6/26/95 USCS: --

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

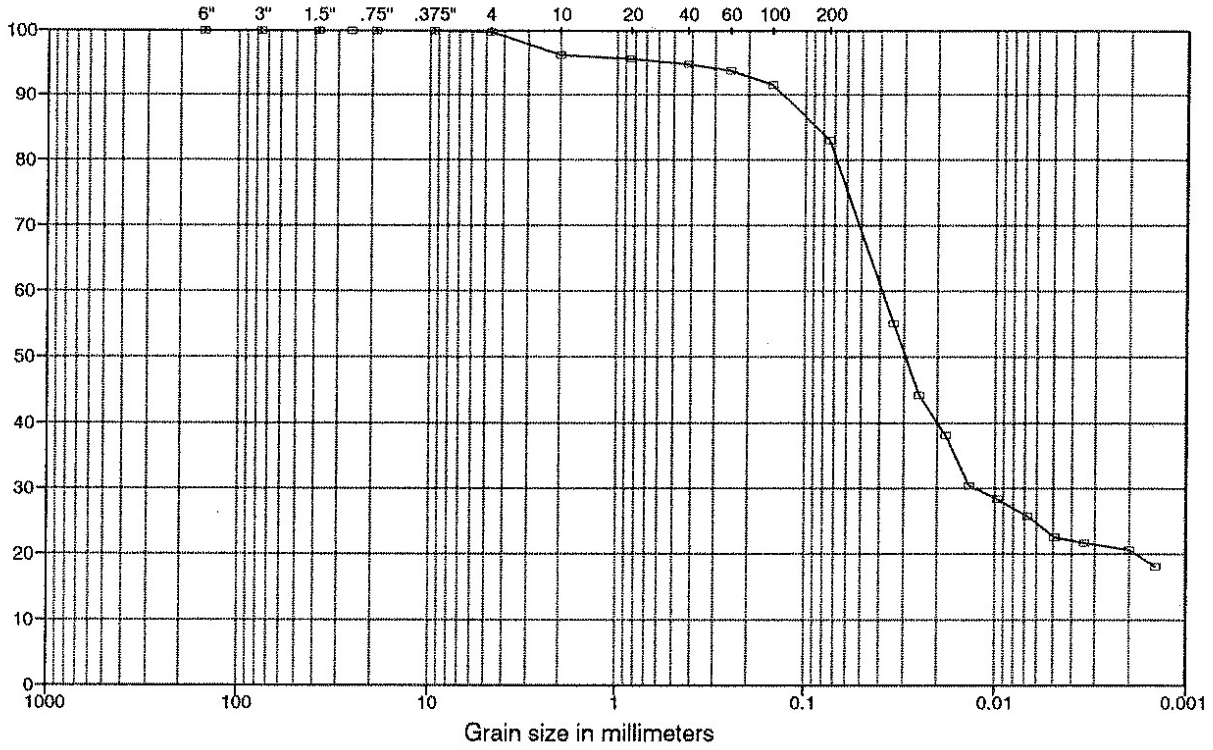
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113B

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		20.1	32	23	9	2.62	Silty CLAY with some coarse to fine sand
SAMPLE NO.	PZ-113-AS						
DEPTH	10.0-12.0						

Sample Type: Date Tested: 4/29/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

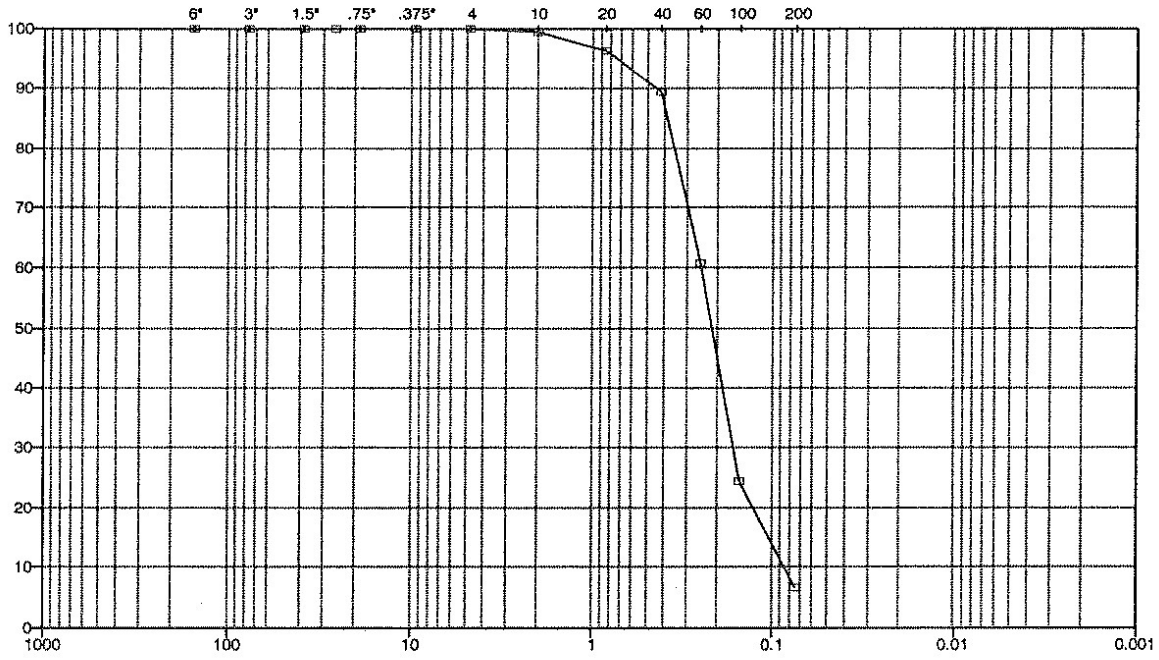
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

	Coarse	Fine	C	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		18.0%	--	--	--	--	Coarse to fine SAND with little fines
SAMPLE NO.	PZ-113AS						
DEPTH (FT.)	34.0-36.0						
Sample Type:		Date Tested: 4/28/95					USCS: SP-SM

TECH: KRF
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

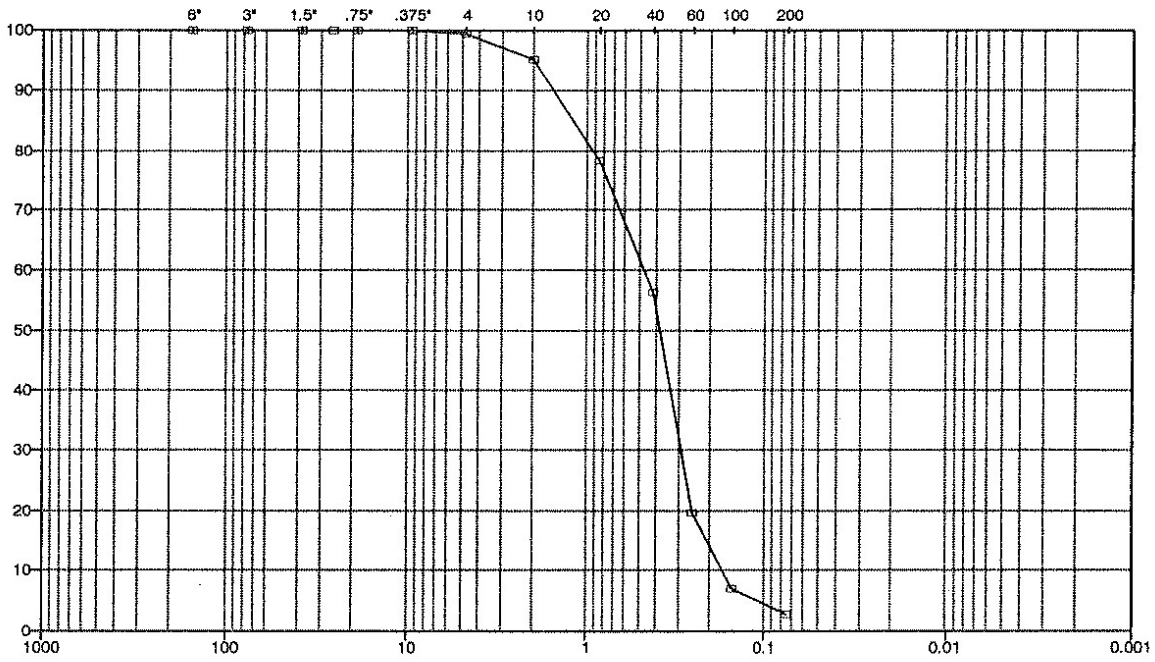
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

	Coarse	Fine	C	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		14.0%	--	--	--	--	Coarse to fine SAND with trace fines,
SAMPLE NO.	PZ-112AS						trace fine gravel
DEPTH (FT.)	34.0-36.0						
Sample Type:		Date Tested: 4/28/95					USCS: SP

TECH: KRF
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

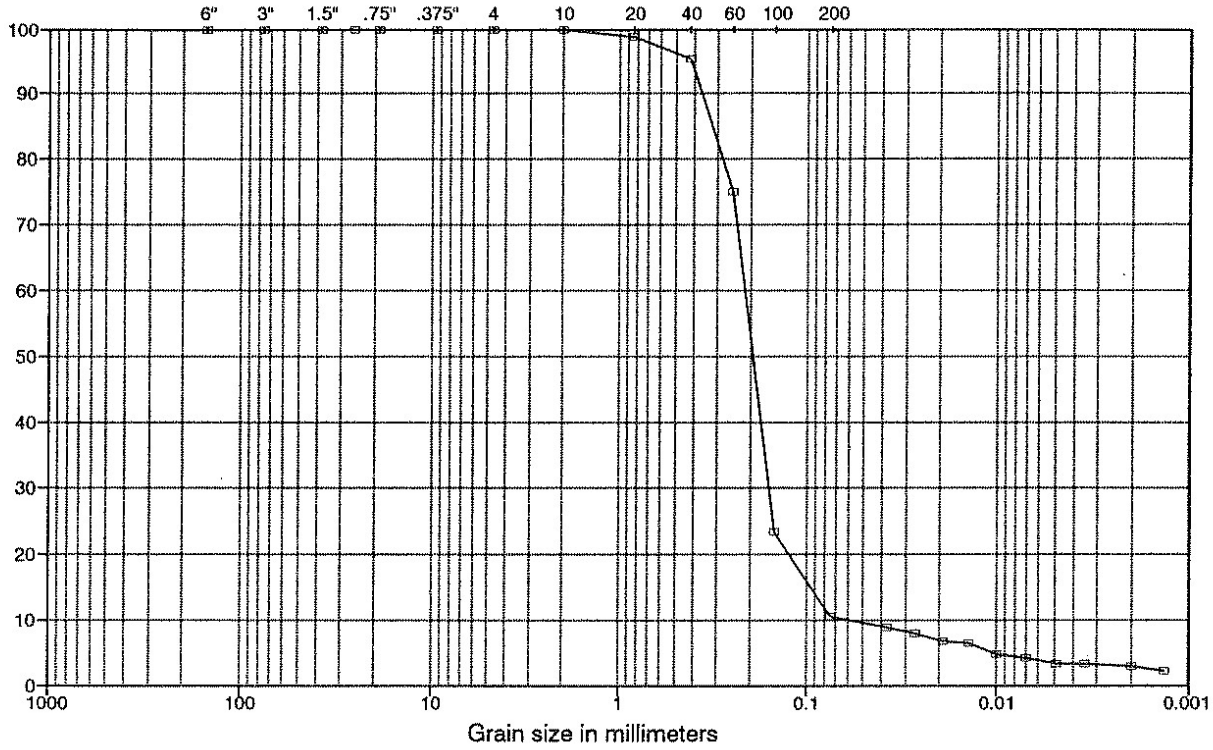
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2846112

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	Coarse	Fine	Cor	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	--	--	2.67	Medium to fine SAND with little fines
SAMPLE NO.	PZ-110-SS						
DEPTH	52-54						

Sample Type: Date Tested: 4/6/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

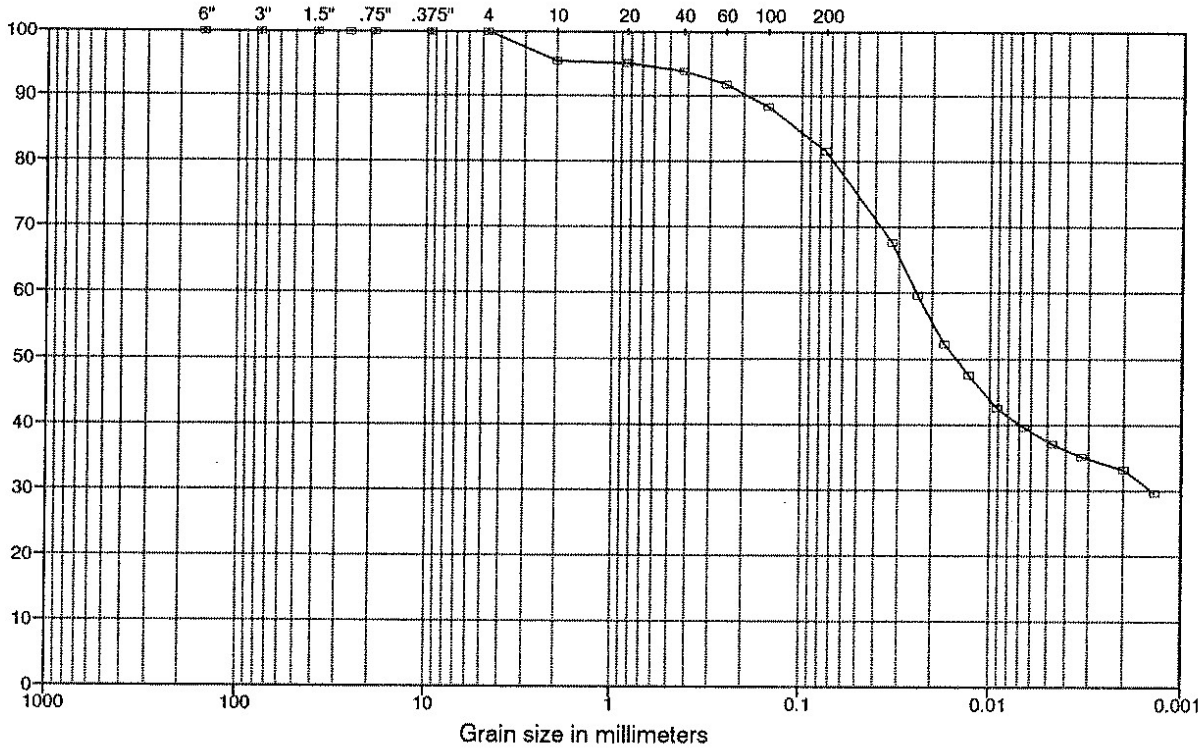
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848110

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
		GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		28.1	44	19	25	2.61	Silty CLAY with some coarse to fine sand
SAMPLE NO.	PZ-109-SS						
DEPTH	10.0-12.0						
Sample Type:		Date Tested: 4/29/95					USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

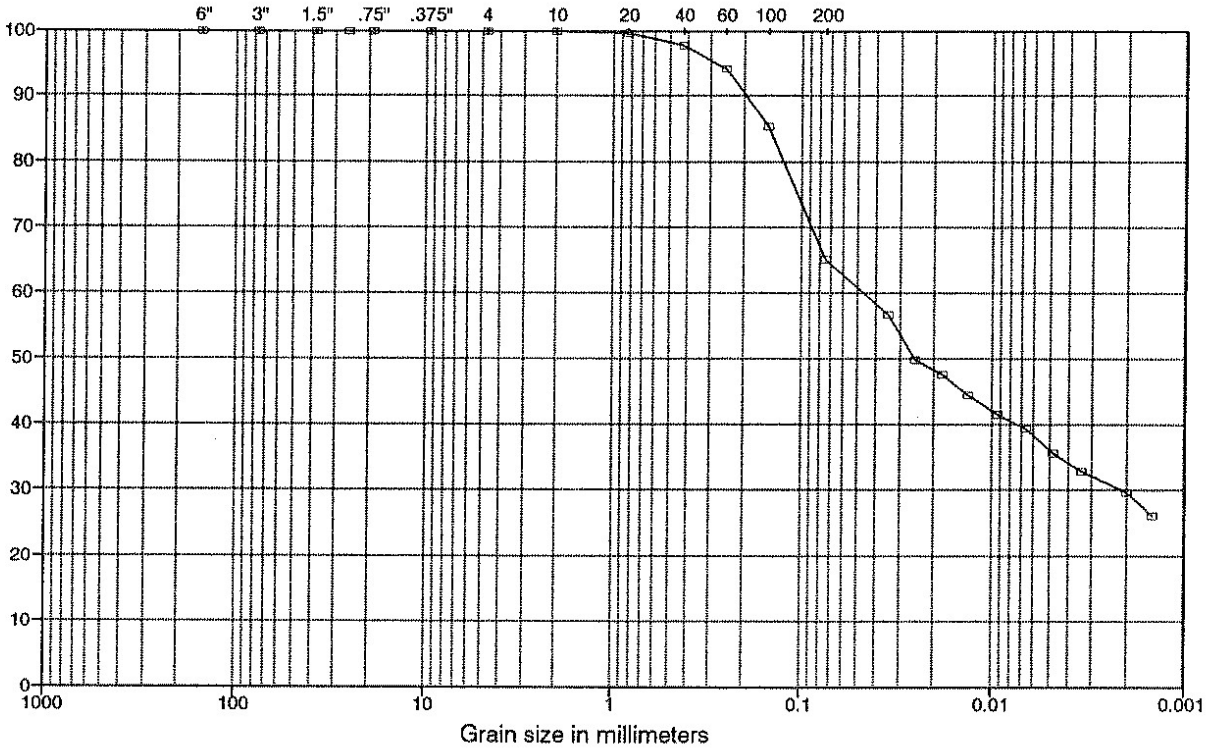
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848109

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	--	--	2.56	FINES and medium to fine SAND
SAMPLE NO.	PZ-108-SS						
DEPTH	16-18						

Sample Type: Date Tested: 4/9/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

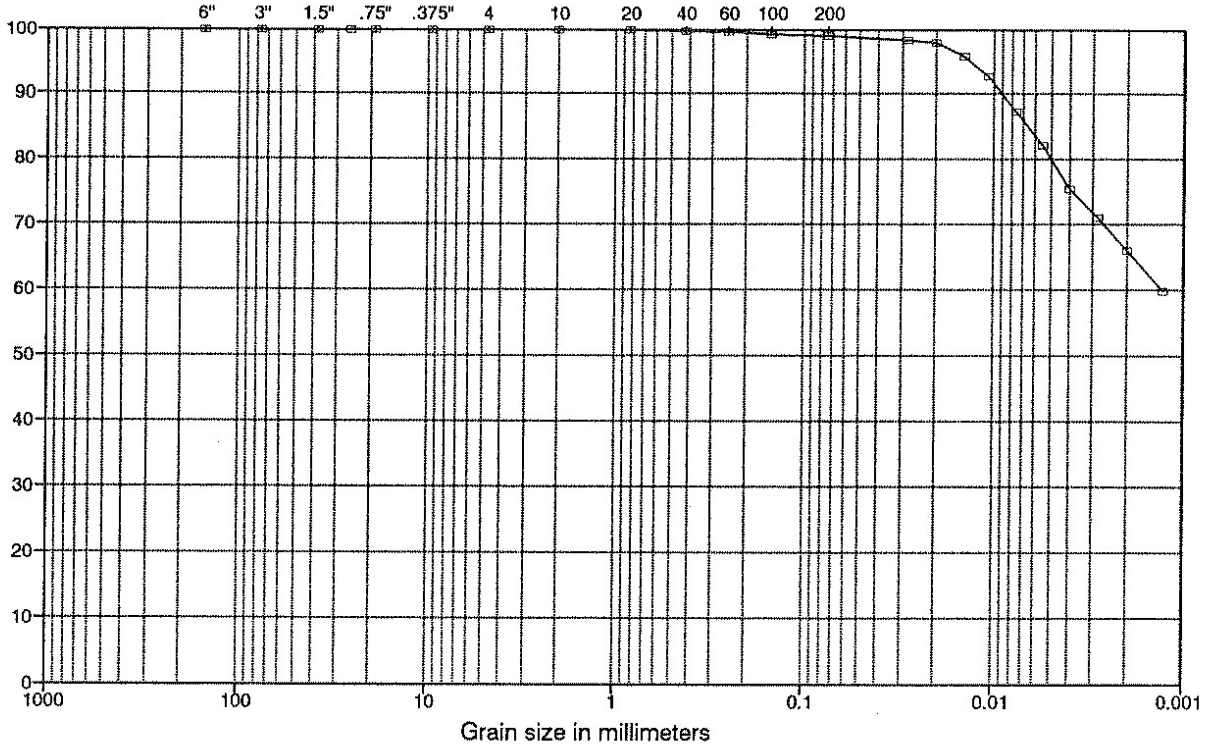
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848104

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	Coarse	Fine	Cor	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	--	--	2.69	FINES with trace fine sand
SAMPLE NO.	PZ-107-SS						
DEPTH	22-24						

Sample Type: Date Tested: 4/9/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

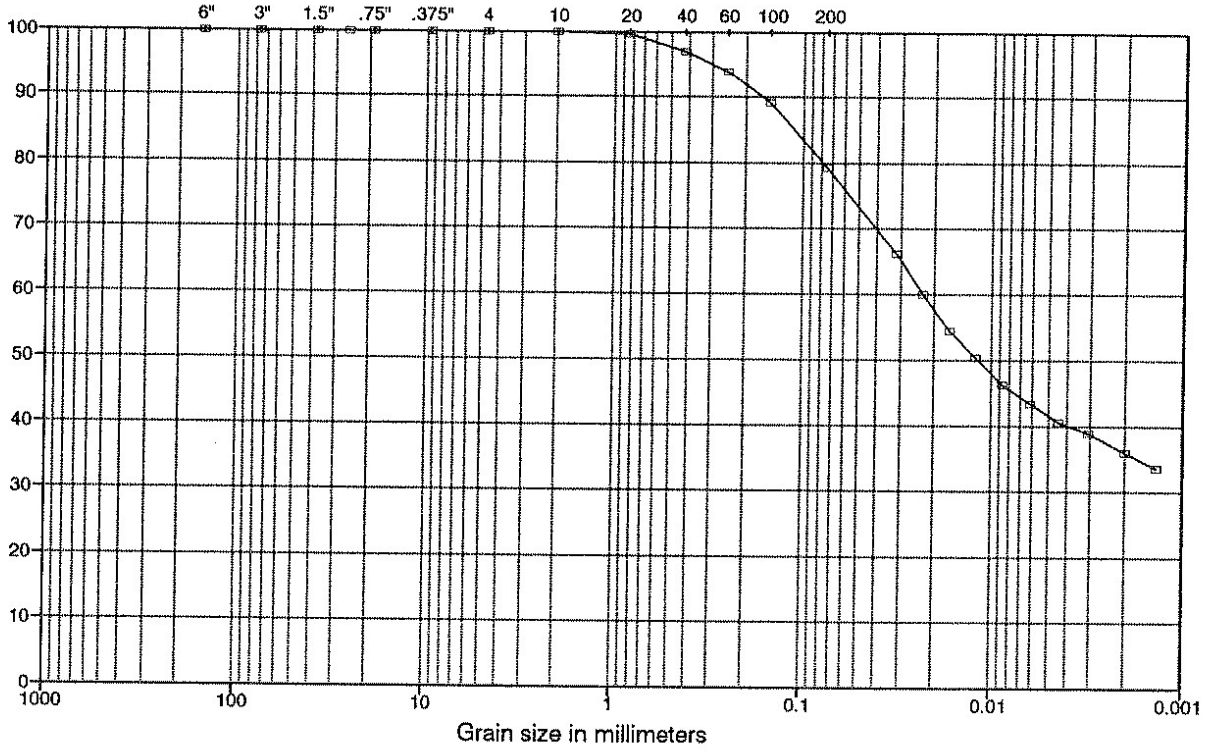
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848107

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		22.2	47	20	27	2.77	Silty CLAY with some medium to fine sand
SAMPLE NO.	PZ-106-KS						
DEPTH	6-8,8-10						

Sample Type: Date Tested: 4/9/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

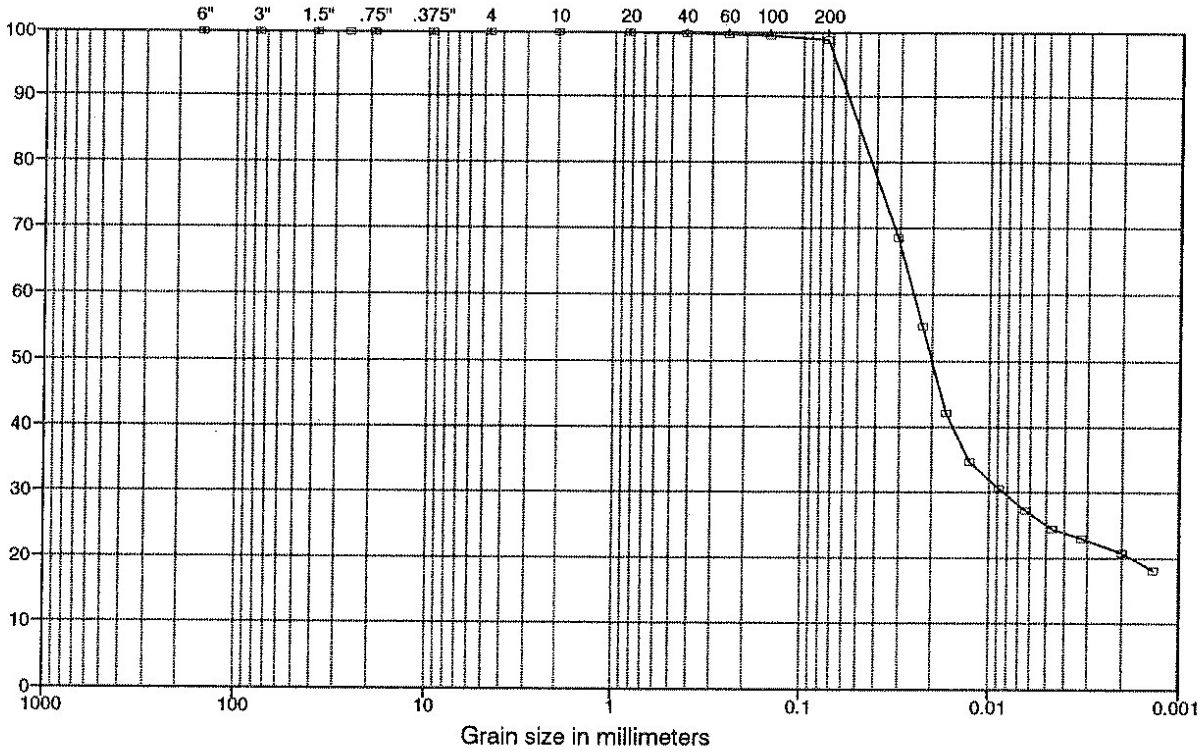
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848106

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-105-SS	--	--	--	--	2.71	FINES with trace fine sand
SAMPLE NO.							
DEPTH	10-12'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

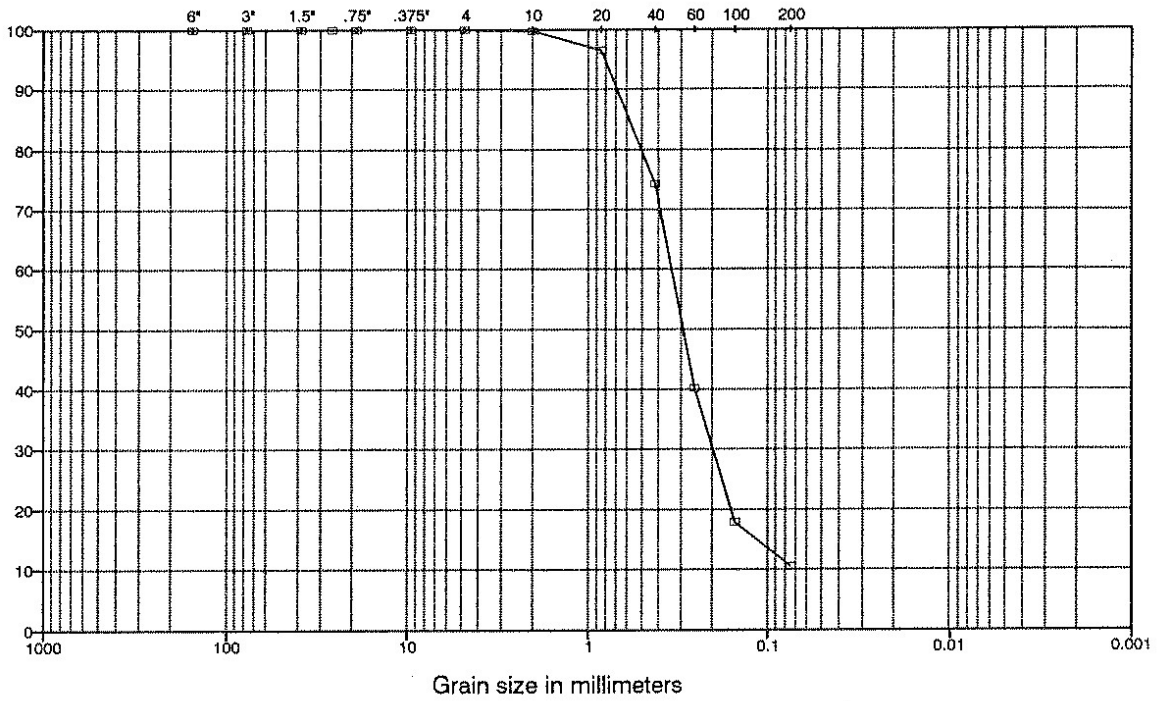
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848105A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-105-SS	--	--	--	--	--	Medium to fine SAND with little fines
SAMPLE NO.							
DEPTH (FT.)	30-32'						
Sample Type:		Date Tested: 6/26/95					USCS: --

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

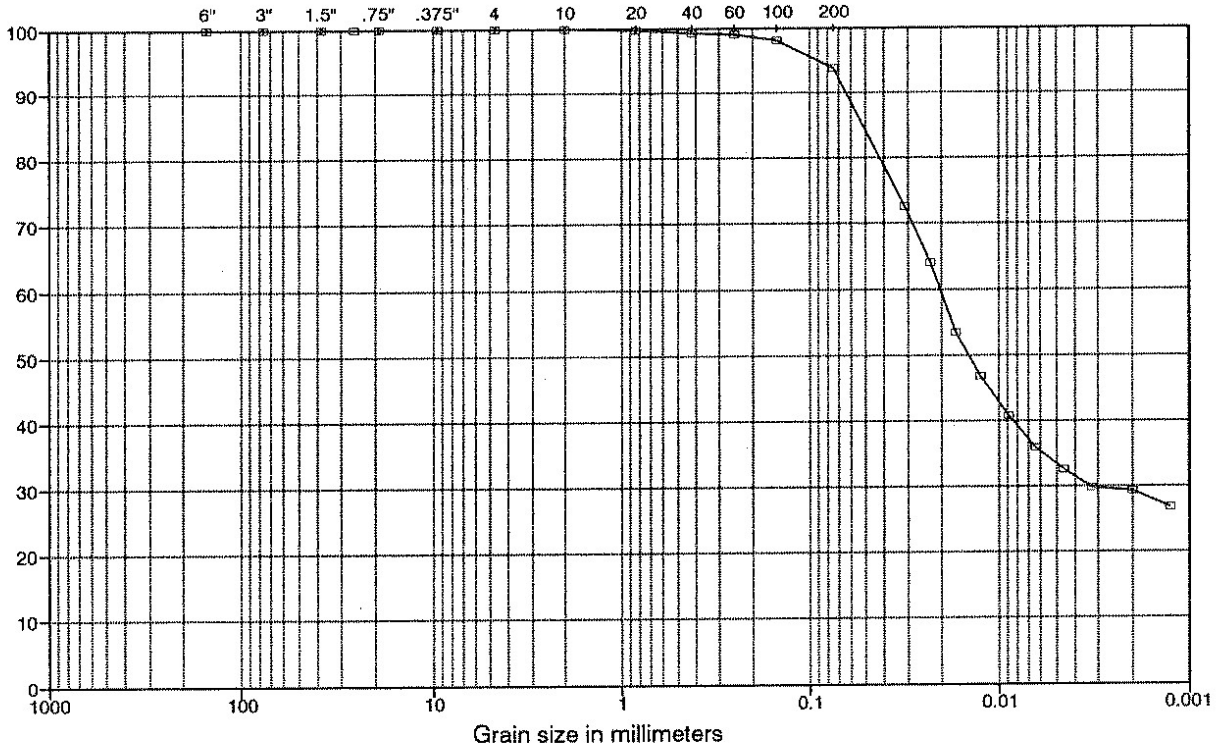
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848105

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



% PASSING

USCS

COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
	Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		23.6	46	25	21	2.66	Silty CLAY with little medium to fine sand
SAMPLE NO.	PZ-104-KS						
DEPTH	4-6,6-8						

Sample Type: Date Tested: 4/6/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

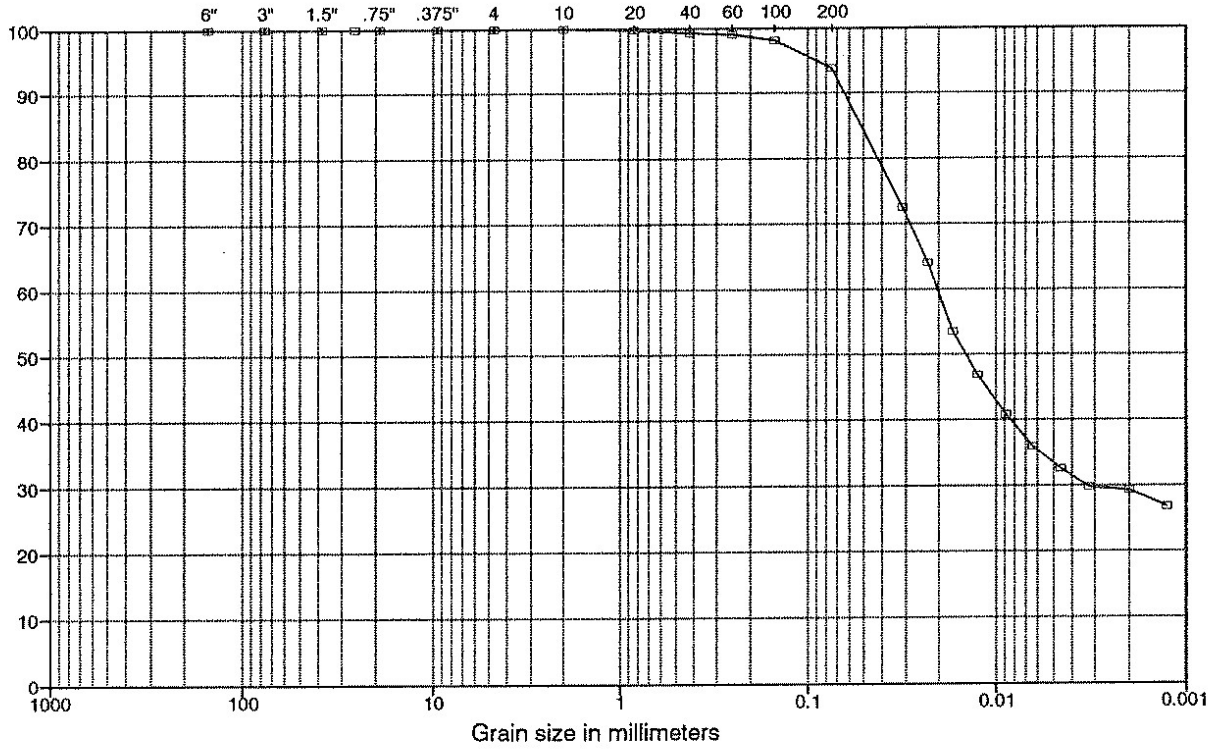
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848104

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	Coarse	Fine	Cor	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		23.6	46	25	21	2.66	Silty CLAY with little medium to fine sand
SAMPLE NO.	PZ-104-KS						
DEPTH	4-6,6-8						

Sample Type: Date Tested: 4/6/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

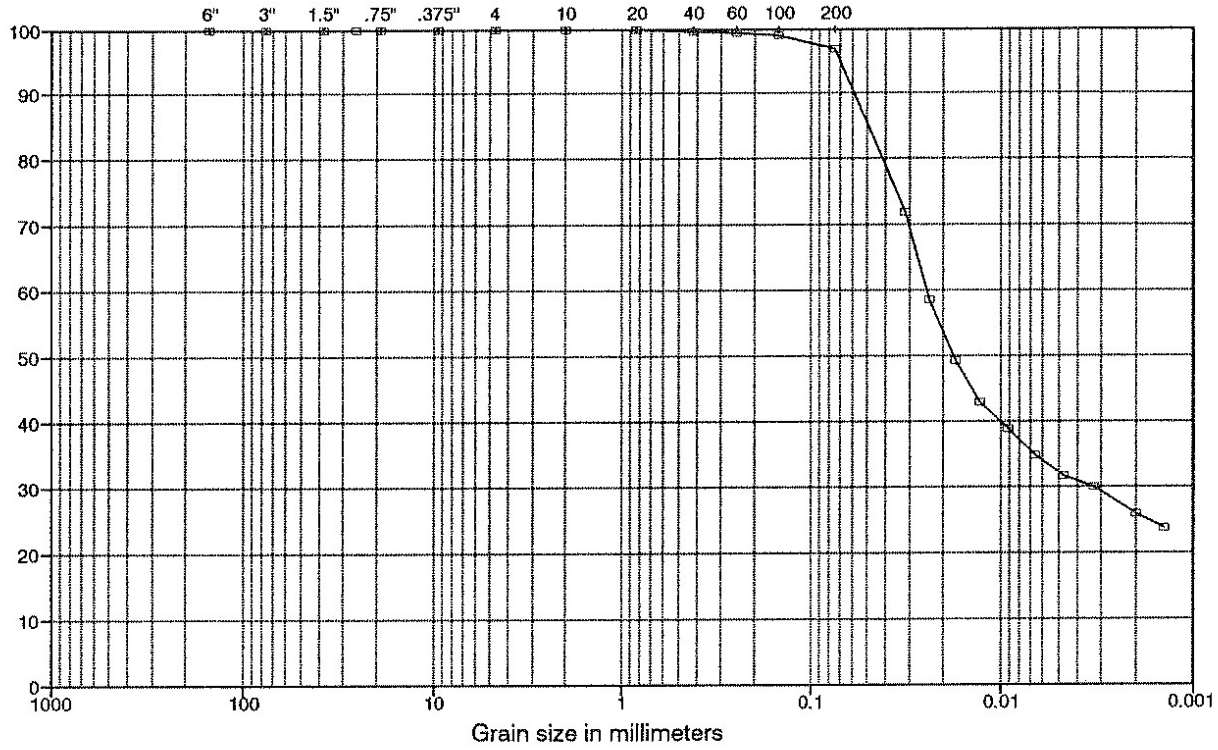
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848104

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		28.3	--	NP	NP	2.67	SILT with trace medium to fine sand
SAMPLE NO.	PZ-103-SS						
DEPTH	12-14,14-16						

Sample Type: Date Tested: 4/9/95 USCS: ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

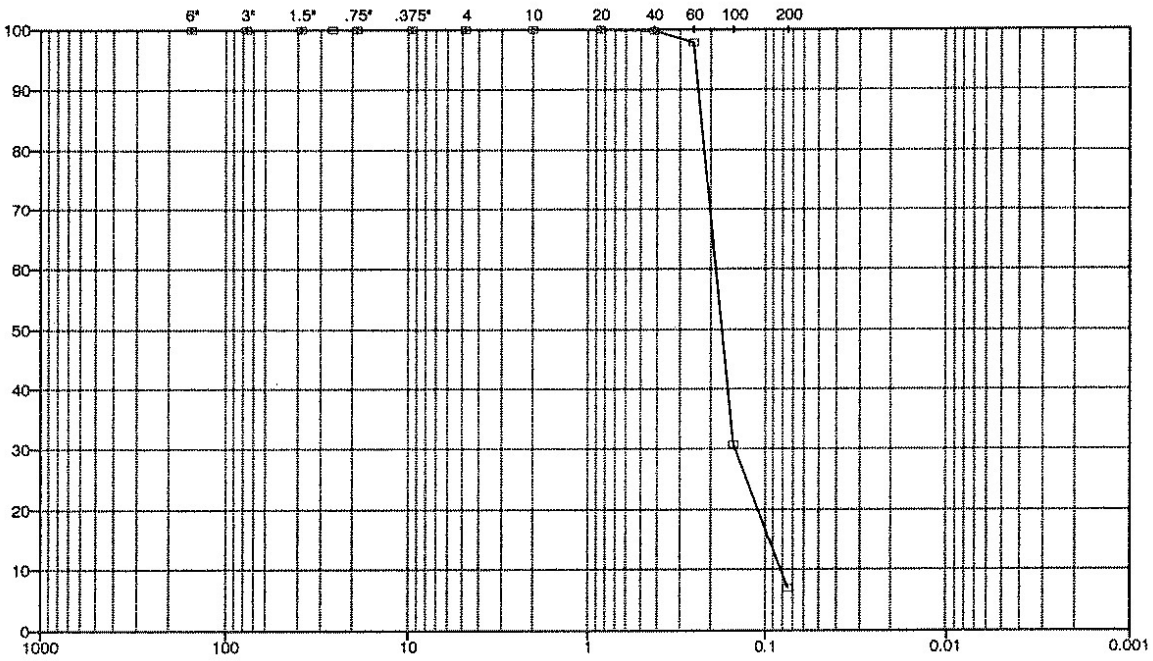
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848103

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt or Clay)
	Coarse	Fine	C	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		17.0%				--	
SAMPLE NO.	PZ-102R-SS						
DEPTH (FT.)	18-20'						

Sample Type: Date Tested: 6/26/95 USCS:

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

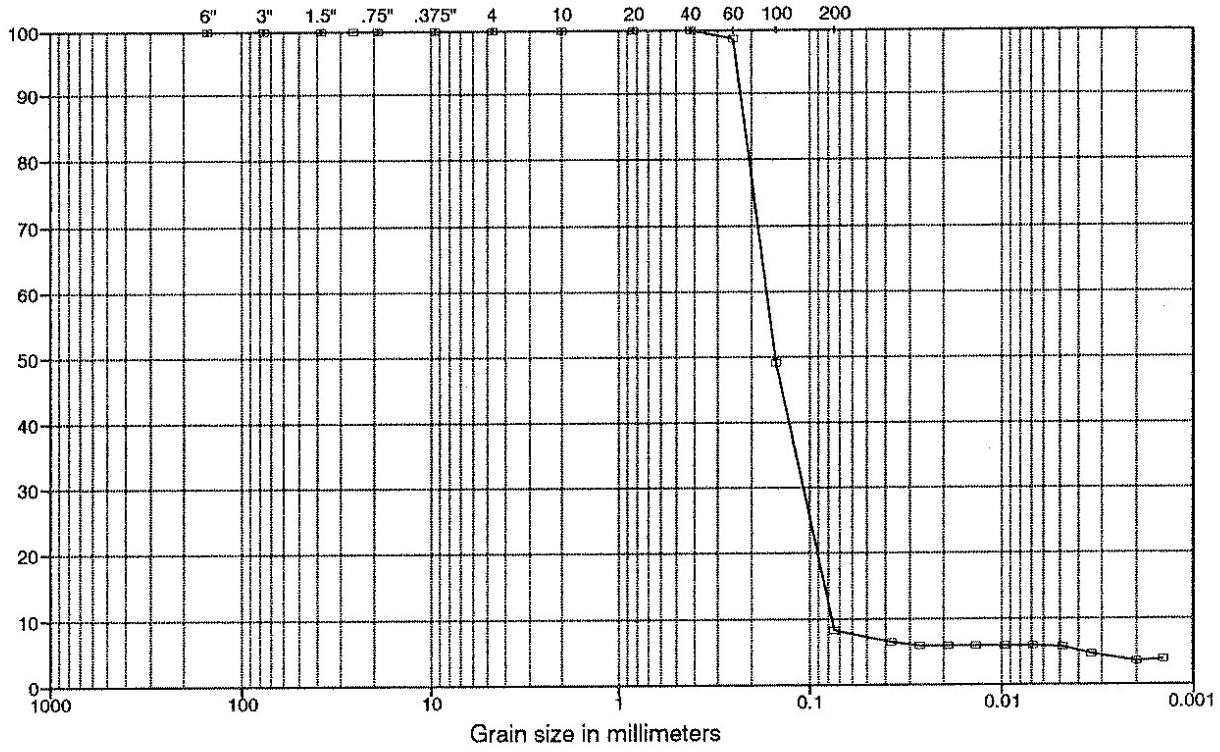
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848102R

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
		GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-102R-SS	--	--	--	--	2.69	Fine SAND with little fines
SAMPLE NO.							
DEPTH	18-20'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

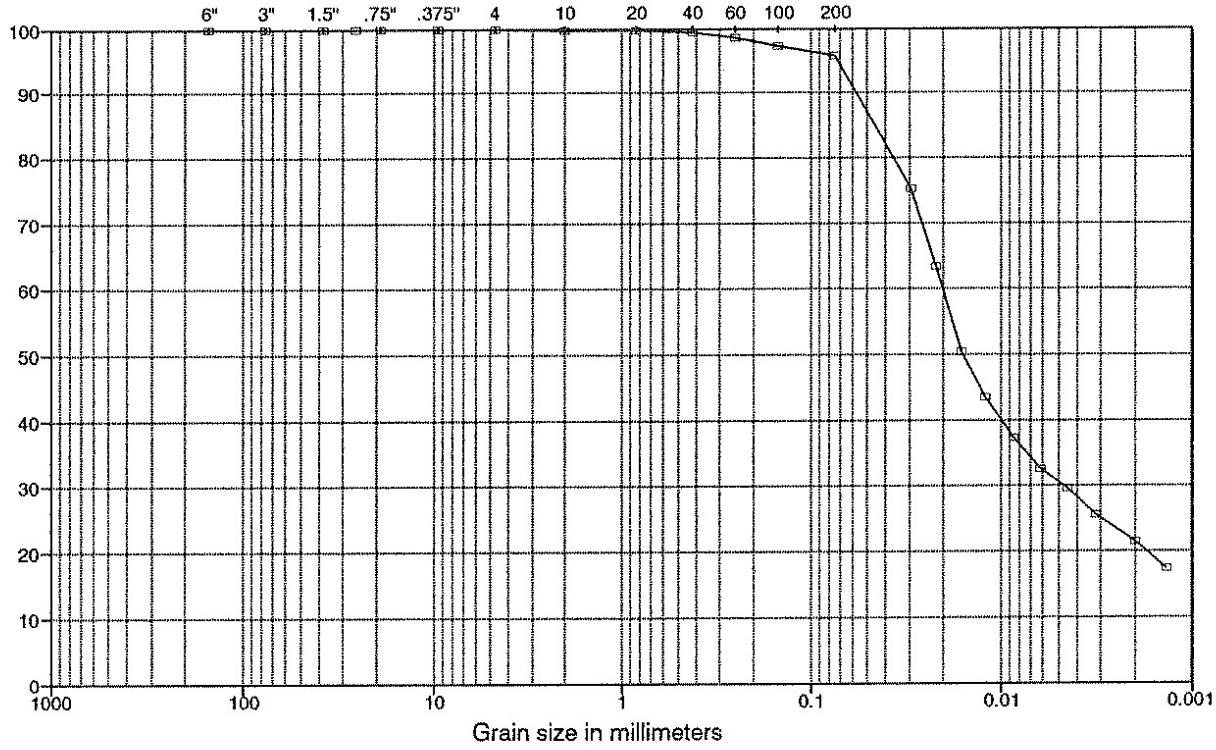
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848102B

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-102R-SS	--	--	--	--	2.76	FINES with trace fine sand
SAMPLE NO.							
DEPTH	12-14'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

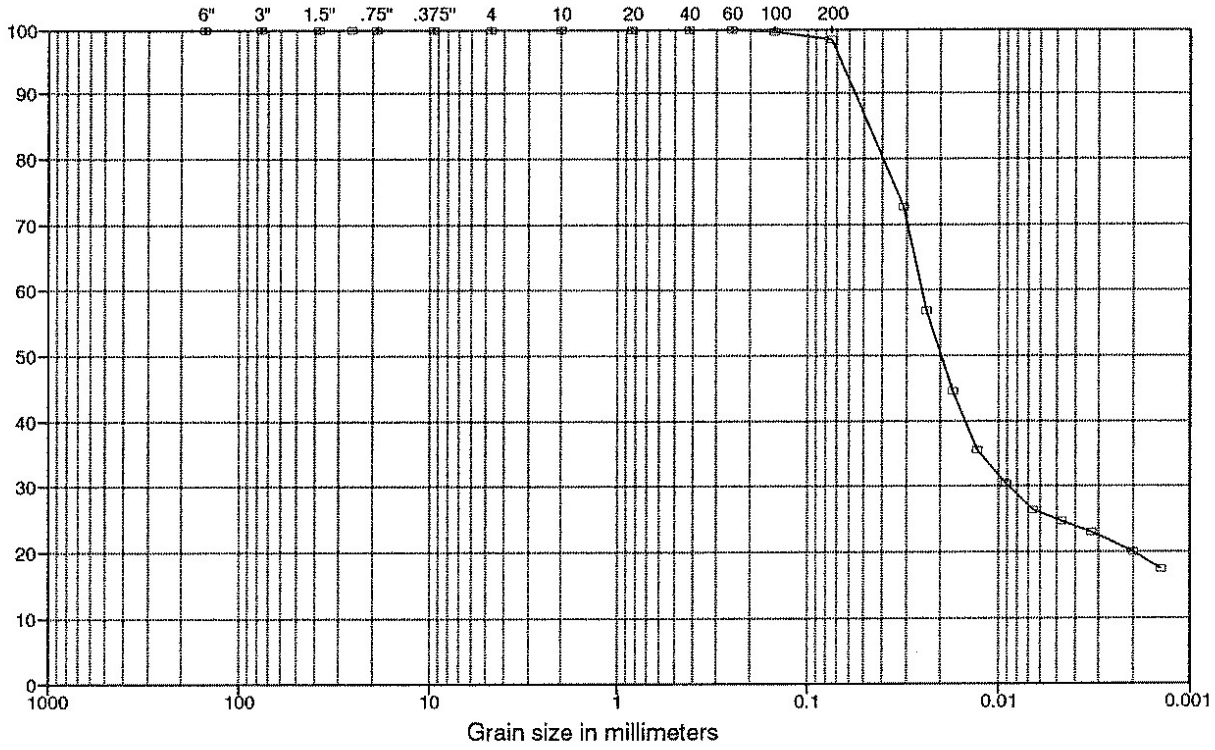
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848102A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		28.2	39	25	14	2.69	Clayey SILT with trace fine sand
SAMPLE NO.	PZ-102-SS						
DEPTH	4-6,8-10						

Sample Type: Date Tested: 4/9/95 USCS: CL-ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

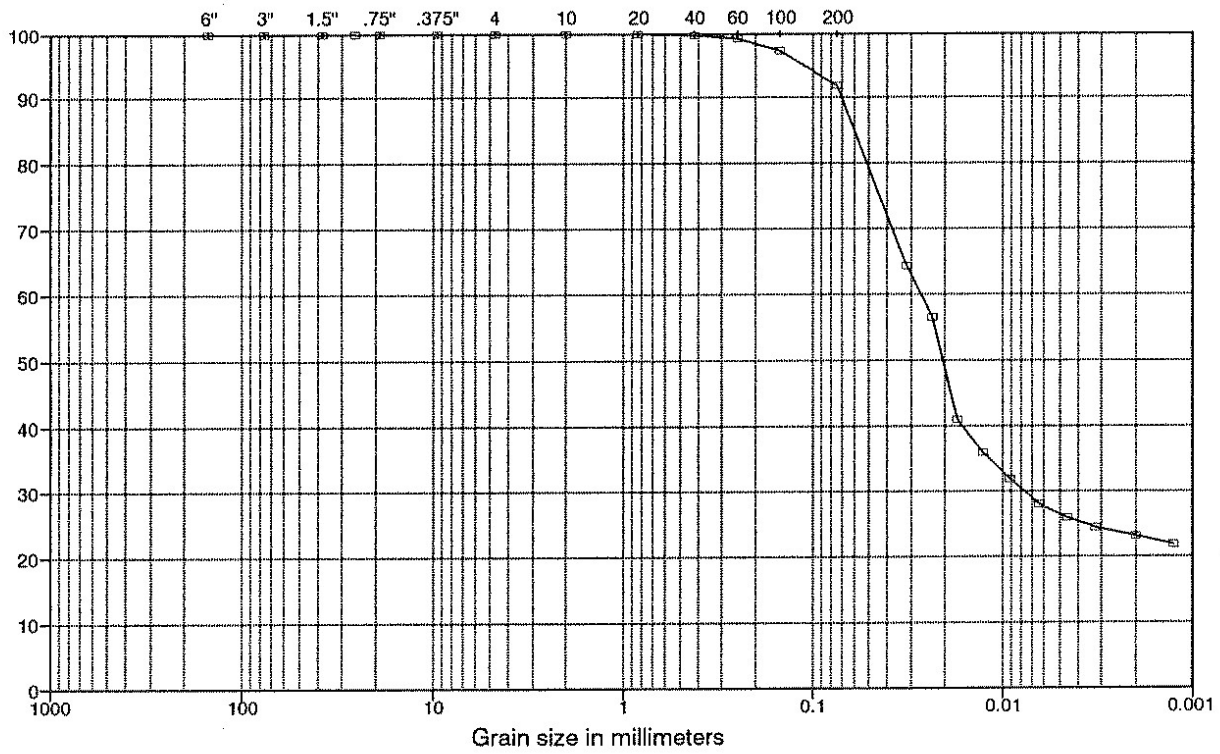
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME 2848102

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
		Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		24.4	38	22	16	2.68	Silty CLAY with little fine sand
SAMPLE NO.	PZ-101-SS						
DEPTH	4-6,6-8						

Sample Type: Date Tested: 4/6/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

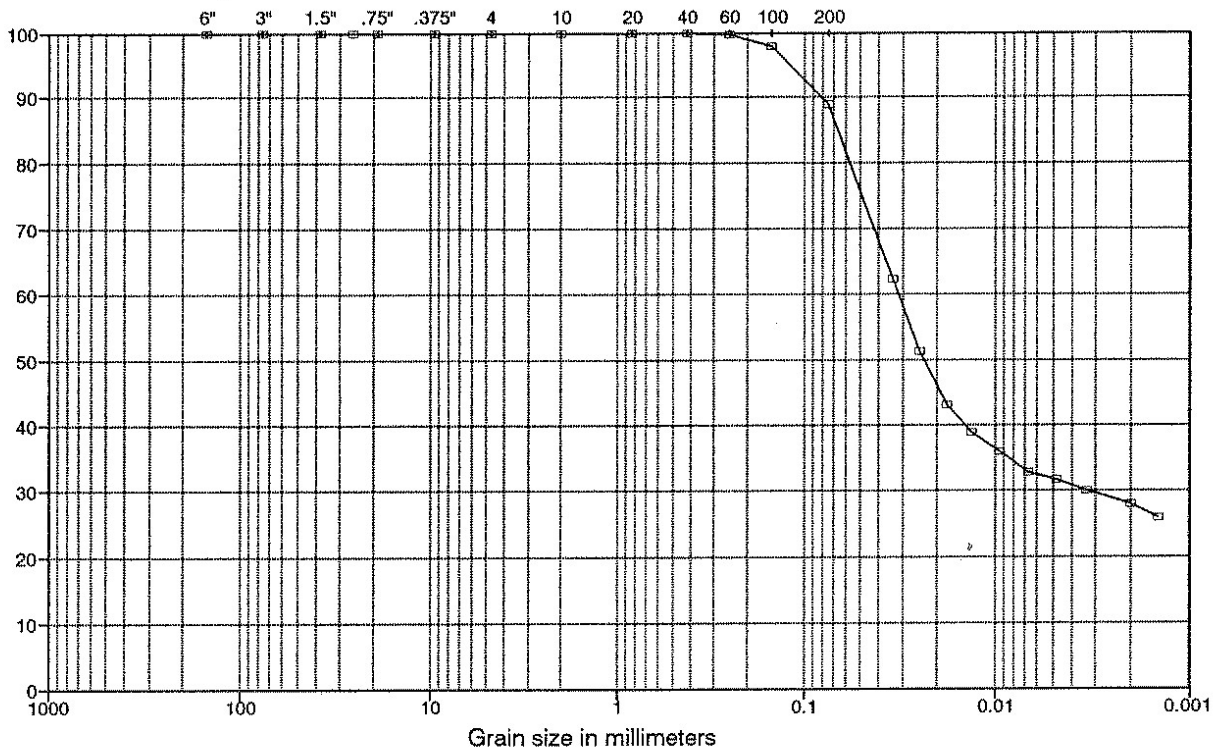
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848101

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS	Coarse	Fine	Cor	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			40	24	16	2.62	Silty CLAY with little fine sand
SAMPLE NO.	PZ-100-KS						
DEPTH	4-6,6-8						

Sample Type: Date Tested: 4/9/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848100

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

APPENDIX L-2

PACKER TESTING SUMMARY

APPENDIX C-1

PACKER TEST DATA

TABLE C-1.1
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS
TEST #	1	2	3	4	5	6	7	8	9
TYPE OF PACKER	Single	Single	Single	Double	Double	Double	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	53.5	58.4	81.3	39.8	52.5	82.3	120.7	122.5	99.4
TOP OF TESTED INTERVAL (feet BGS)	377.0	366.0	265.0	37.3	50.0	110.0	195.0	220.0	290.0
BOT OF TESTED INTERVAL (feet BGS)	391.0	391.0	391.0	42.3	55.0	115.0	200.0	225.0	295.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	57.5	62.4	85.3	43.8	56.5	86.3	124.7	126.5	103.4
H(pressure) -psi	172	143	146	12	20	100.0	12.0	35.0	120.0
Q (gpm)	0.2000	0.1500	3.2000	8.3000	0.0530	0.0180	0.0920	0.0660	3.3000
K (ft/min)	2.7E-06	1.5E-06	8.0E-06	1.5E-03	6.6E-06	7.2E-07	7.7E-06	4.1E-06	1.1E-04
K (cm/sec)	1.4E-06	7.6E-07	4.0E-06	7.5E-04	3.3E-06	3.7E-07	3.9E-06	2.1E-06	5.6E-05

NOTES:

1. The formu $K = [Q/(2\pi LH)]*\ln(L/r)$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells
water levels shown for unsaturated test zones are assumed to be the center of the test interval for calculation purpose

fname: 100KSSUM.XLS

TABLE C-1.2
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-104-SD	PZ-104-SD	PZ-104-SD	PZ-104-SD	PZ-104-SD	PZ-104-SD
TEST #	1	2	3	4	5	6
TYPE OF PACKER	Single	Single	Double	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	129.6	124.6	129.3	132.9	115.5	52.5
TOP OF TESTED INTERVAL (feet BGS)	162.0	235.0	208.0	188.0	113.0	50.0
BOT OF TESTED INTERVAL (feet BGS)	252.5	252.5	213.0	193.0	118.0	55.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	133.6	128.6	133.3	136.9	119.5	56.5
H(pressure) -psi	35	60	100	-	75	40.0
Q (gpm)	1.5000	0.0330	0.4800	-	0.0066	0.0670
K (ft/min)	9.7E-06	6.4E-07	1.7E-05	NA	2.9E-07	5.7E-06
K (cm/sec)	4.9E-06	3.2E-07	8.5E-06	NA	1.5E-07	2.9E-06

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2\pi LH)]*\ln(L/r)$$

Where

K = Hydraulic Conductivity
Q = constant rate of flow into test interval
L = length of the test interval (feet)
H = differential head of water applied in excess of static = H(gravity) + H(pressure)
d = diameter of borehole test interval
* = water levels have been interpolated from measurements taken from completed wells
water levels shown for unsaturated test zones are assumed to be the center
of the test interval for calculation purpose
NA = leakage during test

fname: 104SDSUM.XLS

TABLE C-1.3
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS
TEST #	1	2	3	4	5	6	7	8
TYPE OF PACKER	Single	Single	Single	Single	Single	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	40.4	48.3	58.9	66.8	72.1	56.5	68.7	98.4
TOP OF TESTED INTERVAL (feet BGS)	390.0	360.0	320.0	290.0	270.0	366.0	343.0	287.0
BOT OF TESTED INTERVAL (feet BGS)	408.0	408.0	408.0	408.0	408.0	371.0	348.0	292.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	44.4	52.3	62.9	70.8	76.1	60.5	72.7	102.4
H(pressure) -psi	75	85	115	132	85	35.0	48.0	60.0
Q (gpm)	1.1000	1.2000	1.5000	1.7500	1.6000	0.0880	0.0528	0.1010
K (ft/min)	2.6E-05	1.1E-05	6.5E-06	5.2E-06	5.7E-06	7.9E-06	3.7E-06	5.3E-06
K (cm/sec)	1.3E-05	5.7E-06	3.3E-06	2.6E-06	2.9E-06	4.0E-06	1.9E-06	2.7E-06

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2PILH)]*\ln(L/r)$$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells.

fname: 104KSSUM.XLS

TABLE C-1.4
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-106-SD	PZ-106-SD	PZ-106-SD	PZ-106-SD	PZ-106-SD
TEST #	1	2	3	4	5
TYPE OF PACKER	Single	Single	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	104.6	103.5	103.0	63.5	44.5
TOP OF TESTED INTERVAL (feet BGS)	187.0	140.0	148.0	61.0	42.0
BOT OF TESTED INTERVAL (feet BGS)	201.0	201.0	153.0	66.0	47.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	108.6	107.5	107.0	67.5	48.5
H(pressure) -psi	69	70	90	30	10
Q (gpm)	0.0154	7.0000	0.2500	0.0440	0.0660
K (ft/min)	3.5E-07	5.0E-05	1.0E-05	4.1E-06	1.2E-05
K (cm/sec)	1.8E-07	2.5E-05	5.1E-06	2.1E-06	6.0E-06

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2\pi LH)]*\ln(L/r)$$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells. water levels shown for unsaturated test zones are assumed to be the center of the test interval for calculation purpose

fname: 106SDSUM.XLS

TABLE C-1.5
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO. TEST # TYPE OF PACKER	PZ-106-KS 1 Single	PZ-106-KS 2 Single	PZ-106-KS 3 Single	PZ-106-KS 4 Double	PZ-106-KS 5 Double	PZ-106-KS 6 Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	21.5	23.6	34.4	91.6	83.4	23.8
TOP OF TESTED INTERVAL (feet BGS)	364.0	346.0	301.0	215.0	237.0	357.0
BOT OF TESTED INTERVAL (feet BGS)	374.0	374.0	374.0	220.0	242.0	362.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	25.5	27.6	38.4	95.6	87.4	27.8
H(pressure) -psi	80	125	41	30	38	88.0
Q (gpm)	0.9000	3.8000	4.6000	0.0066	0.0660	1.0000
K (ft/min)	3.4E-05	4.3E-05	5.7E-05	5.1E-07	4.8E-06	5.5E-05
K (cm/sec)	1.7E-05	2.2E-05	2.9E-05	2.6E-07	2.4E-06	2.8E-05

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2\pi LH)]*\ln(L/r)$$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells.

fname: 100KSSUM.XLS

TABLE C-1.6
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-111-SD	PZ-111-SD	PZ-111-SD	PZ-111-SD	PZ-111-SD	PZ-111-SD
TEST #	1	2	3	4	5	6
TYPE OF PACKER	Single	Single	Single	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	87.5	87.5	87.5	87.5	87.5	87.5
TOP OF TESTED INTERVAL (feet BGS)	175.0	140.0	105.0	195.0	125.0	162.0
BOT OF TESTED INTERVAL (feet BGS)	210.0	210.0	210.0	200.0	130.0	167.0
VERTICAL GAUGE HEIGHT (feet AGS)	3.0	3.0	3.0	3.0	3.0	3.0
H(gravity) -feet	90.5	90.5	90.5	90.5	90.5	90.5
H(pressure) -psi	68	65	43	46	46	102.0
Q (gpm)	0.2000	0.9000	0.6000	0.0018	0.0165	0.0396
K (ft/min)	2.4E-06	6.4E-06	3.9E-06	1.1E-07	1.1E-06	1.5E-06
K (cm/sec)	1.2E-06	3.3E-06	2.0E-06	5.8E-08	5.4E-07	7.9E-07

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2\pi LH)]*\ln(L/r)$$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells.

fname: 111SDSUM.XLS

TABLE C-1.7
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS
TEST #	1	2	3	4	5	6	7	8	9
TYPE OF PACKER	Single	Single	Single	Single	Double	Double	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	22.8	34.2	40.7	49.3	22.0	27.1	62.7	77.3	79.5
TOP OF TESTED INTERVAL (feet BGS)	343.0	290.0	260.0	220.0	355.0	343.0	260.0	226.0	221.0
BOT OF TESTED INTERVAL (feet BGS)	368.0	368.0	368.0	368.0	360.0	348.0	265.0	231.0	226.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	26.8	38.2	44.7	53.3	26.0	31.1	66.7	81.3	83.5
H(pressure) -psi	42	60	60	80	54	65.0	66.0	94.0	94.0
Q (gpm)	1.3000	1.9000	1.8500	2.3500	1.0000	0.7000	0.0660	0.0771	0.0440
K (ft/min)	4.1E-05	1.7E-05	1.2E-05	9.1E-06	8.5E-05	4.9E-05	3.8E-06	3.3E-06	1.9E-06
K (cm/sec)	2.1E-05	8.6E-06	6.1E-06	4.6E-06	4.3E-05	2.5E-05	2.0E-06	1.7E-06	9.5E-07

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2\pi LH)]*\ln(L/r)$$

Where

K = Hydraulic Conductivity
Q = constant rate of flow into test interval
L = length of the test interval (feet)
H = differential head of water applied in excess of static = H(gravity) + H(pressure)
d = diameter of borehole test interval
* = water levels have been interpolated from measurements taken from completed wells.

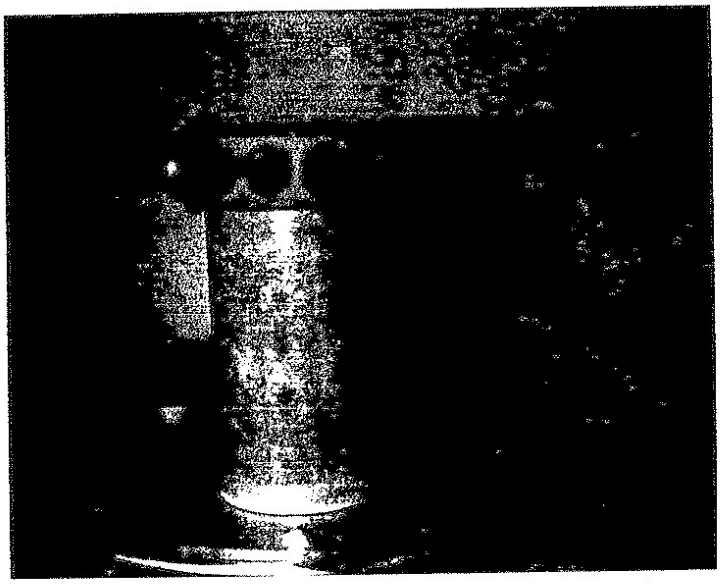
fname: 111KSSUM.XLS

APPENDIX L-3

LABOR

TRIAXIAL, BACK-PRESSURE PERMEABILITY, TX/PBP

ASTM D 5084



Geotech. Assoc.
ST-1 PB-105-K3
201.9 - 202.5'

3003-51
Tailings
23010 PSF

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT Golder Assoc. JOB NO. 2003-51

BORING NO.	GTS-1	SAMPLED	3-15-95 BT
DEPTH	201.9-202.5'	TEST STARTED	4-22-95 DCW
SAMPLE NO.	PZ-106-KS	TEST FINISHED	5-1-95 CJW/CAL
SOIL DESCR.		CELL NUMBER	1N
TEST TYPE	TX/Pbp	SATURATED TEST	Yes
CONF. PRES. PSF	23040		

MOISTURE/DENSITY DATA		BEFORE TEST	AFTER TEST
Wt. Soil + Moisture	(g)	307.6	311.5
Wt. Wet Soil & Pan	(g)	315.0	319.0
Wt. Dry Soil & Pan	(g)	301.9	301.9
Wt. Lost Moisture	(g)	13.1	17.1
Wt. of Pan Only	(g)	7.4	7.4
Wt. of Dry Soil	(g)	294.5	294.5
Moisture Content %		4.5	5.8
Wet Density PCF		158.6	157.3
Dry Density PCF		151.9	148.6

Init. Diameter	(in)	1.770	(cm)	4.496
Init. Area	(sq in)	2.461	(sq cm)	15.876
Init. Height	(in)	3.002	(cm)	7.625
Vol. Bef. Consol.	(cu ft)	0.00427		
Vol. After Consol.	(cu ft)	0.00437		
Porosity %		13.81		
Constant Head	(PSI)	0.00	(cm)	0.00

FLOW PUMP CALCULATIONS

Pump Setting	1.0
Velocity (cm/s)	7.44E-06
Q (cc/s)	2.38E-07
Height	2.996
Diameter	1.791
Pressure (psi)	13.990
Area after consol. (cm*cm)	16.252
Gradient	129.255
Permeability k (cm/s)	1.1E-10
Back Pressure (psi)	98.0
Cell Pressure (psi)	258.0
Ave. Effective Stress (psi)	153.005

Note: Test Terminated at internal pore pressure development of 13.99 psi (machine capacity). Therefore, actual k value is less than that shown.

Data entry by: NAA Date: 5/2/95
Checked by: MGJ Date: 5-3-95
FileName:B:GOY0GTS1

ADVANCED TERRA TESTING, INC.

TRIAXAL COMPRESSION TEST DATA

CLIENT Golder Assoc. JOB NO. 2003-51

BORING NO.	GTS-1	SAMPLED	3-15-95 BT
DEPTH	201.9-202.5'	TEST STARTED	4-22-95 DCW
SAMPLE NO.	PZ-106-KS	TEST FINISHED	5-1-95 CJW/CAL
SOIL DESCR.		SETUP NO.	1N
TEST TYPE	TX/Pbp	SATURATED TEST	Yes
CONF. PRES. PSF	23040		

SATURATION DATA

Cell Pres. (PSI)	Back Pres. (PSI)	Burette Reading (CC)		Pore Pressure (PSI)		Change	B
		Close	Open	Close	Open		
40.0	38.0	7.2	16.4				
50.0	48.0	17.0	17.7	38.4	45.3	6.9	0.69
60.0	58.0	18.0	18.7	48.4	56.1	7.7	0.77
70.0	68.0	19.0	19.8	59.1	67.2	8.1	0.81
80.0	78.0	19.8	20.4	68.5	76.9	8.4	0.84
90.0	88.0	20.6	21.2	78.2	86.9	8.7	0.87
100.0	98.0	21.1	21.8	88.1	96.8	8.7	0.87
110.0		22.0	22.1	98.3	106.9	8.6	0.86

CONSOLIDATION DATA

Elapsed Time (Min)	SQRT Time (Min)	Burette Reading (CC)	Volume Defl. (cc)
0.00	0.00	23.50	0.00
0.25	0.50	33.40	-9.90
0.5	0.71	33.45	-9.95
1	1.00	33.50	-10.00
2	1.41	33.55	-10.05
4	2.00	33.65	-10.15
9	3.00	33.70	-10.20
16	4.00	33.85	-10.35
30	5.48	34.00	-10.50
60	7.75	34.10	-10.60
120	10.95	34.30	-10.80
240	15.49	34.50	-11.00
360	18.97	34.55	-11.05

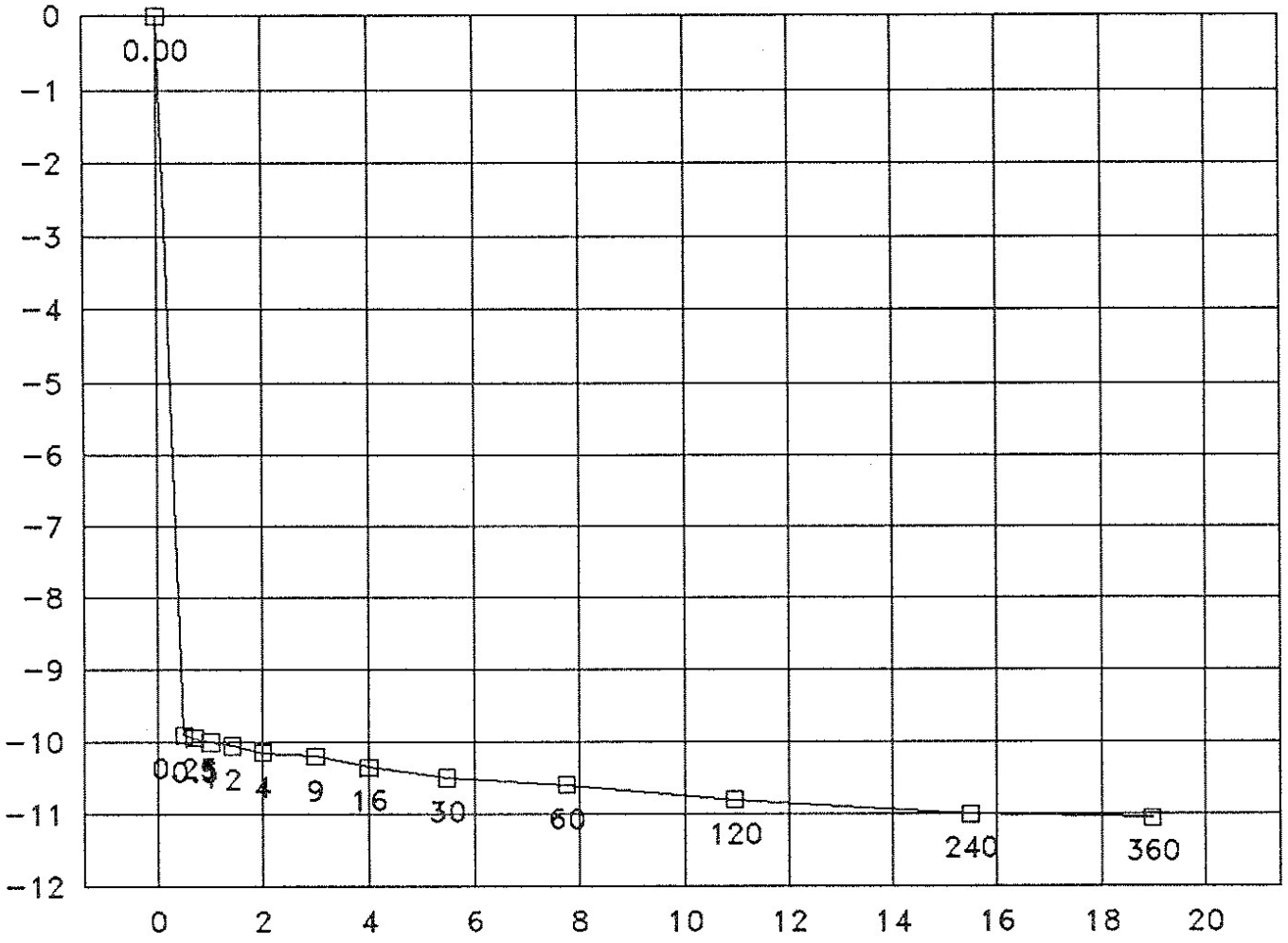
Initial Height	(in)	3.002	Init. Vol.	(CC)	121.07
Height Change	(in)	0.006	Vol. Change	(CC)	27.20
Ht. After Cons.	(in)	2.996	Cell Exp.	(CC)	29.83
Initial Area	(sq in)	2.461	Net Change	(CC)	-2.63
Area After Cons.	(sq in)	2.519	Cons. Vol.	(CC)	123.70

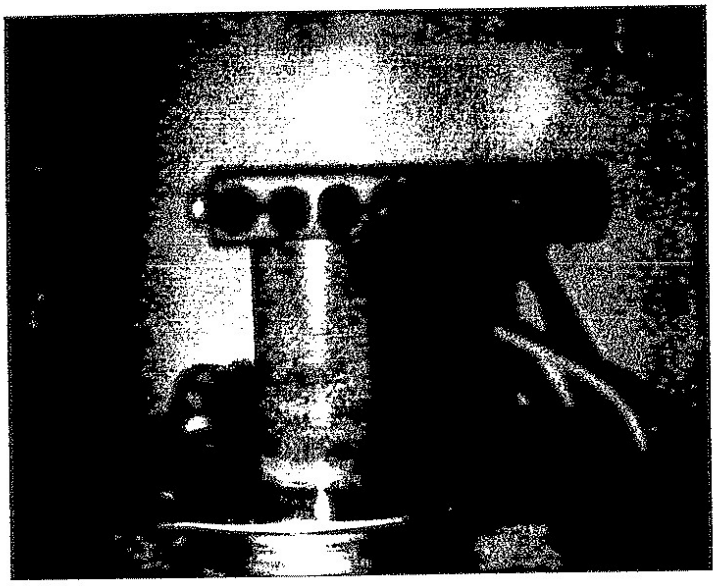
Data entry by: NAA Date: 5/2/95
Checked by: MGS Date: 5-3-95
FileName:B:GOYOGTS1

ADVANCED TERRA TESTING, INC.

CONSOLIDATION DATA

GTS-1, 201.9-202.5', PZ-106-KS





Golder Assoc.
GTS-2 PZ-106-KS
229.5 – 230.1'

2003-51
Tx/Php
25200 PSF

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT	Golder Assoc.	JOB NO.	2003-51
BORING NO.	GTS-2	SAMPLED	3-15-95 BT
DEPTH	229.6-230.1'	TEST STARTED	4-21-95 DCW
SAMPLE NO.	PZ-106-KS	TEST FINISHED	4-30-95 DCW
SOIL DESCR.		CELL NUMBER	3N
TEST TYPE	TX/Pbp	SATURATED TEST	Yes
CONF. PRES. PSF	25200		

MOISTURE/DENSITY DATA		BEFORE TEST	AFTER TEST
Wt. Soil + Moisture	(g)	297.0	303.9
Wt. Wet Soil & Pan	(g)	300.7	307.6
Wt. Dry Soil & Pan	(g)	288.1	288.1
Wt. Lost Moisture	(g)	12.6	19.5
Wt. of Pan Only	(g)	3.7	3.7
Wt. of Dry Soil	(g)	284.4	284.4
Moisture Content %		4.4	6.9
Wet Density PCF		154.5	143.3
Dry Density PCF		148.0	134.1

Init. Diameter	(in)	1.758	(cm)	4.465
Init. Area	(sq in)	2.427	(sq cm)	15.661
Init. Height	(in)	3.016	(cm)	7.661
Vol. Bef. Consol.	(cu ft)	0.00424		
Vol. After Consol.	(cu ft)	0.00468		
Porosity %		14.73		
Constant Head	(PSI)	0.00	(cm)	0.00

FLOW PUMP CALCULATIONS

Pump Setting	1.0
Velocity (cm/s)	7.44E-06
Q (cc/s)	2.38E-07
Height	3.005
Diameter	1.850
Pressure (psi)	10.210
Area after consol. (cm*cm)	17.346
Gradient	94.049
Permeability k (cm/s)	1.5E-10
Back Pressure (psi)	88.0
Cell Pressure (psi)	263.0
Ave. Effective Stress (psi)	169.895

Data entry by: NAA Date: 5/2/95
Checked by: MCT Date: 5-3-95
FileName:B:GOY0GTS2

ADVANCED TERRA TESTING, INC.

TRIAXAL COMPRESSION TEST DATA

CLIENT Golder Assoc. JOB NO. 2003-51

BORING NO.	GTS-2	SAMPLED	3-15-95 BT
DEPTH	229.6-230.1'	TEST STARTED	4-21-95 DCW
SAMPLE NO.	PZ-106-KS	TEST FINISHED	4-30-95 DCW
SOIL DESCR.		SETUP NO.	3N
TEST TYPE	TX/Pbp	SATURATED TEST	Yes
CONF. PRES. PSF	25200		

SATURATION DATA

Cell Pres. (PSI)	Back Pres. (PSI)	Burette Reading (CC)		Pore Pressure (PSI)		Change	B
		Close	Open	Close	Open		
40.0	38.0	6.7	13.0				
50.0	48.0	12.1	12.8	38.3	46.2	7.9	0.79
60.0	58.0	12.7	13.3	48.7	56.8	8.1	0.81
70.0	68.0	13.4	14.0	58.9	67.1	8.2	0.82
80.0	78.0	14.3	14.9	68.9	78.1	9.2	0.92
90.0	88.0	14.8	15.3	78.5	87.9	9.4	0.94
100.0		15.6	15.7	88.1	97.6	9.5	0.95

CONSOLIDATION DATA

Elapsed Time (Min)	SQRT Time (Min)	Burette Reading (CC)	Volume Defl. (cc)
0.00	0.00	0.80	0.00
0.25	0.50	10.90	-10.10
0.5	0.71	11.30	-10.50
1	1.00	11.83	-11.02
2	1.41	11.95	-11.15
4	2.00	12.05	-11.25
9	3.00	12.10	-11.30
16	4.00	12.33	-11.52
30	5.48	12.53	-11.73
60	7.75	12.70	-11.90
120	10.95	13.03	-12.23
240	15.49	13.03	-12.23
360	18.97	13.10	-12.30

Initial Height	(in)	3.016	Init. Vol.	(CC)	119.99
Height Change	(in)	0.011	Vol. Change	(CC)	21.30
Ht. After Cons.	(in)	3.005	Cell Exp.	(CC)	33.73
Initial Area	(sq in)	2.427	Net Change	(CC)	-12.43
Area After Cons.	(sq in)	2.689	Cons. Vol.	(CC)	132.42

Data entry by: NAA Date: 5/2/95
Checked by: MGJ Date: 5-3-95
FileName:B:GOYOGTS2

ADVANCED TERRA TESTING, INC.

CONSOLIDATION DATA

GTS-2, 229.6-230.1', PZ-106-KS

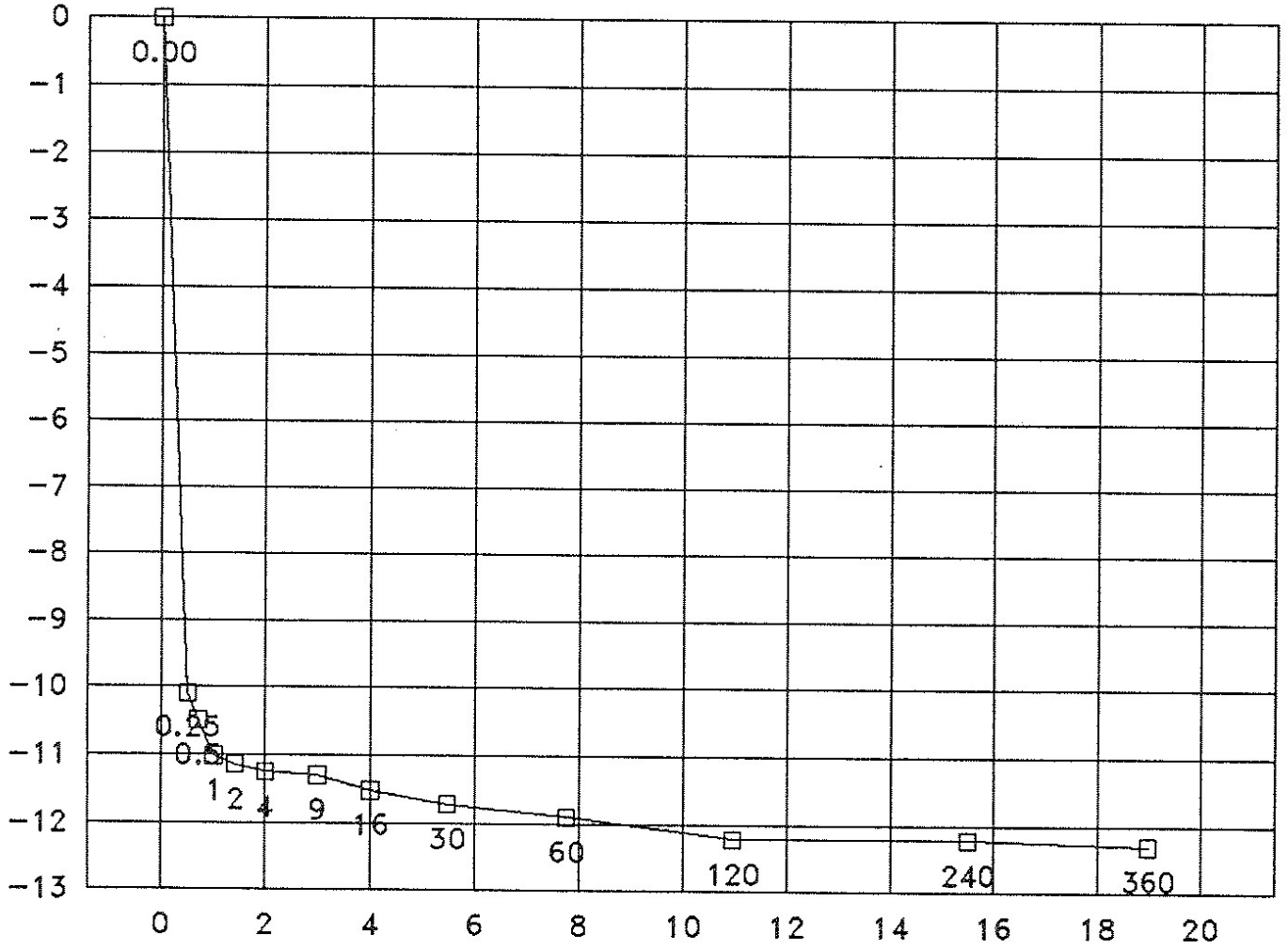


Table 3-5. Summary of Flexible Wall Permeability Test Results, West Lake Landfill

Sample Number	Sample Length (cm)	Sample Diameter (cm)	Sample Dry Density (pcf)	Maximum Dry Density (pcf)	Compaction (%)	Initial Moisture Content (%)	Optimum Moisture Content (%)	Effective Pressure (psi)	Back Pressure (psi)	Gradient	Average Permeability (cm/sec)
PZ-101-SS 6-8	7.99	7.22	91.7	---	---	24.4	---	6	94	2	3×10^{-4}
PZ-102-SS 4-6	8.82	7.07	92.2	---	---	28.2	---	5	95	9	8×10^{-7}
PZ-103-SS 14-16	7.73	7.18	97.7	---	---	28.3	---	13	87	4	2×10^{-6}
PZ-104-KS 6-8	9.11	7.14	95.7	---	---	23.6	---	6	94	24	2×10^{-7}
PZ-106-KS 6-8	8.89	7.14	103.0	---	---	22.2	---	6	94	5	3×10^{-6}
PZ-106-KS GTS-1 201.9-202.5	7.63	4.50	151.9	---	---	4.5	---	153	98	129	$<1.1 \times 10^{-10}$
PZ-106-KS GTS-2 229.6-230.1	7.66	4.47	148.0	---	---	4.4	---	170	88	94	1.5×10^{-10}
PZ-200-SS 6-8	9.59	7.17	95.3	---	---	27.5	---	6	94	4	2×10^{-6}
PZ-201-SS 26-28	8.11	7.13	86.4	---	---	34.5	---	23	77	14	3×10^{-6}
PZ-202-SS 6-8	8.08	7.10	96.4	---	---	26.7	---	6	94	10	3×10^{-7}
PS-1 10	9.56	7.23	100.8	105.0	96	18.4	19.0	5	95	6	2×10^{-7}
PS-2 7	9.55	7.24	101.7	106.0	96	17.5	17.5	5	95	10	3×10^{-7}
LR-103	10.16	7.22	79.9	---	---	37.4	17.5	5	95	3	2×10^{-4}

APPENDIX M

DEPTH TO WATER MEASUREMENTS/GROUNDWATER ELEVATION DATA

WESTLAKE LANDFILL

Groundwater Elevations

Monitoring Well	Top of Pipe Elevation	Surface Elevation	11/16/79	9/5/80	3/17/81	12/10/81	3/25/82	8/20/82
1	456.44	(ground level)	dry	-	-	-		-
2	449.7	447.7	dry	-	-	-		-
3	442.33	-	dry	-	-	-		-
34	478.4	475.1	430.7	428.2	427.4	430.9	433.9	-
35	475.1	471.9	430.6	429.6	427.1	431.1	433.4	442.2
36	471.0	470.0	dry	dry	dry	432.0	432.7	448.2
37	459.9	458.8	dry	dry	dry	434.1	438.7	435.3
37A	477.5	474.4	430.5	429.5	427.0	430.5	432.6	432.2
38	462.6	458.9	432.4	431.1	430.6	430.6	418.6	435.1
39	465.4	462.7	430.6	429.4	426.9	428.9	424.5	435.0
40	480.5	477.4	430.3	429.5	427.0	429.5	432.7	431.2
41	485.5		431.2	429.2	426.5*	-		-
Collection Well								
A 48" RCP	429.1	-	343.1	-	396.4	out of service		
B 48" RCP	490.7	-	440.2	-	364.7	459.7	-	
C 24" RCP	476.0	471.0	447.0	-	447.7	459.2	-	
D 24" RCP	506.2					459.2	-	
E 12" PVC	378.0							

*Insufficient water for sampling.

REITZ & JENS, INC.
November 1979

WEST LAKE LANDFILL

Groundwater Elevations

Monitoring Well	Top of Pipe Elevation	Surface Elevation	11/16/82	2/9/83	5/16/83	8/2/83	11/15/83	2/8/84
HL 1	448.9	444.8	434.0	433.8	436.9	435.5	432.2	432.8
HL 2	449.4	444.7	436.9	438.5	440.8	439.4	436.6	431.5
HL 3	450.3	446.3	440.3	441.3	437.0	438.4	435.7	430.1
34	478.4	475.1	452.3	433.2	436.8	435.2	432.9	432.2
35	475.1	471.9	439.6	433.9	437.1	435.7	432.8	432.8
36	471.0	470.0	431.5	432.6	437.1	435.0	432.4	432.2
37	459.9	458.8	-	434.1	437.3	436.0	434.8	433.6
37A	477.5	474.4	433.5	434.2	436.9	435.5	432.9	432.4
38	462.6	458.9	432.3	436.1	436.5	435.0	432.8	431.8
39	465.4	462.7	432.6	434.1	437.0	435.2	432.3	432.4
40	480.5	477.4	432.3	432.9	437.5	435.5	431.7	431.9
41	485.5	blocked 17.5' from top of pipe			-	-	-	-

Collection Well

B	48" RCP	490.7
C	24" RCP	476.0
D	24" RCP	506.2
E	12" PVC	378.0

REITZ & JENS, INC.
1040 N. Lindbergh
St. Louis, Mo. 63132

REITZ & JENS, INC.

WEST LAKE LANDFILL

Groundwater Elevations

Monitoring Well	Top of Pipe Elevation	Surface Elevation	5/1-2/84
HL 1	449.0	444.8	437.3
HL 2	447.1	444.7	436.1
HL 3	447.7	446.3	433.5
34	478.4	475.1	441.4
35	475.1	471.9	437.4
36	471.0	470.0	437.1
37	459.9	458.8	438.8
37A	477.5	474.4	437.1
38	462.6	458.9	439.1
39	465.4	462.7	437.1
40	480.5	477.4	437.5
41	485.5	blocked 17.5' from top	

WESTLAKE LANDFILL - TABULATION OF PIEZOMETRIC SURFACE ELEVATIONS
(Groundwater Table)

Location and Ref. Elev.	*	Date of Reading **	11/15/83		12/1/83		12/16/83		1/3/84		1/13/84		1/20/84		1/27/84		2/3/84	
			Depth To Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt
50 453.48	408.4 R	418.4	21.23	432.25	19.34	433.64	18.67	434.81	19.97	433.51	20.25	433.23	21.02	432.46	20.70	432.78	20.81	432.67
51 447.72	420.5	423.5	12.0	435.7	14.0	433.7	13.2	434.5	dry	<420.5	17.22	430.50	17.73	429.99	17.73	429.99	17.65	430.07
52 447.0	4.95	422.5	10.5	436.6	14.48	432.6	12.98	434.1	dry	<419.5	15.31	431.77	15.78	431.30	15.83	431.25	15.89	431.1
53 449.00	42[illegible]	424.1	16.8	432.2	15.39	433.6	14.87	434.1	dry	<421.1	15.98	433.02	16.45	432.55	16.42	432.58	16.56	432.44
54 471.0	429.6	432.6	38.6	432.4	37.82	433.2	36.97	434.0	37.46	433.5	37.93	433.1	43.18	427.8	38.28	432.7	38.43	432.6
55 475.1	41[illegible].9	414.9	42.3	432.8	40.96	434.1	39.88	435.2	41.42	433.7	41.86	433.2	42.25	432.8	42.18	432.9	42.36	432.7
56 478.4	414.0	417.0	45.5	432.9	44.73	433.7	43.82	434.6	45.07	433.3	45.51	432.9	45.88	432.5	45.88	432.5	45.88	432.5
57Q																		
58 480.5	417.5	420.5	44.8	431.7	46.95	433.6	45.88	434.6	47.22	433.3	47.61	432.9	48.04	432.5	47.81	432.7	48.20	432.3
59 448.67	401.4	411.4	17.83	430.84	16.80	431.87	15.86	432.81	18.10	430.57	17.50	431.17	17.86	430.81	17.81	430.86	17.63	431.04
60 446.93	422.1	?													15.99	430.94	16.20	430.73
61 450.17	424.1	?													18.85	431.32	19.05	431.12
62 446.08	400.1	410.1	15.58	430.50	14.61	431.47	13.67	432.41	15.36	430.72	14.81	431.27	15.17	430.91	15.45	430.63	15.48	430.60
63 422.19	——	——															+8.87	431.06
64	——	——																
65 441.80	402.5	412.5	10.84	430.96	9.81	431.99	8.84	432.96	15.62	426.18	10.06	431.74	10.37	431.43	10.44	431.36	10.70	431.10
66 441.80	400.8	410.8	10.82	430.98	9.73	432.07	8.82	432.98	14.80	427.00	9.97	431.83	10.27	431.53	10.38	431.42	10.60	431.20
67 439.08	401.1	411.1	7.97	431.11	6.73	432.35	5.85	432.23	25.41	413.67	7.08	432.00	7.43	431.65	7.58	431.50	7.78	431.30
68 448.32	4097 R	419.7	17.15	431.17	16.25	432.07	15.40	432.92	dry	<409.7	16.69	431.63	17.17	431.15	17.24	431.08	17.32	431.00
69Q																		
70Q																		
71Q																		
72 465.4	412.7	415.7	33.1	432.3	32.36	433.0	31.60	433.8	32.06	433.3	33.07	432.3	33.48	431.9	33.25	432.2	33.35	432.0
73 462.6	408.9	411.9	29.8	432.8	30.01	432.6	29.49	433.1	29.73	432.9	30.57	432.0	30.90	431.7	30.86	431.7	30.55	432.0
74Q																		
75 459.9	432.8	435.8	25.1	434.8	23.52	436.4	22,61	437.3	25.78	434.1	24.57	435.3	26.22	433.7	26.02	433.9	26.13	433.8
76 477.5	424.4	427.4	44.6	432.9	43.77	433.7	42.85	434.6	43.63	433.9	43.99	433.5	44.66	432.8	44.70	432.8	44.75	432.8
77 446.10	——	——								ice		ice		ice		ice		ice
River Stage at St. Charles			17.8	431.4	22.5	436.1	18.6	432.2	9.5	423.1	13.6	427.2	14.0	427.6	13.2	426.8	17.5(1)	433.8

* Elev. Bottom of Well

** Elev. top of Slotted Casing

R - Refusal

NOTE: Read all depths to .01 ft.

(1)Note: river rose 4.0' in past 24 hrs.

REITZ & JENS, INC.

WESTLAKE LANDFILL - TABULATION OF PIEZOMETRIC SURFACE ELEVATIONS
(Groundwater Table)

Location and Ref. Elev.	*	**	Date of Reading	2/10/84		2/16/84		2/23/84		3/1/84		3/9/84		3/15/84		3/22/84			
				Depth To Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt	Depth to Gwt	Elev. of Gwt
50 453.48	408.4	418.4		20.65	432.83	20.14	433.34	20.20	433.28	19.12	434.36	18.18	435.30	18.09	435.39	16.91	436.57		
51 447.72	420.5	423.5		17.62	430.10	17.11	430.61	16.68	431.04	16.18	431.54	15.17	432.55	15.01	432.71	13.80	433.92		
52 447.08	419.5	422.5		15.84	431.24	15.36	431.72	14.84	432.24	14.33	432.75	13.48	433.60	13.48	433.60	12.36	434.72		
53 449.00	421.1	424.1		16.48	432.52	16.12	432.88	15.73	433.27	15.11	433.89	14.39	434.61	14.15	434.85	13.20	435.80		
54 4710	429.6	432.6		38.36	432.6	38.54	432.5	38.22	432.8	37.41	433.6	36.73	434.3	36.60	434.4	35.84	435.2		
55 475.1	417.9	414.9		42.15	432.9	41.95	433.2	41.48	433.6	41.34	433.8	40.60	434.5	40.05	435.1	39.35	435.8		
56 478.4	414.0	417.0		45.86	432.5	45.51	432.9	45.36	433.0	45.01	433.4	44.35	434.1	43.88	434.5	43.91	435.5		
57																			
58 480.5	417.5	420.5		48.01	432.5	47.75	432.8	47.70	432.8	47.27	433.2	46.44	434.1	46.03	434.5	45.19	435.3		
59 448.67	401.4	411.4		17.91	430.76	17.72	430.95	17.48	431.19	16.95	431.72	16.02	432.65	15.68	432.99	14.73	433.94		
60 446.93	422.1			16.16	430.77	15.99	430.94	15.65	431.28	15.20	431.73	14.44	432.49	13.68	433.25	13.06	433.87		
61 450.17	424.1			18.89	431.28	18.95	431.22	18.63	431.54	18.35	431.82	17.77	432.40	17.28	432.89	16.29	433.88		
62 446.08	400.1	410.1		15.45	430.63	15.33	430.75	15.02	431.06	14.41	431.67	13.88	432.20	13.27	432.81	12.39	433.69		
63 422.19	——	——		+8.85	431.04	+8.82	431.01	+8.92	431.11	+9.33	431.52	+9.85	432.04	+10.31	432.5	+11.19	433.38		
64	——	——																	
65 441.80	402.5	412.5		10.68	431.12	10.58	431.22	10.42	431.38	10.18	431.62	9.55	432.25	8.94	432.86	8.02	433.78		
66 441.80	400.8	410.8		10.58	431.22	10.32	431.48	10.26	431.54	9.97	431.83	9.32	432.48	8.79	433.01	7.95	433.84		
67 439.08	401.1	411.1		7.80	431.28	7.57	431.51	7.33	431.75	7.10	431.98	6.45	432.63	5.90	433.18	4.95	434.13		
68 448.32	409.7	419.7		17.29	431.03	17.09	431.23	16.78	431.54	16.16	432.16	15.62	432.70	15.09	433.23	14.19	434.13		
69Q																			
70Q																			
71Q																			
72 465.4	412.7	415.7		33.44	432.0	32.51	432.9	32.42	433.0	32.21	433.2	31.62	433.8	30.97	434.4	30.33	435.1		
73 462.6	408.9	411.9		30.47	432.1	30.22	432.4	30.17	432.4	29.34	433.3	29.34	433.3	28.76	433.8	28.10	434.5		
74																			
75 459.9	432.8	435.8		26.24	433.7	23.86	436.0	25.68	434.2	21.20	438.7	19.67	440.2	23.50	436.4	21.86	438.0		
76 477.5	424.4	427.4		45.23	432.3	44.57	432.9	44.59	432.9	44.03	433.5	43.26	434.2	42.76	434.7	42.01	435.5		
77 434.95	——	——		3.71	431.24 ice	3.35	431.6	3.24	431.71	2.53 ice	432.4	0.60	434.4	1.35	433.6	0.33	434.62		
R. River Stage at St. Charles				15.1	428.7	17.9	431.5	18.9	432.5	18.19	432.5	20.9	434.5	17.0	430.6	27.0	440.6		

* Elev. Bottom of Cell

** Elev. top of Slotted Casing

NOTE: Read all depths to .01 ft.

REITZ & JENS, INC.

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: I-50 (old N-1)
Location	Elev. Ground Surface (G.S.): 449.0	
N ____ E ____	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 453.48	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 40.6	Drilling Type:
Date Completed Drilling Hole: ____ Time: ____	Total Depth of Piezometer: 40.6	Footage Slotted: 10.0
Date Piezometer Installed: ____ Time: ____		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	11:15 am	P. Hustad	15.8' from T.O.P.	437.68	
6-[illegible]-84	10:40 am	R. Robinson	16.47' from T.O.P.	437.01	
8-8-84	3:48 pm	G. Ernstmann	18.[illegible]' from T.O.P.	434.86	
8-20-84	5:05 pm	G. Ernstmann	19.5' from T.O.P.	433.98	Electric tape (water level indicator)
8-29-84	7:15 am	G. Ernstmann	20.33 from T.O.P.	433.15	
10-3-84	9:04 am	R. Robinson	20.4 from T.O.P.	433.08	Electric Tape
10-26-84	12:55 pm	G. Ernstmann	18.80 from T.O.P.	434.68	Electric Tape
12-14-84	12:58 pm	G. Ernstmann	18.50 from T.O.P.	434.98	Electric Tape
3-30-85	2:25 pm	G. Ernstmann	15.50 from T.O.P.	437.98	steel tape
4-[illegible]-85	12:35 pm	G. Ernstmann	17.13 from T.O.P.	436.35	
6-7-85	11:[illegible] am	S. Papadakis	19.16 from T.O.P.	[illegible]	
8-9-85	—	S. Papadakis	19.14 from T.O.P.	434.34	steel tape
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: S-51 (old HL-3)
Location	Elev. Ground Surface (G.S.): 446.3	
N ____ E ____	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 447.72	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 25.8	Drilling Type: ____
Date Completed Drilling Hole: ____ Time: ____		
Date Piezometer Installed: ____ Time: ____	Total Depth of Piezometer: 25.8	Footage Slotted: 3.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	11:38 am	P. Hustad	12.3 from T.O.P.	435.42	
5-24-84	12:45 pm	G. Ernstmann	13.0 from T.O.P.	434.72	
6-27-84	10:47 am	R. Robinson	13.36 from T.O.P.	434.36	
8-8-84	3:35 pm	G. Ernstmann	14.97 from T.O.P.	432.75	
8-20-84	5:10 pm	G. Ernstmann	15.75 from T.O.P.	431.97	Electric Tape (water level indicator)
8-29-84	10:45 am	G. Ernstmann	16.39 from T.O.P.	431.33	
10-3-84	9:20 am	R. Robinson	16.40 from T.O.P.	431.32	Electric Tape
10-26-84	12:45 pm	G. Ernstmann	15.35 from T.O.P.	432.37	Electric Tape
12-19-84	12:45 pm	G. Ernstmann	15.2 from T.O.P.	432.5	Electric Tape
3-30-85	2:20 pm	G. Ernstmann	12.58 from T.O.P.	435.14	Steel tape
4-18-85	—	G. Ernstmann	13.00 from T.O.P.	434.72	
4-25-85	12:17 pm	G. Ernstmann	13.83 from T.O.P.	433.89	
6-7-85	11:15 am	S. Payiatakis	13.88 from T.O.P.	433.84	
8-8-85	—	S. Payiatakis	15.74 from T.O.P.	431.98	cloth Tape
12-13-85	—	M. Erio	12.33 from T.O.P.	435.39	Electric Tape
5-19-86	—	M. Erio	16.12 from T.O.P.	431.60	
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: S-52 (old HL-2)
Location	Elev. Ground Surface (G.S.): 444.7	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 447.08	
Date Started Drilling Hole ____ Time ____	Total Depth of Hole: 25.2	Drilling Type: ____
Date Completed Drilling Hole ____ Time ____		
Date Piezometer Installed ____ Time ____	Total Depth of Piezometer: 25.2	Footage Slotted: 3.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	11:28 am	P. Hustad	10.9 from T.O.P.	436.18	
5-23-84	1:00 am	G. Ernstmann	11.3 from T.O.P.	435.78	
6-27-84	10:51 am	R. Robinson	11.39 from T.O.P.	435.31	
8-8-84	3:40 pm	G. Ernstmann	12.98 from T.O.P.	434.10	
8-20-84	5:15 pm	G. Ernstmann	13.75 from T.O.P.	433.33	Electric Tape
8-29-84	10:50 am	G. Ernstmann	14.38 from T.O.P.	432.70	
10-3-84	9:25 AM	R. Robinson	14.54 from T.O.P.	432.54	Electric Tape
10-26-84	12:40 pm	G. Ernstmann	13.50 from T.O.P.	433.58	" "
12-19-84	12:41 pm	G. Ernstmann	13.3 from T.O.P.	434.8	" "
3-30-85	2:15 pm	G. Ernstmann	10.92 from T.O.P.	436.16	steel tape
4-18-85	—	G. Ernstmann	11.4 from T.O.P.	435.68	
4-25-85	12:25 pm	G. Ernstmann	12.0 from T.O.P.	435.08	
6-7-85	11:25 am	S. Payiatakis	11.90 from T.O.P.	435.18	
8-8-85	—	S. Payiatakis	13.96 from T.O.P.	433.32	cloth Tape
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: S-53 (old HL-1)
Location N E	Elev. Ground Surface (G.S.): 444.8 Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 449.00	
Date Started Drilling Hole: ____ Time: ____ Date Completed Drilling Hole: ____ Time: ____ Date Piezometer Installed: ____ Time: ____	Total Depth of Hole: 23.7 Total Depth of Piezometer: 23.7	Drilling Type: ____ Footage Slotted: 3.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	11:32 am	P. Hustad	11.65 from T.O.P.	437.35	
5-23-84	1:05 pm	G. Ernstmann	11.85 from T.O.P.	437.15	
6-27-84	10:55 am	R. Robinson	11.94 from T.O.P.	437.06	
8-8-84	3:42 pm	G. Ernstmann	13.62 from T.O.P.	435.38	
8-20-84	5:20 pm	G. Ernstmann	14.3 from T.O.P.	434.7	Electric Tape
8-29-84	10:55 am	G. Ernstmann	14.96 from T.O.P.	434.04	
10-3-84	9:27 am	R. Robinson	15.09 from T.O.P.	433.91	Electric Tape
10-26-84	12:35 pm	G. Ernstmann	14.10 from T.O.P.	434.90	" "
12-12-84	12:37 pm	G. Ernstmann	14.0 from T.O.P.	435.0	" "
3-30-85	2:10 pm	G. Ernstmann	11.67 from T.O.P.	437.33	Steel tape
4-18-25	NOON	G. Ernstmann	12.1 from T.O.P.	436.90	
4-25-85	12:21 pm	G. Ernstmann	12.63 from T.O.P.	436.37	
6-7-85	11:35 am	S. Payiatakis	12.83 from T.O.P.	436.17	
8-8-85	—	S. Payiatakis	14.48 from T.O.P.	434.52	Cloth Tape
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No.: 84-075-1-002	Hole No.: S-54 (old 36)
Location	Elev. Ground Surface (G.S.): 470.0	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 471.0	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 40.4	Drilling Type: ____
Date Completed Drilling Hole: ____ Time: ____	Total Depth of Piezometer: 40.4	Footage Slotted: 3.0
Date Piezometer Installed: ____ Time: ____		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	1:44pm	P. Hustad	34.2 from T.O.P.	436.8	
5-23-84	1:10pm	G. Ernstmann	34.2 from T.O.P.	436.8	
6-27-84	11:15am	R. Robinson	35.45 from T.O.P.	435.55	
8-8-84	4:15pm	G. Ernstmann	35.75 from T.O.P.	435.25	
8-20-84	4:28pm	G. Ernstmann	36.4 from T.O.P.	434.6	Electric Tape (water level indicator)
8-24-84	1:15pm	G. Ernstmann	36.91 from T.O.P.	434.09	
8-29-84	10:15am	G. Ernstmann	37.24 from T.O.P.	433.76	
10-3-84	11:05am	R. Robinson	37.19 from T.O.P.	433.81	Electric Tape
10-26-84	10:10am	G. Ernstmann	36.20 from T.O.P.	434.80	" "
12-19-84	11:48am	G. Ernstmann	36.3 from T.O.P.	434.7	" "
3-30-85	1:35pm	G. Ernstmann	34.08 from T.O.P.	436.92	steel tape
4-25-85	9:02am	G. Ernstmann	34.75 from T.O.P.	436.25	
6-7-85	1:55pm	S. Payiatakis	34.84 from T.O.P.	436.16	
8-8-85	~	S. Payiatakis	36.83 from T.O.P.	434.17	Cloth Tape
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: I-55 (old 35)
Location	Elev. Ground Surface (G.S.): 471.9	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 475.1	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 60.0	Drilling Type: ____
Date Completed Drilling Hole: ____ Time: ____	Total Depth of Piezometer: 60.0	Footage Slotted: 3.0
Date Piezometer Installed: ____ Time: ____		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	1:40pm	P. Hustad	38.0 from T.O.P.	437.1	
5-23-84	4:15pm	G. Ernstmann	37.9 from T.O.P.	437.2	
6-27-84	11:20am	R. Robinson	38.02 from T.O.P.	437.08	
8-8-84	3:00pm	G. Ernstmann	39.55 from T.O.P.	435.55	
8-20-84	4:25pm	G. Ernstmann	40.4 from T.O.P.	434.7	Electric Tape
8-29-84	10:20am	G. Ernstmann	41.13 from T.O.P.	433.97	
10-3-84	11:10am	R. Robinson	41.15 from T.O.P.	433.95	Electric Tape
10-26-84	10:02am	G. Ernstmann	40.20 from T.O.P.	434.90	" "
12-19-84	11:45am	G. Ernstmann	40.2 from T.O.P.	434.9	" "
3-30-85	1:30pm	G. Ernstmann	37.83 from T.O.P.	437.27	steel tape
4-25-85	8:55am	G. Ernstmann	38.63 from T.O.P.	436.47	
6-7-85	1:50pm	S. Payiatakis	38.52 from T.O.P.	436.58	
8-8-85	—	S. Payiatakis	40.73 from T.O.P.	434.37	Cloth Tape
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No: 84-075-4-002	Hole No: I-56 (old 34)
Location	Elev. Ground Surface (G.S.): 475.1	
N ____ E ____	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 478.4	
Date Started Drilling Hole ____ Time ____	Total Depth of Hole: 61.1	Drilling Type: ____
Date Completed Drilling Hole ____ Time ____		
Date Piezometer Installed ____ Time ____	Total Depth of Piezometer: 61.1	Footage Slotted: 3.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	1:36 pm	P. Hustad	41.45 from T.O.P.	436.95	
4-25-84	8:10 am	G. Ernstmann	41.5 from T.O.P.	436.9	
4-27-84	11:25 am	R. Robinson	41.67 from T.O.P.	436.73	
8-8-84	2:55 pm	G. Ernstmann	43.34 from T.O.P.	435.06	
8-20-84	3:55 pm	G. Ernstmann	44.0 from T.O.P.	434.4	Electric Tape
8-29-84	10:22 am	G. Ernstmann	44.86 from T.O.P.	433.54	
10-3-84	11:15 am	R. Robinson	44.97 from T.O.P.	433.43	Electric Tape
10-26-84	9:57 am	G. Ernstmann	43.95 from T.O.P.	434.45	" "
12-19-84	11:42 am	G. Ernstmann	44.0 from T.O.P.	434.4	" "
3-30-85	1:25 pm	G. Ernstmann	41.42 from T.O.P.	436.98	steel tape
4-25-85	8:48 am	G. Ernstmann	42.17 from T.O.P.	436.23	
6-7-85	1:45 pm	S. Payiatakis	42.18 from T.O.P.	436.22	
8-8-85	—	S. Payiatakis	44.43 from T.O.P.	433.97	
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No: 84-075-4-002	Hole No: I-58 (Cold 40)
Location N E	Elev. Ground Surface (G.S.) 477.5 Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 480.5	
Date Started Drilling Hole ____ Time ____ Date Completed Drilling Hole ____ Time ____ Date Piezometer Installed ____ Time ____	Total Depth of Hole 60.0 Drilling Type ____ Total Depth of Piezometer 60.0 Footage Slotted 3.0	

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	1:30 pm	P. Hustad	43.5 from T.O.P.	437.0	
5-24-84	8:00 am	G. Ernstmann	43.3 from T.O.P.	437.2	
6-27-84	11:35 am	R. Robinson	43.55 from T.O.P.	436.95	
8-8-84	2:45 pm	G. Ernstmann	45.29 from T.O.P.	435.21	
8-20-84	4:10 pm	G. Ernstmann	46.15 from T.O.P.	434.35	Electric Tape
8-29-84	10:30 am	G. Ernstmann	46.81 from T.O.P.	433.69	
10-3-84	11:21 am	R. Robinson	47.02 from T.O.P.	433.48	Electric Tape
10-26-84	9:50 am	G. Ernstmann	46.00 from T.O.P.	434.50	" "
12-19-84	11:35 am	G. Ernstmann	46.0 from T.O.P.	434.5	" "
3-30-85	1:15 pm	G. Ernstmann	43.58 from T.O.P.	436.92	steel tape
4-25-85	8:40 am	G. Ernstmann	44.04 from T.O.P.	436.46	
6-7-85	1:40 pm	S. Payiatakis	44.13 from T.O.P.	436.37	
8-8-85	—	S. Payiatakis	46.41 from T.O.P.	434.09	Cloth Tape
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: I-59 (old N-2)
Location N E	Elev. Ground Surface (G.S.): 444.9 Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 448.67	
Date Started Drilling Hole ____ Time ____ Date Completed Drilling Hole ____ Time ____ Date Piezometer Installed ____ Time ____	Total Depth of Hole: 43.5 Drilling Type: ____ Total Depth of Piezometer: 43.5 Footage Slotted: 10.0	

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	1:22 pm	P. Husted	12.55 from T.O.P.	436.12	
5-24-84	8:20 am	G. Ernstmann	12.7 from T.O.P.	435.97	
6-27-84	11:55 am	R. Robinson	12.92 from T.O.P.	435.75	
8-8-84	2:35 pm	G. Ernstmann	14.68 from T.O.P.	433.99	
8-20-84	10:48 am	G. Ernstmann	15.56 from T.O.P.	433.11	
8-24-84	2:15 pm	G. Ernstmann	15.84 from T.O.P.	432.83	
8-29-84	12:15 pm	G. Ernstmann	16.16 from T.O.P.	432.51	
10-3-84	11:27 am	R. Robinson	16.36 from T.O.P.	432.31	Electric Tape
10-26-84	9:47 am	G. Ernstmann	15.45 from T.O.P.	433.22	" "
12-19-84	11:18 am	G. Ernstmann	15.4 from T.O.P.	433.2	" "
3-30-85	12:47 pm	G. Ernstmann	13.00 from T.O.P.	435.67	steel tape
4-25-85	10:41 am	G. Ernstmann	13.42 from T.O.P.	435.25	
6-7-85	1:15 pm	S. Payiatakis	13.50 from T.O.P.	435.17	
8-8-85	—	S. Payiatakis	15.77 from T.O.P.	432.90	cloth Tape
12-13-85	—	M. Erio	14.43 from T.O.P.	434.24	Electric Tape
5-20-86	—	M. Erio	15.92 from T.O.P.	432.75	

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name	WESTLAKE	Project No.	84-075-4-002	Hole No.	S-60 (old S-2)
Location		Elev. Ground Surface (G.S.)	443.1		
N	E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.)	446.93(1) 446.30(2)		
Date Started Drilling Hole	___ Time ___	Total Depth of Hole	21.0	Drilling Type	___
Date Completed Drilling Hole	___ Time ___				
Date Piezometer Installed	___ Time ___	Total Depth of Piezometer	21.0	Footage Slotted	___

Remarks:
(1) T.O.P = 446.93 prior to (4/17/85)
(2) T.O.P. = 446.30 beginning (4/17/85)

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	afternoon	P. Hustad	10.65 from T.O.P.(1)	436.28	
5-24-84	8:40 am	G. Ernstmann	10.7 from T.O.P.(1)	436.23	
6-27-84	10:91 am	R. Robinson	12.02 from T.O.P.(1)	434.91	
8-8-84	2:22 pm	G. Ernstmann	12.84 from T.O.P.(1)	434.09	
8-20-84	10:42 am	G. Ernstmann	13.74 from T.O.P.(1)	433.19	
8-29-84	12:02 pm	G. Ernstmann	14.4 from T.O.P.(1)	432.53	
10-3-84	11:36 am	R. Robinson	14.70 from T.O.P.(1)	432.23	Electric Tape
10-26-84	9:40 am	G. Ernstmann	13.95 from T.O.P.(1)	432.98	" "
12-19-84	11:12 am	G. Ernstmann	* 13.7(±.1) from T.O.P.(1)	433.2	Electric Tape. *Note: above-ground part of piez. is badly damaged.
3-30-85	12:37 pm	G. Ernstmann	* 1.17 from G.S.	441.93	steel tape *Note: piez. is still damaged and was open at the surface
4-17-85	11:00 am	G. Ernstmann	10.4 from T.O.P.(2)	435.90	
4-25-85	10:31 am	G. Ernstmann	10.92 from T.O.P.(2)	435.38	
6-4-85	2:30 pm	S. Payiatakis	12.06 from T.O.P.(2)	434.24	Cloth Tape
6-7-85	1:30 pm	S. Payiatakis	11.03 from T.O.P.(2)	435.27	Cloth Tape
8-8-85	—	S. Payiatakis	12.98 from T.O.P.(2)	433.32	Cloth Tape
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: S-61 (old S-1)
Location	Elev. Ground Surface (G.S.): 445.6	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 450.17	
Date Started Drilling Hole ____ Time ____	Total Depth of Hole: 21.5	Drilling Type: ____
Date Completed Drilling Hole ____ Time ____	Total Depth of Piezometer: 21.5	Footage Slotted: ____
Date Piezometer Installed ____ Time ____		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	afternoon	P. Hustad	13.3 from T.O.P.	436.87	
5-24-84	8:30am	G. Ernstmann	13.8 from T.O.P.	436.37	
6-27-84	12:07pm	K. Robinson	14.05 from T.O.P.	436.12	
8-8-84	2:20pm	G. Ernstmann	16.00 from T.O.P.	434.17	
8-20-84	10:38am	G. Ernstmann	16.90 from T.O.P.	433.27	
8-29-84	12:00 noon	G. Ernstmann	17.56 from T.O.P.	432.61	
10-3-84	11:40 am	R. Robinson	17.88 from T.O.P.	432.29	Electric Tape
10-26-84	9:20am	G. Ernstmann	17.00 from T.O.P.	433.17	" "
12-19-84	11:08am	G. Ernstmann	16.8 from T.O.P.	433.4	" "
3-30-85	12:35pm	G. Ernstmann	14.42 from T.O.P.	435.75	steel Tape
4-1-85	2:45pm	G. Ernstmann	14.1 from T.O.P.	436.07	Electric Tape
4-25-85	10:28am	G. Ernstmann	14.42 from T.O.P.	435.75	" "
6-4-85	2:10pm	G. Papadakis	15.79 from T.O.P.	434.38	" "
6-7-85	8:47am	G. Papadakis	14.89 from T.O.P.	435.28	" "
8-8-85	—	G. Papadakis	16.72 from T.O.P.	433.45	steel Tape
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: I-62 (old N-3)
Location: N ____ E ____	Elev. Ground Surface (G.S.): 444.1	
	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 446.08	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 44.0	Drilling Type: ____
Date Completed Drilling Hole: ____ Time: ____		
Date Piezometer Installed: ____ Time: ____	Total Depth of Piezometer: 44.0	Footage Slotted: 10.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	afternoon	P. Hustad	8.9 from T.O.P.	437.18	
5-24-84	9:00 am	G. Ernstmann	9.4 from T.O.P.	436.68	
6-27-84	12:20 pm	R. Robinson	9.86 from T.O.P.	436.22	
8-10-84	7:35 am	G. Ernstmann	11.89 from T.O.P.	434.19	
8-16-84	8:00 am	G. Ernstmann	12.40 from T.O.P.	433.68	
8-20-84	7:30 am	G. Ernstmann	12.66 from T.O.P.	433.42	
8-21-84	11:30 am	G. Ernstmann	12.78 from T.O.P.	433.30	
8-28-84	10:40 am	G. Ernstmann	13.2 from T.O.P.	432.88	
8-29-84	1:15 pm	G. Ernstmann	13.35 from T.O.P.	432.73	
10-3-84	1:12 pm	R. Robinson	13.84 from T.O.P.	432.24	Electric Tape
10-26-84	9:12 am	G. Ernstmann	12.95 from T.O.P.	433.13	" "
12-19-84	10:45 am	G. Ernstmann	12.7 from T.O.P.	433.4	" "
3-30-85	12:02 pm	G. Ernstmann	10.04 from T.O.P.	436.04	" "
4-25-85	11:00 am	G. Ernstmann	10.17 from T.O.P.	435.91	" "
6-7-85	9:07 am	S. Papalabros	10.32 from T.O.P.	435.76	" "
8-8-85	—	S. Papalabros	[illegible] from T.O.P.	433.63	Cloth Tape

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: I-65 (old N-4)
Location: N ____ E ____	Elev. Ground Surface (G.S.): 438.5	
	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 441.80	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 36.0	Drilling Type: ____
Date Completed Drilling Hole: ____ Time: ____		
Date Piezometer Installed: ____ Time: ____	Total Depth of Piezometer: 36.0	Footage Slotted: 10.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	12:52 pm	P. Hustad	4.5' from T.O.P.	437.3	
5-24-84	11:00 am	G. Ernstmann	5.0' from T.O.P.	436.8	
6-27-84	1:12 pm	R. Robinson	5.46 from T.O.P.	436.34	
8-8-84	1:40 pm	G. Ernstmann	7.43 from T.O.P.	434.37	
8-21-84	12:20 pm	G. Ernstmann	8.42 from T.O.P.	433.38	
8-30-84	8:55 am	G. Ernstmann	9.18 from T.O.P.	432.62	
10-3-84	11:50 am	R. Robinson	9.45 from T.O.P.	432.35	Electric Tape
10-26-84	12:08 pm	G. Ernstmann	8.55 from T.O.P.	433.25	" "
12-19-84	10:10 am	G. Ernstmann	8.4 from T.O.P.	433.4	" "
3-30-85	2:45 pm	G. Ernstmann	5.33 from T.O.P.	436.47	steel tape
4-25-85	11:10 am	G. Ernstmann	5.83 from T.O.P.	435.97	Electric Tape
6-7-85	8:25 am	S. Payiatakis	6.25 from T.O.P.	435.55	" "
8-8-85	—	S. Payiatakis	7.78 from T.O.P.	433.82	cloth tape
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: I-66 (old N-5)
Location: N ____ E ____	Elev. Ground Surface (G.S.): 437.7	
	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 441.80	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 36.9	Drilling Type: ____
Date Completed Drilling Hole: ____ Time: ____		
Date Piezometer Installed: ____ Time: ____	Total Depth of Piezometer: 36.9	Footage Slotted: 10.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	afternoon	P. Hustad	* from		* water in ditch has surrounded the piezometer
5-24-84	11:15 am	G. Ernstmann	4.9' from T.O.P.	436.9	water in ditch, at base of piezometer, is 3.4' below T.O.P. (438.4)
6-27-84	1:18 pm	R. Robinson	5.40 from T.O.P.	436.4	
8-8-84	1:45 pm	G. Ernstmann	7.42 from T.O.P.	434.38	
8-21-84	12:25pm	G. Ernstmann	8.38 from T.O.P.	433.42	
8-30-84	9:05 am	G. Ernstmann	9.05 from T.O.P.	432.75	
10-3-84	11:55 am	R. Robinson	9.36 from T.O.P.	432.44	Electric Tape
10-26-84	12:15 pm	G. Ernstmann	8.25 from T.O.P.	433.55	" "
12-19-84	10:15 am	G. Ernstmann	8.2 from T.O.P.	433.6	" "
3-30-85	—	G. Ernstmann	see Remarks from —	—	Piez. is inaccessible because of water in ditch.
4-25-85	—	G. Ernstmann	" from "	—	" " " " "
6-7-85	—	S. Payalakis	" from —	—	2' of water @ surface
8-8-85	—	S. Payalakis	7.63 from T.O.P.	434.17	steel tape
5-20-86	—	M. Frio	9.12 from T.O.P.	432.68	
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: I-GT (old N-6)
Location N E	Elev. Ground Surface (G.S.): 436.5 Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 439.08	
Date Started Drilling Hole ____ Time ____ Date Completed Drilling Hole ____ Time ____ Date Piezometer Installed ____ Time ____	Total Depth of Hole: 35.4 Total Depth of Piezometer: 35.4	Drilling Type: ____ Footage Slotted: 10.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	afternoon	P. Hustad	* from –	–	* water in ditch is above the T.O.P.
5-24-84	11:30 am	G. Ernstmann	* from –	–	* water in ditch is above the T.O.P.
6-27-84	1:24 pm	R. Robinson	2.61 from T.O.P.	436.47	
8-8-84	1:35 pm	G. Ernstmann	4.65 from T.O.P.	434.43	
8-21-84	12:50 pm	G. Ernstmann	5.55 from T.O.P.	433.53	
8-30-84	9:10 am	G. Ernstmann	6.22 from T.O.P.	432.86	
10-3-84	noon	R. Robinson	6.42 from T.O.P.	432.66	Electric Tape
12-19-84	10:19 am	G. Ernstmann	5.3 from T.O.P.	433.8	" "
3-30-85	—	G. Ernstmann	See Remarks from –	–	Piez. is inaccessible because of water in ditch.
4-25-85	—	G. Ernstmann	" from –	–	Piezometer is underwater.
6-4-85	—	S. Payiatakis	" from –	–	" " "
8-8-85	—	S. Payiatakis	4.75 from T.O.P.	434.32	cloth Tape
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No: 84-075-4-002	Hole No.: I-68 (old N-7)
Location	Elev. Ground Surface (G.S.): 440.9	
N ____ E ____	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 448.32	
Date Started Drilling Hole ____ Time ____	Total Depth of Hole: 31.2	Drilling Type: ____
Date Completed Drilling Hole ____ Time ____		
Date Piezometer Installed ____ Time ____	Total Depth of Piezometer: 31.2	Footage Slotted: 10.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	12:37pm	P. Hustad	10.9 from T.O.P.	437.42	
5-24-84	11:45am	G. Ernstmann	11.5 from T.O.P.	436.82	
6-27-84	1:30pm	R. Robinson	12.25 from T.O.P.	436.07	
8-8-84	1:47pm	G. Ernstmann	14.02 from T.O.P.	434.30	
8-21-84	6:55am	G. Ernstmann	14.9 from T.O.P.	433.42	Electric tape
8-30-84	9:20 am	G. Ernstmann	15.70 from T.O.P.	432.62	
10-3-84	10:01 a.m.	R. Robinson	15.84 from T.O.P.	432.48	Electric Tape
10-26-84	12:00 noon	G. Ernstmann	14.55 from T.O.P.	433.77	" "
12-19-84	10:40 am	G. Ernstmann	14.6 from T.O.P.	433.7	" "
3-30-85	11:35am	G. Ernstmann	11.17 from T.O.P.	437.15	" "
4-25-85	11:24am	G. Ernstmann	12.29 from T.O.P.	436.03	" "
6-4-85	1:10pm	S. Payiatakis	13.51 from T.O.P.	434.81	" "
6-7-85	8:05 am	S. Payiatakis	11.30 from T.O.P.	437.02	" "
8-8-85	—	S. Payiatakis	14.17 from T.O.P.	434.15	cloth tape
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKES	Project No.: 84-075-4-002	Hole No.: I-72 (old 39)
Location	Elev. Ground Surface (G.S.): 462.7	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 465.4	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 50.0	Drilling Type: ____
Date Completed Drilling Hole: ____ Time: ____		
Date Piezometer Installed: ____ Time: ____	Total Depth of Piezometer: 50.0	Footage Slotted: 3.0

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	2:28 pm	P. Hustad	28.15 from T.O.P.	437.25	
5-23-84	1:00 pm	G. Ernstmann	28.4 from T.O.P.	437.00	
6-27-84	1:35 pm	R. Robinson	28.66 from T.O.P.	436.74	
8-8-84	3:15 pm	G. Ernstmann	30.22 from T.O.P.	435.18	
8-20-84	1:10 pm	G. Ernstmann	31.05 from T.O.P.	434.35	Electric Tape
8-29-84	10:25 am	G. Ernstmann	31.81 from T.O.P.	433.59	
10-3-84	9:40 am	R. Robinson	31.92 from T.O.P.	433.48	Electric Tape
10-26-84	10:35 am	G. Ernstmann	31.05 from T.O.P.	434.35	" "
12-19-84	12:18 pm	G. Ernstmann	30.8 from T.O.P.	434.2	" "
3-30-85	11:50 am	G. Ernstmann	28.58 from T.O.P.	436.82	" "
4-25-85	8:14 am	G. Ernstmann	29.21 from T.O.P.	436.19	" "
6-4-85	2:30 pm	S. Payiatakis	30.10 from T.O.P.	435.30	" "
6-7-85	9:40 am	S. Payiatakis	29.33 from T.O.P.	436.07	" "
8-8-85	—	S. Payiatakis	31.28 from T.O.P.	434.12	cloth Tape
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: I-73 (old 38)
Location N E	Elev. Ground Surface (G.S.): 462.7 Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 465.4	
Date Started Drilling Hole: ____ Time: ____ Date Completed Drilling Hole: ____ Time: ____ Date Piezometer Installed: ____ Time: ____	Total Depth of Hole: 50.0 Drilling Type: ____ Total Depth of Piezometer: 50.0 Footage Slotted: 3.0	

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	2:31 pm	P. Hustad	26.15 from T.O.P.	436.55	
5-23-84	1:15 pm	G. Ernstmann	26.5 from T.O.P.	436.2	
6-27-84	1:40 pm	R. Robinson	26.67 from T.O.P.	436.03	
8-8-84	3:17 pm	G. Ernstmann	28.62 from T.O.P.	436.78	
8-20-84	1:15 pm	G. Ernstmann	29.61 from T.O.P.	435.79	Electric Tape
8-29-84	10:27 am	G. Ernstmann	30.13 from T.O.P.	435.27	
10-3-84	9:43 am	R. Robinson	29.97 from T.O.P.	435.43	Electric Tape
10-26-84	10:38 am	G. Ernstmann	29.20 from T.O.P.	436.20	" "
12-19-84	12:20 pm	G. Ernstmann	29.1 from T.O.P.	436.3	" "
3-30-85	11:53 am	G. Ernstmann	27.17 from T.O.P.	438.23	" "
4-25-85	8:17 am	G. Ernstmann	27.58 from T.O.P.	437.87	" "
6-4-85	2:50 pm	S. Paylatakis	28.48 from T.O.P.	436.92	" "
6-7-85	9:50 am	S. Paylatakis	27.68 from T.O.P.	437.72	" "
8-8-85	—	S. Paylatakis	29.48 from T.O.P.	435.92	cloth Tape
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name	WESTLAKE	Project No.	84-075-4-002	Hole No.	74 Q
Location				Elev. Ground Surface (G.S.)	
N	E			Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.)	approx. 465' ± 5'
Date Started Drilling Hole	Time			Total Depth of Hole	Drilling Type
Date Completed Drilling Hole	Time				
Date Piezometer Installed	Time			Total Depth of Piezometer	Footage Slotted

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	2:36pm	P. Hustad	17.3 from T.O.P.	≈ 448	
5-23-84	1:15pm	G. Einstmann	15.5' from *T.O.P.	≈ 450	* highest point on top of Tilted concrete casing
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: S-75 (old 37)
Location N E	Elev. Ground Surface (G.S.): 458.8 Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 459.9	
Date Started Drilling Hole: ____ Time: ____ Date Completed Drilling Hole: ____ Time: ____ Date Piezometer Installed: ____ Time: ____	Total Depth of Hole: 26.0 Drilling Type: ____ Total Depth of Piezometer: 26.0 Footage Slotted: 3.0	

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-26-84	2:03 pm	P. Hustad	21.4 from T.O.P.	438.5	
5-24-84	12:30pm	G. Ernstmann	22.4 from T.O.P.	437.5	
6-27-84	11:00am	R. Robinson	22.53 from T.O.P.	437.37	
8-8-84	4:05pm	G. Ernstmann	24.33 from T.O.P.	435.57	
8-20-84	4:45pm	G. Ernstmann	25.0 from T.O.P.	434.9	Electric tape
8-24-84	1:05pm	G. Ernstmann	25.37 from T.O.P.	434.53	
8-29-84	10:05am	G. Ernstmann	25.70 from T.O.P.	434.2	
10-3-84	10:58am	R. Robinson	25.53 from T.O.P.	434.37	Electric Tape
10-26-84	10:22am	G. Ernstmann	24.15 from T.O.P.	435.75	" "
12-19-84	11:55am	G. Ernstmann	24.3 from T.O.P.	435.6	" "
3-30-85	1:55 pm	G. Ernstmann	17.50 from T.O.P.	442.4	steel tape
4-17-85	—	"	24.1 from "	435.80	
4-25-85	9:07 AM	"	22.88 from "	437.02	
6-7-85	12:30 PM	S. Payiatakis	17.70 from "	442.20	
8-8-85	—	"	21.18 from "	438.72	Cloth Tape
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: S-76 (old 37A)
Location	Elev. Ground Surface (G.S.): 474.4	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 477.5	
Date Started Drilling Hole: ____ Time: ____	Total Depth of Hole: 50.0	Drilling Type: ____
Date Completed Drilling Hole: ____ Time: ____	Total Depth of Piezometer: 50.0	Footage Slotted: 3.0
Date Piezometer Installed: ____ Time: ____		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-27-84	9:30am	Bill Canney	40.7 from T.O.P.	436.8	
5-23-84	4:00pm	G. Ernstmann	40.5 from T.O.P.	437.0	
6-27-84	11:05am	R. Robinson	40.54 from T.O.P.	436.96	
8-8-84	4:10 pm	G. Ernstmann	42.21 from T.O.P.	435.29	
8-20-84	4:35 pm	G. Ernstmann	42.95 from T.O.P.	434.55	Electric tape
8-24-84	1:10 pm	G. Ernstmann	43.36 from T.O.P.	434.14	
8-29-84	10:15am	G. Ernstmann	43.69 from T.O.P.	433.81	
10-26-84	10:15 am	G. Ernstmann	42.80 from T.O.P.	434.70	Electric Tape
12-19-84	11:52am	G. Ernstmann	42.6 from T.O.P.	434.9	" "
3-30-85	1:45 pm	G. Ernstmann	40.92 from T.O.P.	436.58	Steel Tape
4-25-85	9:05 AM	"	40.04 from "	437.46	
6-7-85	2:00 PM	S. Papiatakis	41.79 from "	435.71	
8-8-85	—	"	43.24 from "	434.26	Cloth Tape
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002		Hole No.: S-80
Location: N 2592.7962 E 2619.0159		Elev. Ground Surface (G.S.): 448.4	
		Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 453.38	
Date Started Drilling Hole: 8-28-84	Time: —	Total Depth of Hole: 22.0'	Drilling Type: SOLID AUGERS
Date Completed Drilling Hole: 8-29-84	Time: —		
Date Piezometer Installed: 8-29-84	Time: 9:00 am	Total Depth of Piezometer: 20.0'	Footage Slotted: 10.0'

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-28-84	—	G. Ernstmann	≈ 14' from G.S.	≈ 439	saturated material encountered during drilling.
8-29-84	7:00 am	G. Ernstmann	12.9' from G.S.	440.48	water level standing in hole during drilling.
8-29-84	9:00 am	G. Ernstmann	18.17 from T.O.P.	435.21	immediately after piezometer installation.
8-29-84	9:30 am	G. Ernstmann	17.4 from T.O.P.	435.98	
10-3-84	8:57 AM	A. ROBINSON	18.6 from T.O.P.	434.78	Electric Tape
10-26-84	12:50 pm	G. Ernstmann	17.10 from T.O.P.	436.28	" "
12-19-84	12:55 pm	G. Ernstmann	14.4 from T.O.P.	439.0	" "
3-30-85	2:30 pm	G. Ernstmann	11.50 from T.O.P.	441.88	steel tape
4-17-85	—	"	9.90 from "	443.48	
4-25-85	12:29 PM	"	16.29 from "	442.09	
6-7-85	10:55 AM	S. Payiatakis	14.18 from "	439.20	Cloth Tape
8-8-85	—	"	15.62 from "	437.76	
12-13-85	—	M. Erio	10.90 from "	442.45	Electric Tape
5-19-86	—	"	14.65 from "	436.73	
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002		Hole No.: D-81
Location		Elev. Ground Surface (G.S.): 447.8	
N 1146.2728	E 922.0145	Elev. Top of Pipe (T.O.P.) or Reference Point (R.P.): 450.82	
Date Started Drilling Hole: 8-13-84	Time: —	Total Depth of Hole: 61.5'	Drilling Type: WASH BORING
Date Completed Drilling Hole: 8-15-84	Time: —	Total Depth of Piezometer: 60.0'	Footage Slotted: 15.0'
Date Piezometer Installed: 8-15-84	Time: 11:00 am		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-13-84	3:30 pm	G. Ernstmann	≈ 13' from G.S.	≈438	saturated material encountered during drilling.
8-15-84	3:05 pm	G. Ernstmann	16.63' from T.O.P.	434.19	4 hours after piezometer installation.
8-20-84	4:50 pm	G. Ernstmann	17.6' from T.O.P.	433.22	Electric tape
8-21-84	9:15 am	G. Ernstmann	17.6' from T.O.P.	433.22	just before evacuating piezometer with compressed air
8-21-84	9:37 am	G. Ernstmann	17.75' from T.O.P.	433.07	2 mins. after evacuating piezometer
8-24-84	1:25 pm	G. Ernstmann	16.94' from T.O.P.	433.88	
8-29-84	12:35 pm	G. Ernstmann	18.28 from T.O.P.	432.54	
10-24-84	10:25 am	G. Ernstmann	17.35 from T.O.P.	433.47	Electric Tape
12-19-84	12:02 pm	G. Ernstmann	17.3 from T.O.P.	433.5	" "
3-30-85	2:35 pm	G. Ernstmann	14.92 from T.O.P.	435.90	steel tape
4-25-85	9:10 AM	"	15.88 from "	434.94	
6-7-85	12:35 PM	S. Papiatakis	15.73 from "	435.09	
8-8-85	—	"	17.68 from "	433.14	Cloth Tape
12-13-85	—	M. Erio	14.71 from "	436.11	Electric Tape.
5-19-86	—	"	18.12 from "	432.70	
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: S-82
Location	Elev. Ground Surface (G.S.): 447.7	
N 599.1580 E 19.3231	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 450.69	
Date Started Drilling Hole: 8-24-84 Time: —	Total Depth of Hole: 26.5'	Drilling Type: WASH-BORING
Date Completed Drilling Hole: 8-27-84 Time: —		
Date Piezometer Installed: 8-27-84 Time: 1:45 pm	Total Depth of Piezometer: 25.5'	Footage Slotted: 10.0'

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-24-84	—	G. Ernstmann	11' to 13' and below 17' from G.S.	below 434'	saturated material encountered during drilling.
8-27-84	1:45 pm	G. Ernstmann	18.2 from T.O.P.	432.49	immediately after piezometer installation.
8-29-84	12:20 pm	G. Ernstmann	18.25' from T.O.P.	432.44	
10-3-84	11:30 am	R. Robinson	18.34 from T.O.P.	432.35	Electric Tape
10-26-84	9:45 am	G. Ernstmann	17.51 from T.O.P.	433.18	" "
12-19-84	11:17 am	G. Ernstmann	17.5 from T.O.P.	433.2	" "
3-30-85	12:45 pm	G. Ernstmann	15.00 from T.O.P.	435.69	steel tape
4-17-85	—	"	15.00 from "	435.69	
4-25-85	10:37 AM	"	15.46 from "	435.23	
6-7-85	12:45 PM	S. Payiatakis	15.56 from "	435.13	
8-8-85	—	"	17.53 from "	433.16	Cloth Tape
5-20-86	—	M. Erio	18.00 from "	432.69	
12-12-85	—	"	14.40 from "	436.29	
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: D-83
Location: N 1742,7093 E 1219,4580	Elev. Ground Surface (G.S.): 444.4	
	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 447,62	
Date Started Drilling Hole: 8-16-84 Time: —	Total Depth of Hole: 115,3'	Drilling Type: WASH BORING
Date Completed Drilling Hole: 8-20-84 Time: —	Total Depth of Piezometer: 97,0'	Footage Slotted: 20.0'
Date Piezometer Installed: 8-21-84 Time: 2:05 pm		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-16-84	—	G. Ernstmann	10.5' from G.S.	437.1	saturated material encountered during drilling.
8-21-84	2:05 pm	G. Ernstmann	14.50' from T.O.P.	433.12	immediately after piezometer installation.
8-27-84	10:40 am	G. Ernstmann	14.84' from T.O.P.	432.78	just prior to evacuating piezometer with compressed air.
8-27-84	11:17 am	G. Ernstmann	15.0' from T.O.P.	432.62	4 minutes after evacuating the piezometer.
8-29-84	1:05 pm	G. Ernstmann	15.04' from T.O.P.	432.58	
10-3-84	1:10 pm	R. Robinson	15,39 from T.O.P.	432.23	Electric Tape
10-24-84	9:10 am	G. Ernstmann	14.55 from T.O.P.	433.07	" "
12-19-84	10:47 am	G. Ernstmann	14.4 from T.O.P.	433.2	" "
3-30-85	12:00 noon	G. Ernstmann	11.46 from T.O.P.	436.16	" "
4-25-85	10:58 AM	"	11.83 from "	435.79	
6-7-85	9:05 AM	S. Papiafakis	12.14 from "	435.48	
8-8-85	—	"	14.18 from "	433.44	Cloth Tape
12-12-85	—	M. Erio	10.56 from	437.06	Electric Tape
5-19-86	—	"	15.08 from	432.54	
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet 1 of 2

Project Name: WEST LAKE	Project No.: 84-075-4-002		Hole No.: S-84
Location		Elev. Ground Surface (G.S.): 452.9	
N: 340.0038	E: 1998.2729	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 456.92	
Date Started Drilling Hole: 8-24-84	Time: —	Total Depth of Hole: 31.5'	Drilling Type: SOLID AUGERS
Date Completed Drilling Hole: 8-24-84	Time: —	Total Depth of Piezometer: 30.9'	Footage Slotted: 10.0'
Date Piezometer Installed: 8-24-84	Time: 12:20 pm		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-24-84	—	G. Ernstmann	13' to 20' from G.S.		few thin saturated zones encountered during drilling.
8-24-84	—	G. Ernstmann	20' from G.S.	437'	saturated material below 20' during drilling.
8-24-84	12:20 pm	G. Ernstmann	23.7' from T.O.P.	433.22	immediately after piezometer installation.
8-27-84	7:15 am	G. Ernstmann	23.91' from T.O.P.	433.01	
8-27-84	9:20 am	G. Ernstmann	23.92' from T.O.P.	433.00	just prior to evacuating piezometer with compressed air
8-27-84	2:15 pm	G. Ernstmann	23.98 from T.O.P.	432.94	about 4½ hrs. after evacuating the piezometer
8-30-84	9:16 am	G. Ernstmann	24.28 from T.O.P.	432.64	
10-3-84	10:05 am	R. Robinson	24.32 from T.O.P.	432.60	Electric Tape
10-26-84	11:56 am	G. Ernstmann	23.20 from T.O.P.	433.72	" "
12-19-84	10:35 am	G. Ernstmann	23.3 from T.O.P.	433.6	" "
3-30-85	11:22 am	G. Ernstmann	20.33 from T.O.P.	436.59	" "
4-25-85	11:15 AM	"	20.83 from "	436.09	
6-4-85	12:30 PM	S. Papiotakis	22.25 from "	434.67	
6-7-85	8:00 AM	"	21.16 from "	435.76	
8-8-85	—	"	22.96 from "	433.96	Cloth Tape
12-13-85	—	M. Erio	19.85 from "	437.07	Electric Tape

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Project Name: WESTLAKE	Project No.: 34-075-4-002	Hole No.: S-84
Location: N See sheet 1 E	Elev. Ground Surface (G.S.): See Sheet 1	
	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.):	
Date Started Drilling Hole: Time:	Total Depth of Hole:	Drilling Type:
Date Completed Drilling Hole: Time:		
Date Piezometer Installed: Time:	Total Depth of Piezometer:	Footage Slotted:

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
5-20-86	—	M. Erjo	24.19 from T.O.P.	432.73	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: D-85
Location	Elev. Ground Surface (G.S.): 453.1	
N 340.5414 E 1986.8430	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 457.15	
Date Started Drilling Hole: 8-21-84 Time: —	Total Depth of Hole: 84.1'	Drilling Type: WASH BORING
Date Completed Drilling Hole: 8-22-84 Time: —		
Date Piezometer Installed: 8-24-84 Time: 10:00 am	Total Depth of Piezometer: 82.0'	Footage Slotted: 20.0'

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-22-84	7:30 am	G. Ernstmann	approx. 18' to 25' from G.S.		saturated material encountered during drilling.
8-24-84	10:00 am	G. Ernstmann	20.05 from T.O.P.	437.10	immediately after piezometer installation.
8-27-84	7:15 am	G. Ernstmann	24.09 from T.O.P.	433.06	
8-27-84	9:40 am	G. Ernstmann	24.12 from T.O.P.	433.03	just prior to evacuating piezometer with compressed air.
8-27-84	2:20 pm	G. Ernstmann	24.21 from T.O.P.	432.94	about 4½ hrs. after evacuating the piezometer.
8-30-84	9:15 am	G. Ernstmann	24.50 from T.O.P.	432.65	
10-3-84	10:07 am	R. Robinson	24.54 from T.O.P.	432.61	Electric Tape
10-26-84	11:55 am	G. Ernstmann	23.35 from T.O.P.	433.80	" "
12-19-84	10:37 am	G. Ernstmann	23.5 from T.O.P.	433.6	" "
3-30-85	11:20 am	G. Ernstmann	20.63 from T.O.P.	436.53	" "
4-25-85	—	"	21.08 from "	436.07	
6-4-85	12:53 PM	S. Payiatakis	22.48 from "	434.67	
6-7-85	8:00 AM	"	21.23 from "	435.92	
8-8-85	—	"	23.22 from "	433.93	Cloth Tape
12-11-85	—	M. Erio	20.20 from "	436.95	Electric Tape
5-20-86	—	"	24.40 from "	432.75	

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

Burns & McDonnell
Engineers-Architects-Consultants

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet 1 of 2

Project Name: WESTLAKE	Project No.: 84-075-4-002		Hole No.: D-87
Location		Elev. Ground Surface (G.S.): 460.0	
N: 114.45	E: 903.6487	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 463.04	
Date Started Drilling Hole: 8-9-84	Time: —	Total Depth of Hole: 111.7'	Drilling Type: WASH BORING
Date Completed Drilling Hole: 8-10-84	Time: —	Total Depth of Piezometer: 111.0'	Footage Slotted: 20.0'
Date Piezometer Installed: 8-10-84	Time: —		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-9-84	—	G. Ernstmann	27' from G.S.		saturated material encountered during drilling.
8-10-84	—	G. Ernstmann	4.46 from T.O.P.	458.58	immediately after piezometer installation.
8-14-84	8:15 am	G. Ernstmann	26.05' from T.O.P.	436.99	
8-20-84	12:50 pm	G. Ernstmann	29.75' from T.O.P.	433.29	
8-23-84	1:30 pm	G. Ernstmann	30.0' from T.O.P.	433.04	before surging well.
8-23-84	3:30 pm	G. Ernstmann	30.3' from T.O.P.	432.74	few minutes after surging and bailing the well.
8-27-84	10:15 am	G. Ernstmann	29.29' from T.O.P.	433.75	just prior to evacuating piezometer with compressed air.
8-27-84	10:32 am	G. Ernstmann	30.5' from T.O.P.	432.54	4 minutes after evacuating the piezometer.
8-29-84	11:15 am	G. Ernstmann	30.46 from T.O.P.	432.58	
10-3-84	9:50 am	R. Robinson	30.61 from T.O.P.	432.43	Electric Tape
10-26-84	10:45 am	G. Ernstmann	29.75 from T.O.P.	433.29	" "
12-19-84	10:43 am	G. Ernstmann	29.6 from T.O.P.	433.4	" "
3-30-85	11:39 am	G. Ernstmann	27.09 from T.O.P.	435.95	" "
4-25-85	8:30 AM	"	27.50 from "	435.54	
6-4-85	1:20 PM	S. Papiatakis	28.74 from "	434.30	
6-7-85	8:35 PM	"	27.88 from "	435.16	

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: D-87
Location: N See sheet 1 E	Elev. Ground Surface (G.S.): See Sheet 1	
	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): "	
Date Started Drilling Hole: " Time: "	Total Depth of Hole: "	Drilling Type: "
Date Completed Drilling Hole: " Time: "	Total Depth of Piezometer: "	Footage Slotted: "
Date Piezometer Installed: " Time: "		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-8-83	—	"	28.78 from "	435.26	Cloth Tape
12-11-85	—	M. Erio	26.75 from "	436.54	Electric Tape
5-20-86	—	"	27.75 from "	435.29	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet 1 of 2

Project Name: WESTLAKE	Project No: 84-075-4-002	Hole No. S-88
Location	Elev. Ground Surface (G.S.) 460.0	
N 695.0461 E 309.2279	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 462.73	
Date Started Drilling Hole 8-15-84 Time —	Total Depth of Hole 41.5'	Drilling Type WASH BORING
Date Completed Drilling Hole 8-16-84 Time —	Total Depth of Piezometer 40.0'	Footage Slotted 10.0'
Date Piezometer Installed 8-16-84 Time 11:00 am		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-15-84	—	G. Ernstmann	18' to 24' from G.S.		saturated seams encountered during drilling.
8-15-84		G. Ernstmann	24' from G.S.	439'	saturated material encountered during drilling - below 24'.
8-16-84	11:00 am	G. Ernstmann	29.3' from T.O.P.	433.43	immediately after piezometer installation.
8-20-84	1:00 pm	G. Ernstmann	29.50' from T.O.P.	433.23	Electric Tape
8-21-84	8:38 am	G. Ernstmann	29.46' from T.O.P.	433.27	just before evacuating piezometer with compressed air
8-21-84	9:01 am	G. Ernstmann	29.8' from T.O.P.	432.93	1½ mins. after evacuating piezometer
8-24-84	1:30 pm	G. Ernstmann	29.90' from T.O.P.	432.83	
8-29-84	11:10 am	G. Ernstmann	30.20 from T.O.P.	432.53	
10-3-84	10:45 am	R. Robinson	30.34 from T.O.P.	432.39	Electric Tape
10-26-84	10:40 am	G. Ernstmann	29.50 from T.O.P.	433.23	" "
12-19-84	12:11 pm	G. Ernstmann	29.4 from T.O.P.	433.3	" "
3-30-85	11:45 am	G. Ernstmann	27.00 from T.O.P.	435.37	" "
4-25-85	8:25 AM	"	27.50 from "	435.23	
6-4-85	2:10 PM	S. Payiatacis	28.81 from "	433.92	
6-7-85	9:17 AM	"	27.71 from "	435.02	
8-8-85	—	"	29.65 from "	433.08	Cloth Tape

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: S-88
Location: N See Sheet 1 E	Elev. Ground Surface (G.S.): See Sheet 1	
	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): "	
Date Started Drilling Hole: " Time: "	Total Depth of Hole: "	Drilling Type: "
Date Completed Drilling Hole: " Time: "	Total Depth of Piezometer: "	Footage Slotted: "
Date Piezometer Installed: " Time: "		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
12-11-85	-	M. Erio	26.48 from T.O.P.	436.25	Electric Tape
5-20-86	-	"	29.79 from "	432.94	" "
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet ____ of ____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: D-89
Location	Elev. Ground Surface (G.S.): 454.1	
N 1790.5514 E 602.6094	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 457.10	
Date Started Drilling Hole: 8-27-84 Time: —	Total Depth of Hole: 49.0'	Drilling Type: WASH BORING
Date Completed Drilling Hole: 8-28-84 Time: —	Total Depth of Piezometer: 49.0'	Footage Slotted: 15.0'
Date Piezometer Installed: 8-28-84 Time: 1:30 pm		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-27-84	—	G. Ernstmann	15' to 20' from G.S.		few thin saturated zones encountered during drilling.
8-27-84	—	G. Ernstmann	21' from G.S.		saturated material encountered during drilling below 21'.
8-28-84	1:30 pm	G. Ernstmann	22.3' from T.O.P	434.8	immediately after piezometer installation.
8-29-84	10:30 am	G. Ernstmann	24.50 from T.O.P.	432.60	just prior to evacuating piezometer with compressed air
8-29-84	11:45 am	G. Ernstmann	24.65 from T.O.P.	432.45	10 minutes after evacuating the piezometer.
10-3-84	9:33 am	R. Robinson	24.73 from T.O.P.	432.37	Electric Tape
10-26-84	12:19 pm	G. Ernstmann	23.65 from T.O.P.	433.45	" "
12-19-84	12:30 pm	G. Ernstmann	23.6 from T.O.P.	433.5	" "
3-30-85	2:00 pm	G. Ernstmann	21.25 from T.O.P.	435.85	steel tape
4-25-85	11:35 AM	"	22.13 from "	434.97	
6-4-85	1:15 PM	S. Papiatakis	22.95 from "	434.15	
6-7-85	10:05 AM	"	22.0 from "	435.09	
8-8-85	-	"	24.10 from "	433.00	Cloth Tape
12-13-85	—	M. Erio	21.07 from "	436.03	Electric Tape
5-19-86	—	"	24.79 from "	432.81	
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-004	Hole No.: D-90
Location: N _____ E _____	Elev. Ground Surface (G.S.):	
	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 450.60	
Date Started Drilling Hole: 8-6-85 Time:	Total Depth of Hole: 47.0'	Drilling Type: Solid Auger & Rotary Wash
Date Completed Drilling Hole: 8-7-85 Time:	Total Depth of Piezometer: 47.0'	Footage Slotted: 10'
Date Piezometer Installed: 8-7-85 Time: 9:50 AM		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
12-13-85	-	M. Erio	13.87 from T.O.P.	436.73	Electric Tape
5-19-86	-	"	15.38 from "	435.22	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-004	Hole No.: D-91
Location	Elev. Ground Surface (G.S.)	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 453.37	
Date Started Drilling Hole: 8-5-85 Time	Total Depth of Hole: 45.0	Drilling Type: Solid Auger
Date Completed Drilling Hole: 8-6-85 Time	Total Depth of Piezometer: 45.0	Footage Slotted: 10'
Date Piezometer Installed: 8-6-85 Time: 9:00		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
12-13-85	—	M. Erio	15.42 from T.O.P.	437.95	Electric Tape
5-19-86	~	"	17.29 from "	434.08	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: D-92
Location	Elev. Ground Surface (G.S.): ≈ 475.5	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 475.37	
Date Started Drilling Hole: 4-9-85 Time	Total Depth of Hole: 143.6	Drilling Type
Date Completed Drilling Hole: 4-11-85 Time	Total Depth of Piezometer: 143.0	Footage Slotted: 20'
Date Piezometer Installed: 4-11-85 Time		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-17-85	11:15 AM	G. Ernstmann	38.9 from T.O.P.	436.47	
4-22-85	10:30 AM	"	40.2 from "	435.17	
4-23-85	3:30 PM	"	39.3 from "	436.07	
4-24-85	7:00 AM	"	40.5 from "	434.87	
4-25-85	8:30 AM	"	40.04 from "	435.33	Electric Tape
6-4-85	1:40 PM	S. Payiatakis	41.17 from "	434.20	
6-7-85	8:40 AM	"	38.06 from "	437.31	
8-8-85	-	"	42.08 from "	433.29	Cloth Tape
12-12-85	-	M. Erio	38.55 from "	436.82	Electric Tape
5-19-86	-	"	42.40 from "	432.97	
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: D-93
Location	Elev. Ground Surface (G.S.): ≈ 448	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 450.7	
Date Started Drilling Hole: 4-15-85 Time	Total Depth of Hole: 119.2	Drilling Type: Wash bore
Date Completed Drilling Hole: 4-18-85 Time	Total Depth of Piezometer: 112'	Footage Slotted: 20'
Date Piezometer Installed: 4-18-85 Time: 1:30PM		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-22-85	10:30 AM	G. Ernstmann	15.3 from T.O.P.	435.4	
4-24-85	7:00 AM	"	15.5 from "	435.2	
4-25-85	–	"	15.46 from "	435.24	Electric Tape
6-7-85	1:00 PM	S. Payiatakis	15.51 from "	435.19	
8-8-85	–	"	17.50 from "	433.20	cloth Tape
12-12-85	–	M. Erio	14.24 from "	436.46	Electric Tape
5-20-86	–	"	17.94 from "	432.76	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name	Project No.	Hole No.
WESTLAKE	84-075-4-002	D-94

Location	Elev. Ground Surface (G.S.)	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.)	

Date Started Drilling Hole	4-18-85	Time	Total Depth of Hole	Drilling Type
Date Completed Drilling Hole	4-24-85	Time	109.0	Wash boring
Date Piezometer Installed	4-24-85	Time 3:00 PM	Total Depth of Piezometer: 106.0	Footage Slotted: 20'

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-25-85	11:08AM	G. Ernstmann	7.29 from T.O.P.	435.39	Electric Tape
6-4-85	1:50 PM	S. Payiatakis	7.88 from "	434.80	
6-7-85	8:15 AM	"	6.98 from "	435.70	
8-8-85	–	"	8.75 from "	433.93	cloth Tape
12-12-85	–	M. Erio	5.25 from "	437.43	Electric Tape.
5-20-86	–	"	10.90 from "	431.78	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: D-95
Location	Elev. Ground Surface (G.S.): ≈450	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 453.09	
Date Started Drilling Hole: 4-22-85 Time:	Total Depth of Hole: 100	Drilling Type: H.S Auger & wash boring
Date Completed Drilling Hole: 4-24-85 Time:		
Date Piezometer Installed: 4-24-85 Time: 3:00 PM	Total Depth of Piezometer: 101.0	Footage Slotted: 20

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
4-25-85	12:00 PM	G. Ernstmann	16.75 from T.O.P.	436.34	Electric Tape
6-7-85	10:35 AM	S. Payiatakis	17.02 from "	436.07	
8-8-85	—	"	19.01 from "	434.08	Cloth Tape
12-12-85	—	M. Erio	15.35 from "	437.74	Electric Tape.
5-21-86	—	"	20.46 from "	432.63	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

Burns & McDonnell
Engineers · Architects · Consultants

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: Earth City #8
Location: Earth City, west of the landfill	Elev. Ground Surface (G.S.)	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 441.87	
Date Started Drilling Hole: — Time: —	Total Depth of Hole: —	Drilling Type: —
Date Completed Drilling Hole: — Time: —	Total Depth of Piezometer: —	Footage Slotted: —
Date Piezometer Installed: — Time: —		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-30-84	12:30 pm	G. Ernstmann	8.7 from T.O.P.	433.17	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: Earth City #9
Location: Earth City, West of the landfill N E	Elev. Ground Surface (G.S.): approx. 436 Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 441.85	
Date Started Drilling Hole: — Time: —	Total Depth of Hole: —	Drilling Type: —
Date Completed Drilling Hole: — Time: —	Total Depth of Piezometer: —	Footage Slotted: —
Date Piezometer Installed: — Time: —		

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
10-26-84	1:20pm	G. Ernstmann	7.4 from T.O.P.	434.45	
12-19-84	11:22am	G. Ernstmann	7.7 from T.O.P.	434.2	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: Earth City #12
Location: Earth City, west of the landfill	Elev. Ground Surface (G.S.)	
N E	Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 440.59	
Date Started Drilling Hole: — Time: —	Total Depth of Hole: —	Drilling Type: —
Date Completed Drilling Hole: — Time: —		
Date Piezometer Installed: — Time: —	Total Depth of Piezometer: —	Footage Slotted: —

Remarks:

Date	Time	By Whom	Depth to Water*	W.L. Elev.	Remarks
8-30-84	1:00pm	G. Ernstmann	7.7 from T.O.P.	432.89	
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		
			from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

Observed Water Level Readings

Sheet _____ of _____

Project Name: WESTLAKE	Project No.: 84-075-4-002	Hole No.: SMP-63
Location: Ponded surface water north of site, southwest of St. Charles Rock Road N — E —	Elev. Ground Surface (G.S.) Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.)	
Date Started Drilling Hole: N.A. Time: —	Total Depth of Hole: N.A.	Drilling Type: N.A.
Date Completed Drilling Hole: N.A. Time: —	Total Depth of Piezometer: N.A.	Footage Slotted: N.A.
Date Piezometer Installed: N.A. Time: —		

Remarks:

Reference point is a rod located in the ponded water north of the site in the ditch southwest of St. Charles Rock Road. The rod is marked in increments of 0.1 foot and starts with 0.0 at the bottom and ends at approximately 12-feet at the top. The top of the rod is under water during most of the spring and early summer.

Date	Time	By Whom	~~Depth to~~ Height of Water*		W.L. Elev.	Remarks
10-15-84	12:15 pm	Bill Canney	10.21	from R.P.		
10-26-84	9:15 am	G. Ernstmann	11.05	from R.P.		
12-19-84	10:53 am	G. Ernstmann	11.4	from R.P.		
3-30-84	—	G. Ernstmann	*	from —		* Reference rod is submerged in ponded water.
				from		
				from		
				from		
				from		
				from		
				from		
				from		
				from		
				from		
				from		
				from		
				from		

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

June 4 & 7, 1990

MONITORING WELL QUALITY SURVEY

Laidlaw Waste Systems
Bridgeton, Missouri
89L46-12

WELL #	CASING DIAM (in)	CASING MATL	CAP (Y/N)	VENTED (Y/N)	PROT. CAS. (Y/N)	PROT.CAS. MATL	STICK-UP HEIGHT (ft)	DEPTH TO WATER (ft)	DEPTH OF WELL (ft)	NOTES
I-50	2	SCH 40 PVC	Y	N	Y	5" Steel	4.00	18.53	45.60	
S-51	-	----	-	-	-	--	--	--	--	unable to locate
S-52	2	SCH 40 PVC	Y	N	N	NA	2.70	12.84	26.50	
S-53	2	SCH 40 PVC	Y	N	N	NA	3.90	14.54	24.00	old pipe
S-54	-	----	-	-	-	--	--	--	--	unable to locate
I-55	2	SCH 40 PVC	Y	N	N	NA	2.50	39.96	61.83	
I-56	2	SCH 40 PVC	Y	N	N	NA	2.60	44.20	63.05	
I-58	2	SCH 40 PVC	Y	N	N	NA	3.50	45.93	59.65	
I-59	2	SCH 40 PVC	Y	Y	Y	4" Steel	3.85	15.72	47.70	OK
S-60	-	----	-	-	-	--	--	--	--	unable to locate
S-61	2	SCH 40 PVC	Y	N	N	NA	4.55	17.33	26.20	
I-62	2	SCH 40 PVC	Y	N	Y	4" Steel	1.70	13.30	45.05	OK
I-65	2	SCH 40 PVC	Y	Y	Y	4" Steel	3.00	9.15	39.35	OK
I-66	2	SCH 40 PVC	Y	Y	Y	4" Steel	3.70	9.24	31.15	OK
I-67	2	SCH 40 PVC	Y	N	N	NA	4.60	10.21	41.20	
I-68	2	SCH 40 PVC	N	N	N	NA	2.20	17.35	40.30	bent; broken riser
I-72	2	SCH 40 PVC	Y	Y	N	NA	2.45	31.85	48.65	
I-73	2	SCH 40 PVC	Y	N	N	NA	3.20	29.94	50.70	
S-75	2	SCH 40 PVC	N	N	N	NA	3.50	25.54	30.80	glued PVC at surf
S-76	-	----	-	-	-	--	--	--	--	unable to locate
S-80	2	SCH 40 PVC	Y	N	N	NA	4.15	13.72	22.40	glued PVC at surf
D-81	2	SCH 40 PVC	Y	N	N	NA	2.85	17.19	62.85	
S-82	2	SCH 40 PVC	Y	Y	N	NA	3.00	17.78	26.40	holes in riser
D-83	2	SCH 40 PVC	Y	Y	N	NA	3.10	14.75	97.50	
S-84	2	SCH 40 PVC	Y	Y	N	NA	2.40	24.52	32.45	steel bumper posts
D-85	2	SCH 40 PVC	Y	Y	N	NA	2.55	24.71	78.75	steel bumper posts
D-87	2	SCH 40 PVC	Y	Y	N	NA	2.25	30.52	114.65	OK
S-88	2	SCH 40 PVC	Y	Y	N	NA	2.20	30.25	42.15	bent
D-89	2	SCH 40 PVC	Y	Y	N	NA	2.75	24.28	51.00	
D-90	2	SCH 40 PVC	N	N	N	NA	3.30	15.62	48.70	holes in riser
D-91	-	----	-	-	-	--	--	--	--	unable to locate
D-92	-	----	-	-	-	--	--	--	--	unable to locate
D-93	2	SCH 40 PVC	Y	Y	N	NA	2.40	16.99	114.45	broken riser
D-94	2	SCH 40 PVC	Y	Y	N	NA	3.70	9.96	110.40	OK
D-95	-	----	-	-	-	--	--	--	--	unable to locate
1201	6	OPEN HOLE	Y	N	Y	6" Steel	2.20	--	--	
1202	6	OPEN HOLE	Y	N	Y	6" Steel	2.00	--	--	
1203	6	OPEN HOLE	Y	N	Y	6" Steel	2.50	--	--	plugged at 115'

Table 1

GROUND WATER ELEVATION DATA

Earth City/Corporate Woods Business Parks
Earth City/Bridgeton, Missouri

Well No.	Top of Well Casing Elevation, ft.	Depth from Top of Well Casing to Ground Water, ft.	Ground Water Elevation, ft.
DM–1	447.7	9.5	438.2
DM–2	449.0	11.4	437.6
DM–3	441.2	4.9	436.3
DM–4	441.9	5.5	436.4
DM–5	440.2	4.0	436.2
CW–1	448.0	9.7	438.3
CW–2	445.6	6.9	438.1
CW–3	445.3	7.2	438.1
CW–4	440.6	3.2	437.4
EC–1	446.9	5.2	441.7
EC–2	447.1	5.0	442.1
EC–3	444.0	5.2	438.8

NOTES

1) Readings obtained on May 17, 1993.

2) Well label legend:

Well Prefix	Description
DM	Dames & Moore observation well along the west side of Laidlaw Landfill
CW	Corporate Woods (North) relief well along the toe of the flood protection levee
EC	Earth City relief well along the toe of the flood protection levee

Table 1
Summary of Fluid Elevations

Well/ Sump	Dates							
	5/12/93	5/13/93	5/21/93	5/24/93	5/26/93	5/28/93	6/15/93	6/18/93
LCS-1			315.20	324.27	325.05	299.60		310.60
LCS-2			303.09	317.94	315.84			276.24
LCS-3			315.14	323.24	324.24	327.59		291.79
LCS-4			318.21	319.01	318.94	319.97		307.56
GC-3			297.06	307.46	308.51			297.66
MW-1201		343.72	340.99	344.82	345.55		347.04	341.19
MW-1204	295.78	295.83	297.39	312.67	311.31		294.85	
MW-1205	329.84	329.94	272.07		285.71	290.42	318.09	
MW-1206	334.73	337.72	333.43		332.73	332.83	334.49	
MW-I-73								436.21
MW-F1S								436.35
MW-F1D								436.33

Blank denotes no reading

Notes: Wells 1201, 1204, 1205 and 1206 were sampled on 5/13 & 14/93
LCS denotes leachate collection sump
GC denotes gas collection manhole
MW denotes groundwater monitoring well

Table 2-7
Monthly Groundwater Monitoring Depth to Water
West Lake Landfill, Bridgeton, Missouri

Well	Northing	Easting	Reference Point Elevation (Feet, MSL)	Depth to Water (Feet below TOC)															
				1994		1995											1996		
				Nov. 22, 23, 28	December 29	January 30	March 3	March 30	April 28	May 26	June 30	July 28, Aug. 3*	Aug 31	Oct. 2	Oct. 31	Nov. 30	Jan. 5	April 2	July 5
Shallow Wells																			
S-1	1069685.83	514205.01	446.51	---	---	---	---	---	---	---	---	---	12.26	13.75	14.38	14.88	15.62	16.94	12.01
S-5	1069155.84	515901.03	468.65	---	---	---	---	---	---	---	---	---	34.2	35.78	36.51	36.84	37.62	38.96	34.02
S-8	1071044.35	514724.16	444.03	---	---	---	---	---	---	---	---	---	----	----	11.85	12.52	13.19	14.50	9.11
S-10	1069827.87	514931.35	480.28	---	---	---	---	---	---	---	---	---	----	47.37	48.16	48.61	49.17	50.85	45.71
S-51	1066161.31	514320.72	449.57	18.77	18.66	17.81	18.22	18.2	17.81	13.38	14.41	14.81	15.54	16.74	17.42	17.46	17.98	19.09	15.43
S-53	1066871.02	514496.97	447.95	17.27	17.37	16.47	16.93	16.86	16.30	12.57	12.99	13.06	13.77	15.17	15.89	17.97	16.65	18.04	casing damaged
S-61	1070159.98	514580.24	449.78	19.55	19.61	18.73	19.00	18.97	18.51	13.36	13.86	----	15.27	16.76	17.51	18.18	18.93	20.29	15.08
S-75	1067250.41	514718.75	462.08	29.92	30.05	29.12	29.85	29.42	29.22	25.31	26.61	26.88	27.41	28.91	29.56	29.81	29.90	29.89	27.23
S-80	1065191.77	513858.35	453.11	19.15	18.97	17.48	16.96	16.17	16.28	12.70	13.91	14.69	14.85	15.82	16.55	17.77	18.87	18.99	abandoned
S-82	1069311.99	514272.95	450.18	19.82	19.88	19.05	19.35	19.32	18.71	14.19	14.80	15.02	15.91	17.40	18.11	18.43	19.15	20.61	15.69
S-84	1069633.39	516439.68	456.23	26.59	26.60	25.67	25.92	25.89	25.68	20.37	20.88	21.49	22.26	23.92	24.67	25.21	25.87	27.07	22.15
S-88	1068398.39	515234.03	462.76	32.18	32.44	31.51	29.41	31.9	31.43	27.23	27.62	27.73	28.60	30.01	30.72	29.95	31.71	33.11	28.43
MW-F1S	1068603.00	515865.35	461.35	31.11	31.00	30.26	30.42	30.42	30.05	25.74	26.05	26.32	27.06	28.52	29.26	29.58	30.31	31.69	26.99
MW-101	1070830.48	514424.00	446.83	16.68	16.73	15.91	16.13	16.11	15.67	10.51	----	----	12.20	13.91	14.67	15.29	16.04	17.37	12.02
MW-102	1070095.01	514532.93	448.18	17.95	18.00	17.18	17.41	17.38	16.91	11.64	12.31	12.81	13.70	15.32	16.06	18.58	17.16	18.67	13.47
MW-103	1068628.37	514334.35	440.31	9.72	9.91	9.01	9.43	9.37	8.79	5.15	5.39	5.34	6.22	7.57	8.25	8.49	9.26	10.61	6.51
MW-104	1067525.17	514339.01	440.96	10.33	10.43	9.48	9.98	9.93	9.33	5.72	6.11	6.13	6.95	8.27	8.95	9.06	9.71	11.11	6.78
MW-106	1065955.75	513616.92	443.78	12.85	12.90	12.28	12.45	12.44	12.07	8.39	8.36	8.56*	9.27	casing damaged	NM	NM	NM	NM	NM
MW-107	1064670.74	513601.12	448.14	5.13	5.44	4.53	5.36	5.1	5.26	-----	4.71	5.57	6.06	8.39	9.07	6.36	5.99	5.68	6.17
MW-F3	1070489.80	515819.83	469.23	38.96	38.97	38.09	38.00	38.29	38.06	32.31	32.94	36.62	34.47	36.21	37.02	37.61	38.39	39.60	34.33
Intermediate Depth Wells																			
I-2	1069698.26	514212.18	446.41	----	----	----	----	----	----	----	----	----	12.03	13.68	14.31	14.76	15.47	16.90	11.92
I-4	1069148.42	515889.5	468.57	----	----	----	----	----	----	----	----	----	34.19	35.75	36.45	38.85	37.62	38.92	33.96
I-7	1070743.05	514299.87	446.97	----	----	----	----	----	----	----	----	----	12.41	14.10	14.87	15.43	16.15	17.52	12.18
I-9	1069329.26	514268.59	450.99	----	----	----	----	----	----	----	----	----	----	----	18.79	19.2	19.98	21.40	16.52
I-11	1069819.16	514925.06	480.27	----	----	----	----	----	----	----	----	----	----	----	48.14	48.61	49.35	50.75	45.69
I-50	1065190.32	513831.96	453.66	22.02	22.27	21.26	21.76	21.65	21.13	16.60	17.40	19.96	18.74	20.27	21	21.03	21.57	23.05	abandoned
I-62	1070938.26	514647.31	446.21	15.99	16.07	15.19	15.47	15.42	15.03	9.87	9.90	10.34*	11.55	13.02	13.78	14.71	15.36	16.71	11.34
I-65	1070953.26	515333.39	441.82	11.6	11.70	10.83	11.00	11.03	10.66	5.25	7.35	8.12	7.04	8.81	9.66	10.3	11.06	12.31	6.87
I-66	1070604.09	515851.01	441.91	11.61	11.66	10.78	11.00	10.95	10.61	5.18	5.56	6.26	7.11	8.83	9.69	10.32	11.04	12.28	6.98
I-67	1070101.57	516244.09	441.90	11.54	11.57	10.63	10.93	10.97	10.65	5.06	5.65	6.31	7.11	8.81	9.61	10.23	10.87	12.16	7.03
I-68	1069571.49	516686.36	450.50	20.16	20.10	19.05	19.44	19.45	19.24	13.94	14.52	16.16	15.91	17.52	18.29	18.8	19.45	20.64	15.74
I-73	1067695.45	515570.09	461.39	31.46	31.68	30.80	31.12	31.9	30.69	26.04	27.15	27.25	27.97	29.39	30.12	30.31	31.00	32.35	28.87
Deep Wells																			
D-3	1069136.26	515871.62	470.32	----	----	----	----	----	----	----	----	----	35.92	37.49	38.21	38.63	39.43	40.70	35.74
D-6	1070194.31	514549.5	447.6	----	----	----	----	----	----	----	----	----	13.23	14.82	15.5	16.09	16.77	18.16	12.99
D-12	1069836.29	514936.08	479.91	----	----	----	----	----	----	----	----	----	----	----	48	48.32	48.98	50.42	45.33
D-13	1070485.74	515601.73	471.1	----	----	----	----	----	----	----	----	----	----	----	38.94	39.48	40.19	41.49	36.21
D-14	1068947.16	516523.17	487.77	----	----	----	----	----	----	----	----	----	----	----	0	NM	58.62	59.69	56.21
D-81	1067338.19	514463.68	451.00	20.3	20.39	19.56	19.95	19.95	19.29	15.62	16.08	16.14	16.91	18.24	18.95	19.04	19.71	21.11	16.78
D-83	1070930.4	514633.64	448.48	18.29	18.40	17.50	17.82	17.76	17.27	12.17	12.16	12.61*	13.88	15.70	16.41	17.01	17.77	19.01	13.72
D-85	1069626.55	516430.42	457.13	26.82	26.77	25.87	26.12	26.13	25.89	20.60	21.11	21.71	22.48	24.13	24.87	25.42	26.11	27.39	22.39
D-87	1069211.46	515404.82	463.05	32.81	32.82	31.96	32.19	32.2	31.81	27.10	27.57	27.86	28.69	30.28	30.96	31.36	32.11	33.54	28.60
D-93	1069317.89	514269.69	448.62	19.66	19.74	18.92	19.22	19.18	18.58	14.02	14.67	14.83	15.79	17.25	18.01	18.34	19.06	20.51	15.59
MW-F1D	1068608.68	515860.04	461.63	31.42	31.31	30.51	30.70	30.78	30.41	26.04	26.34	26.61	27.36	28.86	29.6	29.88	30.62	32.02	27.29
Staff Gages																			
1	1071100.73	514883.10	438.57	----	----	----	----	----	----	----	4.2	3.25	2.35	----	1.5	Dry	Dry	Dry	2.30
2	1071107.71	514878.03	438.84	----	----	----	----	----	----	----	3.95	3.05	2.1	----	1.25	Dry	Dry	Dry	2.25
3	1071249.28	514645.19	440.73	----	----	----	----	----	----	----	1.98	1.05	< 0.5	----	3.2	Dry	Dry	Dry	Dry
4	1071253.42	514635.63	441.05	----	----	----	----	----	----	----	1.7	0.80	< 0.5	----	2.95	Dry	Dry	Dry	Dry
5	1070745.51	515414.94	460.94	----	----	----	----	----	----	----	----	----	----	----	Dry	Dry	Dry	Dry	Dry
6	1069471.76	514096.61	437.28	----	----	----	----	----	----	----	2.18	2.64	1.55	----	0.25	0.7	Dry	Dry	1.75
7	1069480.90	514091.25	437.01	----	----	----	----	----	----	----	2.45	2.95	1.8	0.30	0	1	Dry	Dry	2.00

NM = Not Measured

Table 2-8
Monthly Groundwater Monitoring Elevation Data
West Lake Landfill, Bridgeton, Missouri

Well	Northing	Easting	Reference Point Elevation (Feet, MSL)	Groundwater Elevation (Feet, MSL)															
				1994		1995											1996		
				November	December	January	February	March	April	May	June	July	August	September	October	November	January	April	July
Shallow Wells																			
S-1	1069685.83	514205.01	446.51	—	—	—	—	—	—	—	—	—	434.25	432.76	432.13	431.63	430.89	429.57	434.50
S-5	1069155.84	515901.03	468.65	—	—	—	—	—	—	—	—	—	434.45	432.87	432.14	431.81	431.03	429.69	434.63
S-8	1071044.35	514724.16	444.03	—	—	—	—	—	—	—	—	—	—	----	432.18	431.51	430.84	429.53	434.92
S-10	1069827.87	514931.35	480.28	—	—	—	—	—	—	—	—	—	—	432.91	432.12	431.67	431.11	429.43	434.57
S-51	1066161.31	514320.72	449.57	430.8	430.91	431.76	431.35	431.37	431.76	436.19	435.16	434.76	434.03	432.83	432.15	432.11	431.59	430.48	434.14
S-53	1066871.02	514496.97	447.95	430.68	430.58	431.48	431.02	431.09	431.65	435.38	434.96	434.89	434.18	432.78	432.06	429.98	431.30	429.91	casing damaged
S-61	1070159.98	514580.24	449.78	430.23	430.17	431.05	430.78	430.81	431.27	436.42	435.92	----	434.51	433.02	432.27	431.6	430.85	429.49	434.70
S-75	1067250.41	514718.75	462.08	432.16	432.03	432.96	432.23	432.66	432.86	436.77	435.47	435.20	434.67	433.17	432.52	432.27	432.18	432.19	434.85
S-80	1065191.77	513858.35	453.11	433.96	434.14	435.63	436.15	436.94	436.83	440.41	439.20	438.42	438.26	437.29	436.56	435.34	434.24	434.12	abandoned
S-82	1069311.99	514272.95	450.18	430.36	430.30	431.13	430.83	430.86	431.47	435.99	435.38	435.16	434.27	432.78	432.07	431.75	431.03	429.57	434.49
S-84	1069633.39	516439.68	456.23	429.64	429.63	430.56	430.31	430.34	430.55	435.86	435.35	434.74	433.97	432.31	431.56	431.02	430.36	429.16	434.08
S-88	1068398.39	515234.03	462.76	430.58	430.32	431.25	433.35	430.86	431.33	435.53	435.14	435.03	434.16	432.75	432.04	432.81	431.05	429.65	434.33
MW-F1S	1068603.00	515865.35	461.35	430.24	430.35	431.09	430.93	430.93	431.30	435.61	435.30	435.03	434.29	432.83	432.09	431.77	431.04	429.66	434.36
MW-101	1070830.48	514424.00	446.83	430.15	430.10	430.92	430.70	430.72	431.16	436.32	----	----	434.63	432.92	432.16	431.54	430.79	429.46	434.81
MW-102	1070095.01	514532.93	448.18	430.23	430.18	431.00	430.77	430.8	431.27	436.54	435.87	435.37	434.48	432.86	432.12	429.6	431.02	429.51	434.71
MW-103	1068628.37	514334.35	440.31	430.59	430.40	431.30	430.88	430.94	431.52	435.16	434.92	434.97	434.09	432.74	432.06	431.82	431.05	429.7	433.80
MW-104	1067525.17	514339.01	440.96	430.63	430.53	431.48	430.98	431.03	431.63	435.24	434.85	434.83	434.01	432.69	432.01	431.9	431.25	429.85	434.18
MW-106	1065955.75	513616.92	443.78	430.93	430.88	431.50	431.33	431.34	431.71	435.39	435.42	435.22	434.51	----	NM	NM	NM	NM	NM
MW-107	1064670.74	513601.12	448.14	443.01	442.70	443.61	442.78	443.04	442.88	----	443.43	442.57	442.08	439.75	439.07	441.78	442.15	442.46	441.97
MW-F3	1070489.80	515819.83	469.23	430.27	430.26	431.14	431.23	430.94	431.17	436.92	436.29	432.61	434.76	433.02	432.21	431.62	430.84	429.63	434.90
Intermediate Depth Wells																			
I-2	1069698.26	514212.18	446.41	----	----	----	----	----	----	----	----	----	434.38	432.73	432.1	431.65	430.94	429.51	434.49
I-4	1069148.42	515889.5	468.57	----	----	----	----	----	----	----	----	----	434.38	432.82	432.12	429.72	430.95	429.65	434.61
I-7	1070743.05	514299.87	446.97	----	----	----	----	----	----	----	----	----	434.56	432.87	432.1	431.54	430.82	429.45	434.79
I-9	1069329.26	514268.59	450.99	----	----	----	----	----	----	----	----	----	----	----	432.2	431.79	431.01	429.59	434.47
I-11	1069819.16	514925.06	480.27	----	----	----	----	----	----	----	----	----	----	----	432.13	431.66	430.92	429.52	434.58
I-50	1065190.32	513831.96	453.66	431.64	431.39	432.40	431.90	432.01	432.53	437.06	436.26	433.70	434.92	433.39	432.66	432.63	432.09	430.61	abandoned
I-62	1070938.26	514647.31	446.21	430.22	430.14	431.02	430.74	430.79	431.18	436.34	436.31	435.87	434.66	433.19	432.43	431.5	430.85	429.5	434.87
I-65	1070953.26	515333.39	441.82	430.22	430.12	430.99	430.82	430.79	431.16	436.57	434.47	433.70	434.78	433.01	432.16	431.52	430.76	429.51	434.95
I-66	1070604.09	515851.01	441.91	430.3	430.25	431.13	430.91	430.96	431.30	436.73	436.35	435.65	434.80	433.08	432.22	431.59	430.87	429.63	434.93
I-67	1070101.57	516244.09	441.90	430.36	430.33	431.27	430.97	430.93	431.25	436.84	436.25	435.59	434.79	433.09	432.29	431.67	431.03	429.74	434.87
I-68	1069571.49	516686.36	450.50	430.34	430.40	431.45	431.06	431.05	431.26	436.56	435.98	434.34	434.59	432.98	432.21	431.7	431.05	429.86	434.76
I-73	1067695.45	515570.09	461.39	429.93	429.71	430.59	430.27	429.49	430.70	435.35	434.24	434.14	433.42	432.00	431.27	431.08	430.39	429.04	432.52
Deep Wells																			
D-3	1069136.26	515871.62	470.32	----	----	----	----	----	----	----	----	----	434.40	432.83	432.11	431.69	430.89	429.62	434.58
D-6	1070194.31	514549.5	447.6	----	----	----	----	----	----	----	----	----	434.37	432.78	432.1	431.51	430.83	429.44	434.61
D-12	1069836.29	514936.08	479.91	----	----	----	----	----	----	----	----	----	----	----	431.91	431.59	430.93	429.49	434.58
D-13	1070485.74	515601.73	471.1	----	----	----	----	----	----	----	----	----	----	----	432.16	431.62	430.91	429.61	434.89
D-14	1068947.16	516523.17	487.77	----	----	----	----	----	----	----	----	----	----	----	Dry	NM	429.15	428.08	431.56
D-81	1067338.19	514463.68	451.00	430.7	430.61	431.44	431.05	431.05	431.71	435.38	434.92	434.86	434.09	432.76	432.05	431.96	431.29	429.89	434.22
D-83	1070930.4	514633.64	448.48	430.19	430.08	430.98	430.66	430.72	431.21	436.31	436.32	435.87	434.60	432.78	432.07	431.47	430.71	429.47	434.76
D-85	1069626.55	516430.42	457.13	430.31	430.36	431.26	431.01	431	431.24	436.53	436.02	435.42	434.65	433.00	432.26	431.71	431.02	429.74	434.74
D-87	1069211.46	515404.82	463.05	430.24	430.23	431.09	430.86	430.85	431.24	435.95	435.48	435.19	434.36	432.77	432.09	431.69	430.94	429.51	434.45
D-93	1069317.89	514269.69	448.62	428.96	428.88	429.70	429.40	429.44	430.04	434.60	433.95	433.79	432.83	431.37	430.61	430.28	429.56	428.11	433.03
MW-F1D	1068608.68	515860.04	461.63	430.21	430.32	431.12	430.93	430.85	431.22	435.59	435.29	435.02	434.27	432.77	432.03	431.75	431.01	429.61	434.34
Staff Gages																			
1	1071100.73	514883.10	438.57	----	----	----	----	----	----	----	437.27	436.32	435.42	----	434.57	----	----	----	435.37
2	1071107.71	514878.03	438.84	----	----	----	----	----	----	----	437.29	436.39	435.44	----	434.59	----	----	----	435.59
3	1071249.28	514645.19	440.73	----	----	----	----	----	----	----	437.21	436.28	----	----	438.43	----	----	----	----
4	1071253.42	514635.63	441.05	----	----	----	----	----	----	----	437.25	436.35	----	----	438.5	----	----	----	----
5	1070745.51	515414.94	460.94	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
6	1069471.76	514096.61	437.28	----	----	----	----	----	----	----	433.96	434.42	433.33	----	432.03	432.48	----	----	433.53
7	1069480.90	514091.25	437.01	----	----	----	----	----	----	----	433.96	434.46	433.31	431.81	----	432.51	----	----	433.51

NM = Not Measured

47

TABLE 4-2
GROUNDWATER ELEVATION SUMMARY
BRIDGETON ACTIVE SANITARY LANDFILL

Piezometer	Date			
	6/27/95	7/10/95	7/26/95	8/26/95
	Groundwater Elevation			
Shallow Alluvial Piezometers				
PZ-112-AS	436.12	435.27	435.12	434.67
PZ-113-AS	435.64	435.44	435.30	434.63
PZ-114-AS	435.94	435.59	435.35	434.90
PZ-205-AS	434.41	434.40	434.33	434.06
PZ-207-AS	435.94	435.41	435.41	434.91
MW-F1S	436.30	NA	435.03	434.29
S-75	435.47	NA	435.20	434.67
S-84	435.35	NA	434.74	433.97
S-88	435.14	NA	435.03	434.16
Deep Alluvial Piezometer				
PZ-113-AD	435.68	435.47	435.13	433.74
St. Louis/Upper Salem Hydrologic Unit Piezometers				
PZ-100-SS	405.36	415.59	416.06	415.23
PZ-101-SS	393.23	394.34	394.58	393.37
PZ-102-SS	413.54	416.50	NA	NA
PZ-102R-SS	403.09	418.31	424.30	424.87
PZ-103-SS	363.03	353.33	373.02	363.73
PZ-104-SS	340.67	345.78	360.04	366.22
PZ-105-SS	336.26	336.35	339.83	352.45
PZ-106-SS	359.72	357.56	357.60	364.20
PZ-107-SS	434.52	428.41	434.30	434.00
PZ-108-SS	368.99	367.58	368.99	367.02
PZ-109-SS	370.70	373.01	373.74	360.45
PZ-110-SS	413.76	433.30	433.53	433.27
PZ-113-SS	435.70	435.54	435.23	434.79
PZ-115-SS	426.75	426.58	424.83	424.18
PZ-116-SS	NA	347.42	346.79	356.46
PZ-200-SS	415.05	415.48	415.45	415.59
PZ-201-SS	456.42	456.42	455.53	454.86
PZ-201A-SS	415.03	415.03	414.63	414.38
PZ-202-SS	444.36	445.00	444.78	444.14

Notes provided on Page 2

TABLE 4-2
GROUNDWATER ELEVATION SUMMARY
BRIDGETON ACTIVE SANITARY LANDFILL

Piezometer	Date			
	6/27/95	7/10/95	7/26/95	8/26/95
	Groundwater Elevation			
PZ-203-SS	375.33	374.97	(DRY)	(DRY)
PZ-204-SS	442.82	442.32	441.49	438.10
PZ-204A-SS	NA	399.36	405.65	405.53
PZ-205-SS	424.46	424.22	424.04	423.45
PZ-206-SS	420.04	419.57	419.04	418.22
PZ-208-SS	NA	436.77	436.44	435.60
PZ-1201-SS	NA	427.32	392.33	365.30
MW-1204	333.83	336.19	330.01	357.27
MW-1205	352.28	355.99	357.38	296.81
MW-1206	368.19	367.91	367.12	367.86
Deep Salem Piezometers				
PZ-100-SD	394.61	398.79	370.68	381.79
PZ-104-SD	359.05	358.46	356.64	362.97
PZ-106-SD	358.64	357.31	353.52	361.98
PZ-111-SD	373.70	408.06	423.87	428.55
Keokuk Piezometers				
PZ-100-KS	438.17	438.85	438.93	437.84
PZ-104-KS	444.63	444.76	444.74	444.27
PZ-106-KS	442.18	442.51	442.51	442.48
PZ-111-KS	441.58	441.78	441.91	442.01

NOTES:

NA = Not available, water level data was not collected on the indicated date either because the piezometer had not yet been installed, development was not completed, or the piezometer was inactive.

PZ-102-SS was replaced by PZ-102R-SS, and is inactive.

All elevations provided in feet above Mean Sea Level (MSL)

Water level data for monitoring wells MW-F1S, S-75, S-84, and S-88 were collected by McLaren/Hart on June 30, July 28, and August 31, 1995.

WATER LEVEL DATA

WELL LOCATION P2-100-KS MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
11/4/96	1337	elec. probe	50.95	JDR			WH	Depths to water
2/6/96	1035	" "	50.54	"			MS	
3/4/96	1715	" "	51.68	"			MS	
4/3/96	0904	" "	49.93	"			MS	
4/30/96	1101	" "	50.89	"			WH	
5/1/96	1255	" "	50.55	"			WH	
5/2/96	1503	" "	50.36	"			WH	
5/3/96	1423	" "	50.08	"			WH	
6/13/96	1224	" "	46.80	"			MS	
7/12/96	1453	" "	46.29	"			MS	
8/8/96	1201	" "	46.14	"			MS	
9/6/96	1212	" "	46.25	"			MS	
2/9/97	0845	" "	43.88	"			SM	
5/9/97	1240	" "	41.76	"			JDR	
8/11/97	1044	" "	43.03	"			JDR	
11/6/97	0956	" "	42.99	"			JDR	
2/10/98	1456	" "	39.80	"			DTS	
5/26/98	1332	" "	37.61	"			JDR	
11/9/98	1200	"	37.89	"			BFP	
5/14/99	1422	"	22.97	"			BFP	
5/22/00	0931	"	35.30	"			MAM	

Golder Associates

P2-100-KS

WATER LEVEL DATA

WELL LOCATION PZ-100-SD MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
1/4/96	1325	elec probe	130.78	TOPVC			WH	[illegible]
2/6/96	1038	" "	122.81	"			MS	
3/4/96	1716	" "	128.09	"			MS	
4/3/96	0901	" "	112.94	"			MS	double checked w.l.
4/30/96	1058	" "	125.03	"			WH	
5/1/96	1253	" "	121.27	"			WH	
5/2/96	1501	" "	119.29	"			WH	
5/3/96	1421	" "	118.00	"			WH	
6/13/96	1222	" "	109.89	"			MS	
7/12/96	1451	" "	118.78	"			MS	
8/8/96	1205	" "	118.26				MS	
8/23/96	0645	" "	118.92	"			MS	
8/23/96		dw't -	purged	to 189.30				
8/26/96	0915	" "	117.34	"			MS	
9/6/96	1216	" "	118.69	"			MS	
2/4/97	0843	" "	106.88	"			SM	
5/9/97	1237	" "	91.46	"			JDR	
8/11/97	1045	" "	102.60	"			JDR	
11/6/97	0754	" "	101.05	"			JDR	
2/9/98	1217	" "	76.71	"			DJ	double checked w.l.
5/26/98	1329	" "	83.76	"			JDR	
11/9/98	1203	"	72.96	"			BFP	
5/14/99	1420		55.24				BFP	
5/22/00	0930	"	57.87	"			MAN	

Golder Associates

PZ 100-SD

WATER LEVEL DATA

WELL LOCATION PZ-100-SS MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12								
12/24/95	1418	elec. probe	73.33	TOPVC			MS	
12/26/95	1016	" "	72.33	TOPVC			MS	
12/31/95	1350	" "	72.20	TOPVC			MS	
1/4/96	1323	" "	72.21	TOPVC			MS	Lock on but not locked
2/6/96	1041	" "	72.38	"			MS	
3/4/96	1712	" "	72.64	TOPVC			MS	
4/3/96	0859	" "	72.97	"			MS	Lock on but not locked
4/30/96	1056	" "	73.10	"			WH	
5/1/96	1251	" "	73.05	"			WH	
5/2/96	1458	" "	73.03	"			WH	
5/3/96	1418	" "	73.01	"			WH	
6/13/96	1220	" "	72.74	"			MS	
7/12/96	1448	" "	72.90	"			MS	
8/8/96	1209	" "	73.19	"			MS	
8/26/96	0915	" "	73.23	"			MS	
8/26/96		don't pump!	97.76				MS	
9/6/96	1219	" "	74.68	"			MS	
2/4/97	0850	" "	86.46	"			SM	
5/9/97	1235	" "	71.94	"			JDR	
8/11/97	1047	" "	73.03	"			JDR	
11/6/97	0952	" "	72.56	"			JDR	
2/9/98	1215	" "	70.04	"			DB	
5/26/98	1326	" "	63.07	"			JDR	
11/9/98	1204	"	69.20	"			BFP	
5/14/99	1417	"	56.48				BFP	
5/22/00	0927	"	60.29	"				

Golder Associates

PZ-100-SS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-101-SS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

PROJECT _____ LOCATION _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
6/13/96	1227	Elec. Probe	99.21	TOPVC			MS	
7/12/96	1456	" "	89.60	"			MS	
8/8/96	1137	" "	89.03	"			MS	
9/6/96	1223	" "	88.60	"			MS	
2/4/97	0842	" "	72.38	"			SM	
5/9/97	1228	" "	72.36	"			JDR	
8/11/97	1037	" "	82.77	"			JDR	
11/6/97	0747	" "	85.06	"			JDR	
2/10/98	1452	" "	79.88	"			DTS	
5/20/98	1320	" "	73.50	"			PDR	
11/9/98	1143		76.33				BFP	
5/14/99	1332	"	57.07	"			BFP	
11/22/99	1445	"	67.46	"			BFP	
5/22/00	0845	"	58.52	"			MAM	

PZ-101-SS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-102-SS MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2-26-95	1915	Elec. Probe	29.73	bgs core hole			BT	
2-28-95	1600	"	29.66	bgs-core hole			"	
3-1-95	1345	"	32.71	" "			"	
3-6-95	1345		29.66	" "			BT	
3-25-95	1028	" "	72.34	TOPVC			WH	
3/29/95	0805	" "	74.26	TOC				
4/9/95	1706	" "	73.81	TOR			BM	cap not vented
4/21/95	0830	" "	73.66	TOR			MDA	Cap vented
5/5/95	1630	" "	72.81	TOR			MDA	
5/17/95	0810	" "	76.68	TOPVC			AK	
5-23-95	1156	" "	86.57	TOPVC			AK	
5-24-95	1327	" "	87.19	TOPVC			AK	
5-30-95	0705	" "	81.03	TOPVC			AK	
6-1-95	0739	" "	86.81	TOPVC			AK	
6-7-95	0809	" "	84.80	TOPVC			AK	
6/27/95	0726	" "	70.31	TOPVC			AK	
7/10/95	1428	" "	67.35	TOPVC			AK	
12/13/95	1550	" "	78.10	TOPVC			TAK	
1/4/96	1352	" "	78.00	TOPVC			WH	
2/6/96	1059	" "	79.15	"			MS	
3/4/96	1604	" "	79.24	"			MS	
4/3/96	0915	" "	79.32	"			MS	
4/30/96	1116	" "	79.70	"			WH	
5/1/96	1306	" "	79.81	"			WH	
5/2/96	1512	" "	79.90	"			WH	
5/3/96	1433	" "	79.94	"			WH	
6/13/96	1233	" "	78.92	"			MS	
7/12/96	1505	" "	78.94	"			MS	
8/8/96	1140	" "	78.85	"			MS	
9/6/96	1227	" "	79.17	"			MS	
2/4/97	0965	" "	71.30	"			SM	

PZ-102-SS

Water Level Data

Well: PZ-102-SS

Well Location PZ-102-SS Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/9/97	1221	elec. probe	71.09	TOPVC			JDR	
8/11/97	1010	"	76.60	"			JDR	
11/6/97	0737	"	72.60	"			JDR	
2/10/98	1442	"	62.62	"			DJS	
5/26/98	1307	"	71.87	"			JDR	
11/9/98	1137	"	66.09	"			BFP	
5/14/99	1372	"	54.06				BFP	
11/19/99	1155	"	59.64				BFP	
5/22/00	0900		56.50				MAM	

WELL or DATE _____

PZ-102R-55

WATER LEVEL DATA

WELL LOCATION _____ MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
6/27/95	0722	ELECTROBE	82.49	TOPVC			AK	
7/10/95	1424	" "	807.22	TOPVC			AK	
8/15/95	947	" "	666.25	TOPVC			AK	
8/26/95	945	" "	60.71	TOPVC			AK	
9/30/95	1121	" "	62.78	TOPVC			AK	
10/28/95	1342	" "	63.59	TOPVC			AK	
11/18/95	1402	" "	63.95	TOPVC			AK	
12/13/95	1543	" "	64.80	TOPVC			AK	
1/4/96	1347	" "	64.99	TOPVC			WH	WELL #2 SEAL
2/6/96	1058	" "	66.09	"			MS	
3/4/96	1606	" "	66.33	"			MS	
4/3/96	0917	" "	66.67	"			MS	
4/30/96	1118	" "	67.26	"			WH	
5/1/96	1308	" "	67.28	"			WH	
5/2/96	1514	" "	67.36	"			WH	
5/3/96	1435	" "	67.34	"			WH	
6/13/96	1235	" "	666.00	"			MS	
7/12/96	1509	" "	64.98	"			MS	
8/8/96	1143	" "	64.32	"			MS	
8/22/96	0930	" "	64.79	"			MS	
8/22/96	well - purged		to 89.81				MS	
8/26/96	1020	" "	78.38	"			MS	
9/6/96	1230	" "	65.54	"			MS	
2/4/97	0900	" "	61.38	"			BM	
5/9/97	1219	" "	61.12	"			JDR	
8/11/97	1013	" "	81.96	"			JDR	
11/6/97	0739	" "	84.51	"			JDR	
2/9/98	1209	" "	56.53	"			DB	
5/26/98	1310	" "	56.73	"			JDR	
11/9/98	1140	"	55.49	"			BFP	
5/14/99	1335	"	49.78	"			BFP	
11/19/99	1156	"	50.11	"			BFP	
5/22/00	0903	"	48.28	"			MSM	

LOCATION

PROJECT

Golder Associates

PZ-102R-55

WATER LEVEL DATA

WELL LOCATION PZ-103-SS MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
11/4/96	HHD	elec. probe	118.70	TOPVC			[illegible]	[illegible]
2/6/96	1110	" "	117.87	"			MS	
3/4/96	1616	" "	118.16	"			MS	
4/3/96	0937	" "	117.32	"			MS	Not looked (time on)
4/30/96	1123	" "	116.04	"			WH	
5/1/96	1312	" "	116.11	"			WH	
5/2/96	1518	" "	116.30	"			WH	
5/3/96	1440	" "	116.46	"			WH	
6/13/96	1248	" "	115.73	"			MS	
7/12/96	1529	" "	116.75	"			MS	
8/8/96	1148	" "	116.60	"			MS	
9/6/96	1240	" "	116.68	"			MS	
2/4/96	0930	" "	108.38	"			SM	
6/9/97	1212	" "	104.78	"			JDR	
8/11/97	1018	" "	107.56	"			JDR	
11/6/97	0731	" "	100.52	"			JDR	
2/10/98	1135	" "	86.62	"			DTS	
5/26/98	1254	" "	92.78	"			PDR	
11/9/99	1128	"	86.68	"			BFP	
5/14/99	1400	"	50.12	"			BFP	
11/9/99	1147	"	74.13	"			BFP	
5/22/00	0911	"	63.40	"			MAM	

Golder Associates

PZ-103-SS

WELL or DATE _____

WATER LEVEL DATA

PZ-104-KS
WELL LOCATION _____

MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
6/26/95	0823	ELECTROBE	39.39	TOPVC			AK	
6/27/95	1005	" "	39.41	TOPVC			AK	
7/10/95	1139	" "	39.28	TOPVC			AK	
7/26/95	1141	" "	39.30	TOPVC			AK	
8/15/95	914	" "	39.19	TOPVC			AK	
8/26/95	911	" "	39.77	TOPVC			AK	
9/30/95	1025	" "	42.06	TOPVC			AK	
10/28/95	1150	" "	43.05	TOPVC			AK	
11/18/95	1214	" "	43.27	TOPVC			AK	
12/13/95	1435	" "	43.62	TOPVC			TAC	
12/20/95	1247	" "	43.95	TOPVC			GAVT	
12/29/95	1436	" "	43.82	TOPVC			AS	
12/26/95	1030	" "	43.68	TOPVC			MDS	
12/31/95	1402	" "	43.60	"			MS	
[illegible]	[illegible]	"	43.82	TOPVC			WH	No YEP
1/15/96		weg hole dried - Sent						
2/16/96	0825	" "	40.94	TOPVC			MS	
3/5/96	1522	" "	42.30	"			WH	
4/2/96	1408	" "	41.10	"			MS	
4/30/96	0857	" "	41.23	"			WH	
5/1/96	1007	" "	40.98	"			WH	
5/2/96	1240	" "	40.84	"			WH	
5/3/96	1153	" "	40.69	"			WH	
6/13/96	1111	" "	36.69	"			MS	
7/12/96	1304	" "	36.64	"			MS	
8/8/96	0953	" "	36.10	"			MS	
9/6/96	1016	" "	36.97	"			MS	
1/4/97	1113	" "	35.24	"			SW	
5/9/97	1103	" "	32.89	"			JDR	
8/11/97	1304	" "	34.16	"			JDR	
11/6/97	1048	" "	34.42	"			JDR	

PZ-104-KS

Water Level Data

Well: PZ-104-KS

Well Location

Measuring Point

Elevation: Measuring Point

Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/26/98	1555	electrode	29.04	Top PVC			FDR	
11/9/99	1607	"	29.41	"			BFP	
5/14/99	1217	"	25.61	"			BFP	
11/19/99	1445	"	29.81	"			BFP	
5/22/00	1452	"	28.26	"			MAM	

PZ-104-KS

WELL or DATE

PZ-104-SD

WATER LEVEL DATA

WELL LOCATION

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
6/26/95	818	ELEC. PROBE	124.64	TOPVC			AK	
6/27/95	1007	" "	124.64	TOPVC			AK	
~~6/28/95~~ 7/10/95	1143	" "	125.23	TOPVC			AK	
7/26/95	1144	" "	127.05	TOPVC			AK	
8/15/95	912	" "	119.99	TOPVC			AK	
8/26/95	1109	" "	120.72	TOPVC			AK	
9/30/95	1029	" "	139.36	TOPVC			AK	
10/28/95	1153	" "	142.61	TOPVC			AK	
11/16/95	1216	" "	141.79	TOPVC			AK	
12/13/95	1440	" "	144.64	TOPVC			TAC	
12/20/95	1245	" "	135.82	TOPVC			WAT	
12/24/95	1429	" "	139.40	TOPVC			MS	
12/26/95	1029	" "	140.76	TOPVC			MS	
12/31/95	1357	" "	142.91	"			MS	
1/4/96	1411	" "	140.54	TOPVC			WH	No hose.
1/15/96		Well hole drilled - no site						
2/6/96	0823	" "	121.81	TOPVC			MS	
3/5/96	1520	" "	135.45	"			WH	
4/2/96	1406	" "	123.44	"			MS	
4/30/96	0855	" "	102.79	"			WH	
5/1/96	1005	" "	107.70	"			WH	
5/2/96	1238	" "	111.04	"			WH	
5/3/96	1151	" "	112.81	"			WH	
6/13/96	1113	" "	116.77	"			MS	
7/12/96	1306	" "	115.92	"			MS	
8/8/96	0955	" "	113.61	"			MS	
8/24/96	0650	" "	109.56	"			MS	
8/24/96	dev'd - purged to 2		01.58				MS	
9/6/96	1019	" "	120.03	"			MS	
2/4/97	1124	" "	101.48				SM	
5/9/97	1101	" "	105.50	"			JDR	

LOCATION

PROJECT

Water Level Data

Well: PZ-104-SD

Well Location PZ-104-SD Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
8/11/97	1309	Elec. Probe	91.97	TOP PVC			JDR	
11/6/97	1046	" "	84.05	" "			JDR	
2/9/98	1342	" "	92.86	"			DJ	
5/26/98	1334	" "	81.18	"			JDR	
11/9/98	1609	"	77.14	"			BEP	
5/14/99	1220	"	58.52	"			BEP	
5/22/06	1450	"	70.89	"			MAM	

PZ-104-SD

PZ-104-SS

WELL or DATE

WATER LEVEL DATA

WELL LOCATION

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
6/26/95	811	ELEC. PROBE	137.53	TOPVC			AK	
6/26/95	1219	" "	137.02	TOPVC			AK	
6/27/95	1011	" "	142.96	TOPVC			AK	DEVELOPED WITHIN 24HRS
7/6/95	1255	" "	124.84	TOPVC			AK	
7/10/95	1202	" "	137.85	TOPVC			AK	
7/14/95	1050	" "	128.67	TOPVC			AK	
7/26/95	1149	" "	123.59	TOPVC			AK	
8/15/95	917	" "	117.66	TOPVC			AK	
8/26/95	1107	" "	117.41	TOPVC			AK	
9/36/95	1032	" "	122.62	TOPVC			AK	
10/28/95	1156	" "	123.29	TOPVC			AK	
11/10/95	1220	" "	123.22	TOPVC			AK	
12/13/95	1443	" "	123.08	TOPVC			TAL	
12/26/95	1243	" "	123.00	TOPVC			WH	
12/27/95	1433	" "	122.73	TOPVC			MS	
12/26/95	1027	" "	122.23	TOPVC			MS	
12/31/95	1353	" "	122.19	"			MS	
1/4/96	1453	" "	122.10	TOPVC			WH	NO WATER IN WELL
1/15/96			dry	hole dr. NE - W side				
2/6/96	0820	" "	118.32	TOPVC			MS	
3/5/96	1518	" "	120.71	"			WH	
4/2/96	1408	" "	120.64	"			MS	
4/30/96	0853	" "	108.28	"			WH	
5/1/96	1004	" "	106.45	"			WH	
5/2/96	1238	" "	106.42	"			WH	
5/3/96	1148	" "	107.19	"			WH	
6/13/96	1115	" "	107.33	"			MS	
7/12/96	1308	" "	112.53	"			MS	
8/8/96	0958	" "	114.94	"			MS	
8/22/96	1450	" "	110.21	"			MS	
8/22/96	new # - purged to		130.34					

Golder Associates

PZ-104-SS

WELL or DATE

PZ-104-SS

WATER LEVEL DATA

WELL LOCATION

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
9/6/96	1022	elec. probe	116.88	top PVC			MS	
3/4/97	1125	" "	102.04	"			SM	
5/9/97	1058	" "	105.52	"			JDR	
8/11/97	1307	" "	92.49	"			JDR	
11/6/97	1044	" "	87.69	"			JDR	
2/9/98	1340	" "	80.60	"			DTS	
5/26/98	1532	" "	80.33	"			JDR	
12/9/98	1611		76.89				BAF	
5/14/99	1223		50.01				BAF	
5/22/00	1455	"	71.85	"			MAM	

LOCATION

PROJECT

Golder Associates

PZ-104-SS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-105-SS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-25-95	0750	Elec. Probe	85.26'	bgs			AK	
6-7-95	1104	" "	113.98'	bgs			AK	
6-13-95	0944	" "	118.44	TOPVC			AK	
6-16-95	0905	" "	145.40	TOPVC			AK	DEVELOPED 2 DAYS AGO
6/23/95	1414	" "	148.40	TOPVC			AK	
6/26/95	759	" "	147.79	TOPVC			AK	
6/27/95	0952	" "	147.35	TOPVC			AK	
7-5-95	0753	" "	144.36	TOPVC			AK	
7/10/95	944	" "	147.20	TOPVC			AK	
7/26/95	1132	" "	143.78	TOPVC			AK	
8/15/95	902	" "	140.95	TOPVC			AK	
8/26/95	1122	" "	131.16	TOPVC			AK	DOUBLE-ED
9/20/95	1014	" "	136.81	TOPVC			AK	
10/28/95	1139	" "	140.38	TOPVC			AK	
11/18/95	1203	" "	140.85	TOPVC			AK	
12/13/95	1425	" "	141.08	TOPVC			JAL	
2/2/96	1452	" "	140.40	TOPVC			WH	1/2 WSP
1/15/96	1135				weep hole installed -			W side. WH
2/6/96	0811	" "	126.09	TOPVC			MS	
3/5/96	1510	" "	133.15	TOPVC			WH	
4/2/96	1423	" "	127.39	TOPVC			MS	
4/30/96	0907	" "	105.40	"			WH	unlocked
5/1/96	1015	" "	105.53	"			WH	
5/2/96	1246	" "	106.09	"			WH	
5/3/96	1159	" "	106.78	"			WH	
6/13/96	1105	" "	107.02	"			MS	
7/12/96	1315	" "	113.00	"			MS	
8/8/96	1004	" "	115.83	"			MS	
9/6/96	1028	" "	118.35	"			MS	
2/4/97	1112	" "	100.46	"			SM	
5/9/97	1110	" "	104.40	"			JDR	
8/11/97	1258	" "	90.02	"			JDR	
11/6/97	1025	" "	85.16	"			JDR	
2/9/98	1336	" "	82.33	"			DTS	

PZ-105-SS

Water Level Data

Well: PZ-105-55

Well Location PZ-105-55 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/26/98	1603	electrode	79.36	Top PVC			PDR	
11/9/98	1601	"	78.34	"			BFP	
5/14/99	1211	"	59.56	"			BFP	
5/22/00	1505	"	72.69	"			MAM.	

PZ-105-55

WELL or DATE

WATER LEVEL DATA

WELL LOCATION PZ-106-KS

MEASURING POINT Stickup = 2.49'

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
4-9-95	1237	elec. probe	25.54	TOR			JBM	cap not vented yet
4-21-95	1025	" "	25.48	TOR			MDA	Cap Vented
5-5-95	1310	" "	25.00	TOPVC			LBT	
5-24-95	1530	" "	26.00	TOPVC			AK	
6-7-95	1036	" "	25.73	TOPVC			AK	
6/27/95	0921	" "	22.06	TOPVC			AK	
7/10/95	912	" "	21.75	TOPVC			AK	
7/26/95	1053	" "	21.75	TOPVC			AK	
8/15/95	750	" "	21.64	TOPVC			AK	
8/26/95	1228	" "	21.78	TOPVC			AK	
9/30/95	944	" "	23.96	TOPVC			AK	
10/28/95	953	" "	24.79	TOPVC			AK	
11/18/95	1047	" "	25.24	TOPVC			AK	
12/13/95	1405	" "	25.44	TOPVC			TAC	
12/20/95	1258	" "	25.80	TOPVC			GWT	
			~~25.61~~					
12/24/95	~~1553~~ 1553	" "	25.69	TOPVC			MPA	
12/26/95	1500	" "	25.53	TOPVC			MPA	
12/31/95	1445	" "	25.36	"			MS	
1/24/96	1551	" "	25.65	TOPVC			WH	water level 25.22
2/6/96	0757	" "	23.56	"			MS	
3/5/96	1454	" "	24.35	"			WH	
4/2/96	1528	" "	23.76	"			MS	
4/30/96	0924	" "	24.07	"			WH	
5/1/96	1101	" "	23.86	"			WH	
5/2/96	1326	" "	23.76	"			WH	
5/3/96	1246	" "	23.59	"			WH	
6/13/96	1051	" "	21.63	"			MS	
7/12/96	1323	" "	19.80	"			MS	
8/8/96	1022	" "	19.58	"			MS	
9/6/96	1037	" "	19.85	"			MS	
2/4/97	1051	" "	19.02	"			SM	

PZ-106-KS

Water Level Data

Well: PZ-106-KS

Well Location PZ-106-KS Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/9/97	1031	elec. probe	16.58	TOPVC			JDR	
8/11/97	1227	" "	16.81	"			JDR	
11/6/97	0948	" "	17.28	"			JDR	
2/10/98	1523	" "	15.30	"			DTS	
5/26/98	1536	" "	12.91	"			JDR	
11/9/98	1540	"	12.72				BFP	
5/14/99	1121	"	9.74	"			BFP	
11/19/99	1015		12.35	"			BFP	
5/22/00	1524	"	11.95	"			MAM	

PZ-106-KS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-106-SD

MEASURING POINT Stickup = 1.97

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
4-9-95	1233	elec. probe	115.68	TOR			JDM	cap not vented yet
4-21-95	1005	" "	116.38	TOR			MDA	Cap Vented
5-5-95	1310	" "	113.74	TOPVC			BT	
5-24-95	1545	" "	114.10	TOPVC			AIC	
6-7-95	1029	" "	104.35	TOPVC			AIC	THIS WAS DOUBLE CHECKED
6/27/95	0918	" "	104.78	TOPVC			AIC	
7/10/95	908	" "	106.11	TOPVC			AIC	
7/26/95	1051	" "	109.90	TOPVC			AIC	
8/3/95	941	" "	107.98	"			"	
8/14/95	745	" "	104.80	"			"	
8/26/95	1226	" "	101.44	"			AIC	
9/30/95	941	" "	114.98	"			AIC	
10/28/95	949	" "	117.02	"			AIC	
11/18/95	1044	" "	116.64	"			"	
12/13/95	1411		122.82	"			TAL	
12/20/95	1256	" "	123.25	"			WH	
12/24/95	1546	" "	121.52	"			MRS	
12/26/95	1102	" "	121.34				MRS	
12/31/95	1450	" "	121.54				MRS	
1/4/96	1549	"	121.10	TOPVC			WH	Logger data
2/6/96	0755	" "	106.60	"			MS	
3/5/96	1452	" "	117.16	"			WH	
4/2/96	1526	" "	113.25	"			MS	
4/30/96	0923	" "	101.95	"			WH	
5/1/96	1059	" "	100.43	"			WH	
5/2/96	1324	" "	99.32	"			WH	
5/3/96	1244	" "	98.61	"			WH	
6/13/96	1053	" "	93.99	"			MS	
7/12/96	1325	" "	96.11	"			MS	
8/8/96	1019	" "	93.77	"			MS	
8/22/96	0935	" "	93.82	"			MS	

Golder Associates

PZ-106-SD

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-106-SD

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
8/22/96		development	– pumped to 199.55				MS	
9/6/96	1040	elec. probe	103.11	topvc			MS	
2/4/97	1050	" "	87.00	"			SM	
5/9/97	1033	" "	86.21	"			JDR	
8/11/97	1225	" "	78.70	"			JDR	
11/6/97	0946	" "	76.17	"			JDR	
2/9/98	1300	" "	70.68	"			DTS	
5/20/98	1538	" "	67.35	"			JDR	
11/9/98	1542	"	65.45	"			BFP	
5/18/99	1119	"	45.40	"			BFP	
5/22/00	1522	"	58.00	"			MAM	

Golder Associates

PZ-106-SD

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-106-55 MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5/1/96	1058	Elec. Probe	89.73	TOPVC			WH	
5/2/96	1322	" "	90.68	"			WH	
5/3/96	1242	" "	91.14	"			WH	
6/13/96	1055	" "	87.69	"			MS	
7/12/96	1327	" "	94.24	"			MS	
8/8/96	1016	" "	93.65	"			MS	
8/21/96	1400	" "	89.74	"			MS	
8/21/96	dev't—purged to 146.72							
9/6/96	1043	" "	92.87	"			MS	
2/4/97	1052	" "	84.60	"			SM	
5/9/97	1037	" "	83.51	"			JDR	
8/11/97	1229	" "	76.64	"			JDR	
11/6/97	0944	" "	73.06	"			JDR	
2/9/98	1302	" "	68.52	"			DB	
5/26/98	1540	" "	64.59	"			JDR	
11/9/98	1544	"	64.12	"			BFP	
5/14/99	1114	"	44.66	"			BFP	
5/22/00	1520	"	56.67	"			MAM	

Golder Associates

PZ-106-55

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-107-SS MEASURING POINT TOPVC

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-24-95	0935	elec probe	27.95	bgs			AK	temporary PVC stick up
6-6-95	0940	" "	27.30	TOPVC			AK	
6-7-95	1017	" "	30.29	TOPVC			AK	BAILED WITHIN 24 HRS OF READING
		~~" "~~	~~30.29 AK~~					
6-16-95	1416	" "	29.96	TOPVC			AK	
6-17-95	1017	" "	31.65	TOPVC			AK	BAILED WITHIN 24 HRS
6/27/95	0909	" "	30.14	TOPVC			AK	
6/29/95	1157	" "	30.07	TOPVC			AK	
7/10/95	848	" "	30.25	TOPVC			AK	
7/26/95	1043	" "	30.30	TOPVC			AK	
8/15/95	737	" "	30.34	TOPVC			AK	
8/26/95	1233	" "	30.66	TOPVC			AK	
9/30/95	934	" "	32.30	TOPVC			AK	
10/28/95	943	" "	32.75	TOPVC			AK	
11/18/95	1036	" "	33.09	TOPVC			AK	
12/15/95	940	" "	33.54	TOPVC			AK	
1/24/96	1605	" "	33.76	TOPVC			WH	
2/6/96	0838	" "	34.42	"			MS	
3/4/96	1508	" "	35.08	"			MS	
4/2/96	1532	" "	35.31	"			MS	
4/30/96	1928	" "	34.59	"			WH	
5/1/96	1103	" "	34.43	"			WH	
5/2/96	1328	" "	34.32	"			WH	
5/3/96	1249	" "	34.32	"			WH	
6/13/96	1048	" "	30.87	"			MS	
7/12/96	1330	" "	31.11	"			MS	
8/8/96	1024	" "	31.76	"			MS	
9/6/96	1046	" "	32.55	"			MS	
2/3/97	1430	" "	33.20	"			SM	
5/9/97	1500	" "	30.96	"			JDR	
8/11/97	1216	" "	32.85	"			JDR	
11/6/97	0940	" "	33.54	"			JDR	settlement, concrete is 6" aboveground
2/9/98	1312	" "	33.42	"			DB	

LOCATION

PROJECT

Golder Associates

PZ-107-SS

Water Level Data

Well:

Well Location PZ-107-55 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/26/98	1533	elecprobe	31.08	TOP PVC			FOR	
11/9/98	1537	"	31.36	"			BFP	
5/14/99	1107	"	30.68	"			BFP	
11/19/99	1445	"	34.33	"			BFP	
5/22/00	1004	"	31.07	"			MAM	

PZ-107-55

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-108-55 MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

bgs - corehole

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
3/25/95	1103	Elec. probe	25.20'	~~Assume at corehole~~	25.22'		WH	~~in corehole not final grade~~
3/28/95	1500	plopper	31.4'	bgs-Corehole	31.4		BT	
4/9/95	1357	elec. probe	99.15'	TOR			JDM	measured from
—	—	—	—	—	—	—	—	TOR-cut off @ 1.5' above ground
—	—	—	—	—	—	—	—	cap not vented
4/21/95	1345	elec. prob	112.60	TOR			MDA	locking cap
5-5-95	1305	" "	96.25	TOPVC			BT	
5-24-95	1514	" "	85.70	TOPVC			AK	
6-7-95	0956	" "	88.23	TOPVC			AK	
6/27/95	0857	" "	87.21	TOPVC			AK	
7/10/95	830	" "	88.62	TOPVC			AK	
7/26/95	1031	" "	87.21	TOPVC			AK	
8/4/95	802	" "	86.65	TOPVC			AK	
8/15/95	724	" "	86.35	TOPVC			AK	
8/26/95	1251	" "	89.18	TOPVC			AK	
9/30/95	921	" "	104.06	TOPVC			AK	DOUBLE CHECKED
10/28/95	934	" "	100.32	TOPVC			AK	
11/8/95	1011	" "	99.42	TOPVC			AK	
12/15/95	1006	" "	108.76	TOPVC			TAL	
1/4/96	1610	" "	109.73	TOPVC			LOH	corehole - inside
2/6/96	0851	" "	104.32	TOPVC			MS	
3/5/96	1553	" "	109.95	TOPVC			~~MS~~ WH	
4/2/96	1558	" "	100.20	TOPVC			MS	
4/30/96	0941	" "	98.61	"			WH	
5/1/96	1111	" "	97.45	"			WH	
5/2/96	1353	" "	96.83	"			WH	
5/3/96	1256	" "	96.23	"			WH	
6/13/96	1324	" "	94.70	"			MS	
7/12/96	1346	" "	98.01	"			MS	
8/8/96	1035	" "	97.32	"			MS	
9/6/96	1056	" "	94.83	"			MS	
2/4/97	1040	" "	87.68	"			SM	
6/9/97	1453	" "	80.02	"			JDR	
8/11/97	1156	" "	81.00	"			JDR	

LOCATION

PROJECT

Golder Associates

PZ-108-55

P2-204-SS
3/25/95 11:12 Elec. water Level probe 27.26 TOPVC WT

Water Level Data

Well: PZ-108-55

Well Location PZ-108-55 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
11/6/97	0926	elecprobe	73.04	TOPPVC			JDR	
2/9/98	1415	"	65.03	"			DJ	
5/26/98	1519	"	66.94	"			PDR	
11/9/98	1510	"	64.71	"			BFP	
5/14/99	1040	"	40.68	"			BFP	
11/19/99	1445	"	52.12	"			BFP	
5/22/00	0952	"	51.72	"			MAM	

PZ-108-55

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-109-SS

MEASURING POINT X

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-5-95	12:50	elec. probe	94.42	TOPVC			BT	
5-24-95	1104	" "	109.77	TOPVC			AK	
6-7-95	0958	" "	93.60	TOPVC			AK	
6/27/95	0852	" "	87.80	TOPVC			AK	
7/10/95	825	" "	85.49	TOPVC			AK	
7/26/95	1639	" "	84.76	TOPVC			AK	
8/4/95	1341	" "	85.63	TOPVC			AK	
~~8/8/95~~	~~1317~~	" "	~~95.27~~	~~TOPVC~~			AK	DOUBLE-CHECKED
						NOT ACCURATE DUE DEVELOPMENT		
						ON THE 8/4/95		
8/15/95	719	Elec. Probe	110.96	TOPVC			AK	
8/26/95	1045	" "	98.05	TOPVC			AK	
9/30/95	914	" "	99.30	TOPVC			AK	
10/28/95	931	" "	103.86	TOPVC			AK	
11/8/95	1008	" "	103.38	TOPVC			AK	
12/15/95	956	" "	106.70	TOPVC			JAC	
1/4/96	1620	" "	108.10	TOPVC			DM	WEEP HOLE-SINK
2/6/96	0855	" "	107.66	"			MS	
3/5/96	1605	" "	107.63	"			WH	
4/2/96	1604	" "	107.72	"			MS	
4/30/96	0954	" "	106.64	"			WH	
5/1/96	1132	" "	106.46	"			WH	
5/2/96	1357	" "	106.29	"			WH	
5/3/96	1258	" "	106.09	"			WH	
6/13/96	1321	" "	100.32	"			MS	
7/12/96	1349	" "	97.93	"			MS	
8/8/96	1039	" "	102.96	"			MS	
9/6/96	1100	" "	102.56	"			MS	
2/4/97	1095	" "	84.68	"			SM	
5/9/97	1450	" "	84.93	"			JDR	
8/11/97	1154	" "	87.61	"			JDR	
11/6/97	0922	" "	92.82	"			JDR	
2/9/98	1252	" "	67.06	"			DTJ	
5/26/98	1575	" "	63.04	"			PDR	

PZ-109-SS

Water Level Data

Well:

Well Location PZ-109-SS Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/14/99	1036		42.41'				BTP	
5/22/00	0950		51.79				MAM	

PZ-109-SS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-110-SS

MEASURING POINT X

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-25-95	0730	Elec Probe	33.15	~~TOPVC~~ DRY			AK	unfinished piezometer
6-7-95	0936	" "	25.43	TOPVC			AK	
6-9-85	0745	" "	73.04	TOPVC			AK	DEVELOPED WITH 24 HRS.
6-12-95	1425	" "	72.29	TOPVC			AK	
6-14-95	0742	" "	91.93	TOPVC			AK	DEVELOPED 2 DAYS AGO
6-16-95	0744	" "	94.07	TOPVC			AK	
6/22/95	0840	" "	45.15	TOPVC			AK	
7/10/95	818	" "	25.61	TOPVC			AK	
7/26/95	1615	" "	25.38	TOPVC			AK	
8/15/95	709	" "	25.30	TOPVC			AK	
8/26/95	1300	" "	25.64	TOPVC			AK	
9/30/95	905	" "	27.34	TOPVC			AK	
10/28/95	922	" "	27.98	TOPVC			AK	
11/18/95	930	" "	28.33	TOPVC			AK	
12/14/95	1007	" "	28.80	TOPVC			TAK	
12/20/95	1312	" "	28.85	TOPVC			WH	
12/24/95	1556	" "	28.74	TOPVC			MS	
12/26/95	1109	" "	28.77	TOPVC			MS	
12/31/95	1759	" "	28.82	"			MS	
1/4/96	1630	" "	29.04	TOPVC			WH	
2/6/96	0906	" "	29.92	"			MS	
3/5/96	1623	" "	30.60	"			WH	
4/2/96	1642	" "	31.41	"			MS	
4/30/96	1006	" "	30.66	"			WH	
5/1/96	1152	" "	30.51	"			WH	
5/2/96	1412	" "	30.40	"			WH	
5/3/96	1313	" "	30.26	"			WH	
6/13/96	1318	" "	26.46	"			MS	
7/12/96	1352	" "	26.82	"			MS	
8/8/96	1042	" "	27.16	"			MS	
9/6/96	1106	" "	27.78	"			MS	
2/4/97	1015	" "	30.04	"			SM	

PZ-110-SS

Water Level Data

Well: PZ-110-55

Well Location PZ-110-55 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/9/97	1447	elec. probe	36.93	TOPVC			JDR	
8/11/97	1152	" "	41.99	"			JDR	
11/6/97	9858	" "	47.52	"			JDR	
2/9/98	1247	" "	44.33	"			DB	
5/26/98	1458	" "	45.21	"			PDR	
11/9/98	1501	"	44.88	"			BFP	
5/14/99	1006	"	30.67	"			BFP	
5/22/00	1006	"	33.74	"			MAM	

PZ-110-55

WELL or DATE

WATER LEVEL DATA

WELL LOCATION PZ-111-SD

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL		BY	COMMENTS
					DEPTH	ELEVATION		
5-5-95	1240	electric probe	30.46	TOPVC			BT	
5-24-95	1459	" "	28.32	TOPVC			AK	
6-7-95	0926	" "	26.61	TOPVC			AK	
6/27/95	0832	" "	27.85	TOPVC			AK	
7/10/95	810	" "	53.49	TOPVC			AK	
8/4/95	858	" "	34.21	TOPVC			AK	
8/15/95	700	" "	39.09	TOPVC			AK	
8/26/95	1208	" "	33.00	TOPVC			AK	
9/30/95	901	" "	29.33	"			AK	
10/28/95	919	" "	29.65	TOPVC			AK	
11/18/95	927	" "	30.08	TOPVC			AK	
12/14/95	1000	" "	30.62	TOPVC			TAC	
12/20/95	1308	" "	30.74	TOPVC			WH	
12/24/95	1558	" "	30.78	TOPVC			MS	
12/26/95	1114	" "	30.80	TOPVC			MS	
12/31/95	1506	" "	30.85	TOPVC			MS	
1/4/96	1642	" "	30.92	TOPVC			WH	weep hole S side
2/6/96	0911	" "	31.49	"			MS	
3/5/96	1616	" "	32.12	"			WH	
4/2/96	1652	" "	32.65	"			MS	
4/30/96	1012	" "	32.73	"			WH	
5/1/96	1154	" "	32.68	"			WH	
5/2/96	1414	" "	32.63	"			WH	
5/3/96	1320	" "	32.55	"			WH	
6/13/96	1309	" "	29.00	"			MS	
7/12/96	1355	" "	28.09	"			MS	
8/8/96	1048	" "	28.36	"			MS	
8/23/96	1255	" "	28.74	"			MS	
8/23/96		dw't —	purged	to 102.35			MS	
8/24/96	0931	" "	101.70				MS	
9/6/96	1109	" "	61.06	"			MS	
2/4/97	1018	" "	30.14	"			SM	

LOCATION

PROJECT

Golder Associates

.163 gal/ft

PZ-111-SD

Water Level Data

Well: PZ-111-SD

Well Location

Measuring Point

Elevation: Measuring Point

Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/9/97	1437	elec. probe	29.82	TOPVC			JDR	
8/11/97	1143	" "	30.28	"			JDR	
11/6/97	0850	" "	31.07	"			JDR	
2/9/98	1243	" "	28.27	"			DTS	
5/26/98	1426	" "	unable to get tape down well, sub pump blocked the well bore.		POOR			
11/9/98	1430	"	29.08				BFP	
5/14/99	0951	"	27.78				BFP	
5/22/00	1100	"	33.24				MAM	

PZ-111-SD

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-111-KS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
~~5-24-95~~	~~0745~~ 1500	Elec. Probe	18.91'	bgs			AK	unfinished piezo.
AK 6-7-95	0931	" "	19.64	TOPVC			AK	
6/27/95	0835	" "	19.29	TOPVC			AK	
7/10/95	813	" "	19.09	TOPVC			AK	
7/26/95	1017	" "	18.90	TOPVC			AK	
8/15/95	704	" "	18.87	TOPVC			AK	
8/26/95	1205	" "	18.80	TOPVC			AK	
9/30/95	858	" "	20.48	TOPVC			AK	
10/28/95	916	" "	21.19	TOPVC			AK	
11/18/95	925	" "	21.73	TOPVC			AK	
12/14/95	1003		22.02	TOPVC			TAC	
12/29/95	1308	" "	22.16	TOPVC			CAK	
12/24/95	1615	" "	22.14	TOPVC			MS	
12/26/95	1113	" "	22.04	TOPVC			MS	
12/31/95	1501	" "	21.82	"			MS	
1/4/96	1442	" "	22.10	TOPVC			WH	water level
2/6/96	0914	" "	20.83	"			MS	
3/5/96	1618	" "	20.95	"			WH	
4/2/96	1655	" "	20.74	"			MS	
4/30/96	1013	" "	20.86	"			WH	
5/1/96	1156	" "	20.86	"			WH	
5/2/96	1416	" "	20.80	"			WH	
5/3/96	1318	" "	20.71	"			WH	
6/13/96	1315	" "	18.32	"			MS	
7/12/96	1357	" "	17.21	"			MS	
8/8/96	1047	" "	17.20	"			MS	
9/6/96	1111	" "	17.09	"			MS	
2/4/97	1018	" "	15.30	"			SM	
5/9/97	1459	" "	14.31	"			JDR	
8/11/97	1145	" "	14.16	"			JDR	
11/6/97	0852	" "	14.45	"			JDR	
2/10/98	1550	" "	13.10	"			DB	

PZ-111-KS

Water Level Data

Well: [ ]

Well Location PZ-111-KS Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
3/26/98	1457	elec probe	10.80	TOP PVC			PDR	
11/9/98	1430	"	10.73	"			BFP	
5/14/99	0954	"	8.34	"			BFP	
11/19/99	1445	"	10.31	"			BFP	
8/22/00	1101	"	10.25	"			MAN	

PZ-111-KS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-112-AS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-25-95	1305	Elec Probe	24.73'	TOPVC			AK	unfinished piezometer
6-7-95	1215	" "	23.71	TOPVC			AK	UNFINISHED PIEZOMETER
7/10/95	805	" "	24.56	TOPVC			AK	
7/26/95	1515	" "	24.71	TOPVC			AK	
8/4/95	1113	" "	24.70	TOPVC			AK	
8/15/95	1045	" "	24.75	TOPVC			AK	
8/26/95	1318	" "	25.16	TOPVC			AK	
9/30/95	850	" "	26.99	TOPVC			AK	
10/28/95	910	" "	27.70	TOPVC			AK	
11/18/95	921	" "	27.99	TOPVC			AK	
12/14/95	843	" "	28.68	TOPVC			JAL	
1/4/96	1246	" "	28.78	TOPVC				No weep hole
1/15/96				weep hole installed S side				
2/1/96	0925	" "	29.37	TOPVC			MS	
3/5/96	1609	" "	30.03	"			WH	
4/3/96	0741	" "	30.30	"			MS	Mud surrounding
4/30/96	1024	" "	29.60	"			WH	
5/1/96	1408	" "	29.42	"			WH	
5/2/96	1432	" "	29.19	"			WH	
5/3/96	1338	" "	29.10	"			WH	
6/13/96	1307	" "	25.20	"			MS	
7/12/96	1421	" "	25.52	"			MS	
8/18/96	1111	" "	26.22	"			MS	
9/6/96	1139	" "	27.10	"			MS	
2/4/97	0950	" "	28.00	"			SM	
5/9/97	1428	" "	25.39	"			DDR	
8/11/97	1137	" "	27.46	"			DDR	
11/6/97	0847	" "	28.54	"			DDR	
2/9/98	1420	" "	28.31	"			DTS	
5/26/98	1421	" "	25.19	"			DDR	
11/9/98	1300	" "	25.98	"			BFP	
5/4/99	0938	" "	25.34	"			BFP	
11/19/99	1445	" "	29.43	"			BFP	
5/22/00	1106	" "	30.75	"			MAM	

LOCATION

PROJECT

WELL or DATE PZ113-AS

WATER LEVEL DATA

WELL LOCATION Near scalehouse PZ-113-AS

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
4-21-95	1120	Elec. Probe	30.66	TOR			MDA	Cap Vented
5-6-95	755	" "	29.68	TOPVC			BT	
5/16/95	1220	" "	28.63	TOPVC			AK	
5-20-95	0806	" "	26.65	TOPVC			AK	
5-24-95	1450	" "	25.71	TOPVC			AK	
5-31-95	0710	" "	25.05	TOPVC			AK	
6-7-95	0914	" "	25.05	TOPVC			AK	
6/27/95	0816	" "	25.78	TOPVC			AK	
7/11/95	1146	" "	25.98	TOPVC			AK	
7/26/95	1211	" "	26.12	TOPVC			AK	
8/3/95	1033	" "	26.28	TOPVC			AK	
8/26/95	1158	" "	26.79	TOPVC			AK	
9/30/95	830	" "	28.59	TOPVC			AK	
10/28/95	905	" "	29.23	TOPVC			AK	
11/19/95	914	" "	29.61	TOPVC			AK	
12/14/95	848	" "	30.24	TOPVC			AK	
12/20/95	1151	" "	30.12	TOPVC			WH	
12/24/95	1357	" "	30.05	TOPVC			MRS	
12/26/95	1005	" "	30.11	TOPVC			MRS	
12/31/95	1330	" "	30.18	TOPVC			MS	
1/4/96	1253	" "	30.35	TOPVC			WH	Water at top of PVC
2/6/96	0938	" "	30.95	"			MS	
3/4/96	1633	" "	31.49	"			MS	
4/3/96	0732	" "	31.94	"			MS	
4/30/96	1029	" "	31.12	"			WH	
5/1/96	1405	" "	30.92	"			WH	
5/2/96	1437	" "	30.71	"			WH	
5/3/96	1342	" "	30.63	"			WH	
6/13/96	1339	" "	28.68	"			MS	
7/12/96	1424	" "	27.03	"			MS	
8/8/96	1113	" "	27.77	"			MS	

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-113-AS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
8/26/96	1215	elec. probe	28.25	TOPVC			MS	
8/26/96	dev't —	purged 10 gal, w.l.			28.32			
9/6/96	1143	" "	28.66	"			MS	
2/3/97	1402	" "	29.60	"			SM	
5/9/97	1410	" "	26.91	"			JDR	
8/11/97	1129	" "	29.06	"			JDR	
11/6/97	0841	" "	30.15	"			JDR	
2/10/98	1416	" "	29.92	"			DD	
5/26/98	1404	" "	26.68	"			JDR	
11/9/98	1243	"	27.57	"			BFP	
5/14/99	0905	"	26.84	"			BFP	
8/22/00	1123	"	32.75	"			MAM	

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-113-AD MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-6-95	800	elec probe	29.64	TOPVC			BT	
5/17/95	0913	elec. probe	28.90	TOPVC			AK	
5-22-95	0820	" "	26.07	TOPVC			AK	
5-24-95	0946	" "	25.70	TOPVC			AK	
6-7-95	0911	" "	26.05	TOPVC			AK	
6/27/95	0812	" "	25.78	TOPVC			AK	
7/11/95	742	" "	25.99	TOPVC			AK	
7/26/95	1207	" "	26.33	TOPVC			AK	
8/15/95	1629	" "	26.28	TOPVC			AK	
8/26/95	1154	" "	27.72	TOPVC			AK	
9/30/95	839	" "	28.57	TOPVC			AK	
10/28/95	902	" "	29.18	TOPVC			AK	
11/18/95	911	" "	29.64	TOPVC			AK	
12/14/95	852	" "	30.28	TOPVC			AK	
12/20/95	1149	" "	30.18	TOPVC			WH	
12/24/95	1355	" "	30.09	TOPVC			MS	
12/26/95	1007	" "	30.19	TOPVC			MS	
12/31/95	1335	" "	30.27	TOPVC			MS	
1/4/96	1254	" "	30.43	TOPVC			WH	weight hole E side
2/6/96	0941	" "	31.02	"			MS	
3/4/96	1634	" "	31.54	"			MS	
4/3/96	0734	" "	31.84	"			MS	
4/30/96	1029	" "	31.17	"			WH	
5/1/96	1403	" "	30.96	"			WH	
5/2/96	1435	" "	30.73	"			WH	
5/3/96	1340	" "	30.65	"			WH	
6/13/96	1341	" "	26.67	"			MS	
7/12/96	1427	" "	27.11	"			MS	
8/8/96	1116	" "	27.76	"			MS	
8/26/96	1045	" "	28.32	"			MS	
8/26/96	pumped 20 gal, w.l.		28.34				MS	

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-113-AD

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
9/6/96	1146	elec. probe	28.72	topvc			MS	
2/3/97	1403	" "	29.66	"			SM	
5/9/97	1412	" "	26.98	"			JDR	
8/11/97	1127	" "	29.13	"			JDR	
11/6/97	0843	" "	30.20	"			JDR	
2/9/98	1240	" "	30.00	"			DB	
5/26/98	1402	" "	27.01	"			JDR	
11/9/98	1245	" "	27.61	"			BFP	
5/14/99	0903	" "	27.87	"			BFP	
5/22/00	1124	" "	32.81	"			MAM	

PZ-113-SS

WELL or DATE

WATER LEVEL DATA

WELL LOCATION PZ-1B-SS

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-24-95	1444	Elec Probe	24.41	bgs			AK	unfinished pipe
6/27/95	0819	" "	26.07	TOPVC			AK	
7/11/95	739	" "	26.23	TOPVC			AK	
7/26/95	1006	" "	26.54	TOPVC			AK	
8/18/95	1026	" "	26.56	TOPVC			AK	
8/26/95	1152	" "	26.98	TOPVC			AK	
9/30/95	844	" "	28.72	TOPVC			AK	
10/28/95	859	" "	29.48	TOPVC			AK	
11/13/95	909	" "	29.93	TOPVC			AK	
12/14/95	857		34.44	TOPVC			JAL	
12/20/95	1147	" "	30.40	TOPVC			WH	
12/24/95	1400	" "	30.31	TOPVC			MS	
12/26/95	10:09	" "	30.35	TOPVC			MS	
12/31/95	1325	" "	30.42	TOPVC			MS	
1/4/96	1256	" "	30.61	TOPVC			WH	weep hole
2/6/96	0944	" "	31.19	"			MS	
3/4/96	1635	" "	31.71	"			MS	
4/3/96	0737	" "	32.12	"			MS	Low or but not Dried
4/30/96	1027	" "	31.40	"			WH	
5/1/96	1402	" "	31.20	"			WH	
5/2/96	1435	" "	31.00	"			WH	
5/3/96	1338	" "	30.88	"			WH	
6/13/96	1343	" "	26.96	"			MS	
7/12/96	1420	" "	29.31	"			MS	
8/8/96	1119	" "	28.05	"			MS	
9/6/96	1149	" "	28.94	"			MS	
2/3/97	1404	" "	29.92	"			SM	
5/9/97	1414	" "	27.22	"			JDR	
8/11/97	1125	" "	29.31	"			JDR	
11/6/97	0846	" "	30.35	"			JDR	
2/10/98	1415	" "	30.17	"			DTS	

PZ-113-SS

Water Level Data

Well:

Well Location PZ 113-55 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/26/98	1410	elec probe	27.01	TOP PVC			[illegible]	
11/9/98	1247	"	27.80	"			BFP	
5/14/99	0980	"	27.11	"			BFP	
5/22/00	11 25	"	33.00	"			MAM	

PZ-113-55

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-114-AS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-5-95	1320	elec. probe	19.38	TOPVC			BT	
5-18-95	1230	" "	15.81	TOPVC			AK	
5-24-95	1405	" "	15.85	TOPVC			AK	
5-25-95	1250	" "	14.90	TOPVC			AK	
5-27-95	1137	" "	14.65	TOPVC			AK	
5-30-95	1218	" "	14.73	TOPVC			AK	
5-31-95	0951	" "	14.76	TOPVC			AK	
6-7-95	0849	" "	14.58	TOPVC			AK	
6/21/95	0857	" "	15.17	TOPVC			AK	
6/27/95	756	" "	15.37	TOPVC			AK	
7/10/95	745	" "	15.72	TOPVC			AK	
7/26/95	1231	" "	15.96	TOPVC			AK	
8/15/95	1015	" "	15.99	TOPVC			AK	
8/26/95	1027	" "	16.41	TOPVC			AK	
9/30/95	822	" "	18.25	TOPVC			AK	
10/28/95	846	" "	19.20	TOPVC			AK	
11/18/95	901	" "	19.38	TOPVC			AK	
12/14/95	910	" "	20.08	TOPVC			TAC	
1/24/96	1206	" "	20.11	TOPVC			WH	water hose by side
2/6/96	1017	" "	20.64	"			MS	
3/4/96	1657	" "	21.22	"			MS	
4/3/96	0839	" "	21.38	"			MS	
4/30/96	1039	" "	19.84	"			WH	
5/1/96	1330	" "	19.90	"			WH	
5/2/96	1457	" "	19.81	"			WH	
5/3/96	1636	" "	19.71	"			WH	
6/13/96	1215	" "	16.13	"			MS	
7/12/96	1441	" "	16.85	"			MS	
8/8/96	1132	" "	17.56	"			MS	
9/6/96	1206	" "	18.52	"			MS	
2/4/97	0828	" "	18.89	"			SM	
5/9/97	1252	" "	16.62	"			JDR	
8/11/97	1059	" "	18.91	"			JDR	
11/6/97	0804	" "	19.98	"			JDR	
2/9/98	1159	" "	19.73	"			JDR	

PZ-114-AS

Water Level Data

Well:

Well Location PZ-114-AS Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/26/98	1344	elec probe	15.88	TOPPVC			[illegible]	
11/9/98	1743	"	17.43	"			BFP	
5/14/99	0843	"	16.02	"			BFP	
5/22/00	0940	"	22.45	"			MAM	

PZ-114-AS

34.44

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-115SS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-24-95	1400	Elec Probe	21.05	bgs			AK	
6-5-95	1241	" "	22.66	TOPVC			AK	
6-7-95	0845	" "	38.61	TOPVC			AK	BAILED DRY WITHIN 24 HRS
6-13-95	1050	" "	25.51	TOPVC			AK	
6/20/95	0917	" "	25.14	TOPVC			AK	
6/27/95	0753	" "	25.55	TOPVC			AK	
7/10/95	751	" "	25.72	TOPVC			AK	
7/26/95	1229	" "	27.47	TOPVC			AK	
8/15/95	1018	" "	26.99	TOPVC			AK	
8/26/95	1023	" "	28.12	TOPVC			AK	
9/30/95	825	" "	35.24	TOPVC			AK	DOUBLE CHECKED
10/28/95	848	" "	39.21	TOPVC			AK	
11/18/95	853	" "	40.59	TOPVC			AK	
12/14/95	910	" "	44.44	TOPVC			TAC	
1/4/96	1308	" "	37.96	TOPVC			WH	WRONG SIDE
2/6/96	1020	" "	39.07	"			MS	
3/4/96	1659	" "	45.96	"			MS	Double Checked
4/3/96	0842	" "	37.99	"			MS	Double checked
4/30/96	1041	" "	28.97	"			WH	
5/1/96	1328	" "	28.34	"			WH	
5/2/96	1452	" "	28.46	"			WH	
5/3/96	1638	" "	28.79	"			WH	
6/13/96	1216	" "	26.50	"			MS	
7/12/96	1443	" "	30.45	"			MS	
8/8/96	1134	" "	32.74	"			MS	
9/6/96	1208	" "	37.79	"			MS	double checked
2/4/97	0829	" "	28.82	"			SM	
5/9/97	1249	" "	29.33	"			JDR	
8/11/97	1100	" "	37.42	"			JDR	
11/6/97	0802	" "	33.07	"			JDR	
2/9/98	1155	" "	30.73	"			DTS	
5/26/98	1341	" "	19.19	"			JDR	dbl chkd
11/9/98	1216	"	28.21				BHP	
5/14/99	0846	"	17.28				REF	

PZ-115-SS

Water Level Data

Well: P2-115-SS

Well Location P2-115-SS Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/22/00	0941	Elec Probe	26.06	PVC			MAM.	

WELL or DATE _____

PZ-116-SS

WATER LEVEL DATA

WELL LOCATION _____ MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
7/10/95	931	ELEC. PROBE	137.45	TOPVC			AK	
8/3/95	1041	" "	140.82	TOPVC			AK	
8/15/95	808	" "	135.06	TOPVC			AK	
8/26/95	1128	" "	128.41	TOPVC			AK	
9/20/95	1005	" "	146.69	TOPVC			AK	
10/28/95	1130	" "	151.29	TOPVC			AK	
11/18/95	1152	" "	153.44	TOPVC			AK	
12/15/95	958	" "	154.80	TOPVC			TOC	
1/24/96	1504	" "	154.19	TOPVC			WH	Water to the Edge
2/6/96	0806	" "	133.25	"			MS	
3/5/96	1501	" "	138.74	"			WH	
4/2/96	1426	" "	146.91	"			MS	Double Checked
4/30/96	0912	" "	135.61	"			WH	
5/1/96	1018	" "	133.91	"			WH	
5/2/96	1250	" "	132.52	"			WH	
5/3/96	1203	" "	131.46	"			WH	
6/13/96	1100	" "	120.60	"			MS	DBL cleared
7/12/96	1320	" "	119.36	"			MS	
8/8/96	DDR	" "	129.32	"			MS	
9/6/96	1034	" "	128.71	"			MS	
2/4/97	1107	" "	109.38	"			SM	
5/9/97	1116	" "	121.00	"			JDR	
8/11/97	1252	" "	101.01	"			JDR	
11/6/97	1080	" "	88.84	"			JDR	
2/9/98	1329	" "	87.63	"			DB	
5/26/98	16060	" "	90.23	"			JDR	
11/9/98	1536	"	87.53	"			BFP	
5/14/99	1147	"	67.30	"			BFP	
11/19/99	1445	"	70.26	"			BFP	
5/22/00	1510	"	88.70	"			MAM	

LOCATION

PROJECT

Golder Associates

PZ-116-SS

WATER LEVEL DATA

WELL LOCATION PZ-200-SS MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
1/4/96	1333	elec probe	72.90	TOPVC			WH	Borehole - Waide
2/16/96	1104	" "	73.21	"			AS	
3/4/96	11:21	" "	73.49	"			MS	
4/3/96	0924	" "	73.60	"			MS	
4/30/96	1104	" "	73.65	"			WH	
5/1/96	1257	" "	73.63	"			WK	
5/2/96	1505	" "	73.65				WH	
5/3/96	1426	" "	73.58	"			WH	
6/13/96	1252	" "	73.27	"			MS	
7/12/96	1533	" "	73.35	"			MS	
8/8/96	1156	" "	73.69	"			MS	
9/6/96	1244	" "	73.55	"			MS	
2/4/97	0859	" "	72.90	"			SM	
5/9/97	1225	" "	72.36	"			JDR	
8/11/97	1031	" "	73.68	"			JDR	
11/6/97	0742	" "	73.05	"			JDR	
2/10/98	1450	" "	not able to measure due to a L.F. gas sampling cap					
								DTS
6/26/98	1316	" " not	able to remove cap, stuck on well				JDR	
11/9/98	1156	"	6503				BR	
5/14/99	1412		56.46				BR	
11/19/99	1445		58.04				BR	
5/22/00	0925	"	54.29	"			MAM	

Golder Associates

PZ-200-SS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-201A-SS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
4-24-95	07:34	elec. probe	27.16	TOR			JDM	hasn't been cut off
–	–	–	–	–	–	–	–	yet - 3' stickup
4-24-95	1600	elec. probe	26.36	TO Riser			MDA	Now Cut ~1.8ft marked
5-5-95	1635	" "	28.10	TOR			MDA	
5-23-95	1311	" "	69.09	TOPVC			AK	
6-7-95	0740	" "	66.71	TOPVC			AK	
6/27/95	0735	" "	65.46	TOPVC			AK	
7/10/95	1435	" "	65.46	TOPVC			AK	
7/26/95	1319	" "	65.86	TOPVC			AK	
8/26/95	938	" "	66.11	TOPVC			AK	
9/30/95	1126	" "	67.22	TOPVC			AK	
10/28/95	1337	" "	67.31	TOPVC			AK	
11/18/95	1302	" "	67.59	TOPVC			AK	
12/13/95	1601	" "	68.04	TOPVC			TAL	
1/4/96	1405	" "	68.03	TOPVC			WH	No weephole
1/15/96			Weep hole drilled. S-Side					
2/6/96	1117	" "	68.24	TOPVC			MS	
3/4/96	1610	" "	68.24	TOPVC			MS	
4/3/96	0931	" "	68.10	TOPVC			MS	
4/30/96	1112	" "	68.16	TOPVC			WH	
5/1/96	1302	" "	68.14	"			WH	
5/2/96	1509	" "	68.14	"			WH	
5/3/96	1430	" "	68.13	"			WH	
6/13/96	1245	" "	67.50	"			MS	
7/12/96	1524	" "	67.08	"			MS	
8/8/96	1150	" "	66.99	"			MS	
8/22/96	1200	" "	66.73	"			MS	
8/22/96	–	DW4 - purged to 90.34					MS	
8/26/96	1024	" "	77.15	"			MS	
9/6/96	1236	" "	67.51				MS	
2/4/97	0915	" "	66.54	"			SM	
5/9/97	1206	" "	65.79	"			JDR	
8/11/97	1004	" "	66.66	"			JDR	
11/6/97	0723	" "	66.21	"			JDR	
2/9/98	1205	" "	62.33	"			DVS	

Water Level Data

Well: PZ-201A-55

Well Location PZ-201A-55 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/26/98	1301	elec probe	63.27	TOP PVC			FDR	
11/9/98	1134	"	62.45	"			BFP	
5/14/99	1348	"	47.65	"			BFP	
5/22/00	0955	"	50.07	"			MAM	

PZ-201A-55

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-201-55 MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5/3/96	1428	Elec. Probe	28.64	TOPVC			WH	
6/13/96	1243	" "	27.99	"			MS	
7/2/96	1520	" "	27.06	"			MS	
8/8/96	1152	" "	27.29	"			MS	
9/6/96	1233	" "	27.19	"			MS	
2/4/97	0910	" "	24.44	"			MS	
5/9/97	1209	" "	25.45	"			JDR	
8/11/97	1001	" "	25.66	"			JDR	
11/6/97	0926	" "	26.22	"			JDR	
2/10/98	1440	" "	25.91	"			DJS	
5/26/98	1259	" "	23.62	"			JDR	
11/9/98	1132	"	23.42	"			BFP	
5/14/99	1356	"	22.72				BFP	
5/22/00	0855	"	22.93	"			MAM	

LOCATION _____

PROJECT _____

Golder Associates

PZ-201-55

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-202-55 MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
7/12/96	1257	Elec. Probe	33.70	TOPVC			MS	
8/8/96	0942	" "	33.21	"			MS	
9/6/96	1006	" "	33.81	"			MS	
2/4/97	1128	" "	32.56	"			SM	
5/9/97	1610	" "	30.04	"			JDR	
8/11/97	1331	" "	31.55	"			JDR	
11/6/97	1033	" "	31.54	"			JDR	
2/9/98	1359	" "	29.33	"			DB	
5/26/98	1249	" "	25.69	"			JDR	
11/9/98	1620	"	26.48	"			BFP	
5/14/99	1250	"	28.07	"			BFP	
11/19/99	1445	"	27.31	"			BFP	
5/22/00	1430	"	25.21	"			MAN	

LOCATION _____

PROJECT _____

Golder Associates

PZ-202-55

WATER LEVEL DATA we dedicated w.l. meter

WELL LOCATION PZ-203-SS MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
6-7-95	1110	ELEL. PROBE	109.66	bgs			AK	UNFINISHED PIEZOMETER
6/26/95	806	" "	111.28	TOPVC			AK	
6/27/95	1000	" "	111.26	TOPVC			AK	
7/10/95	950	" "	111.02	TOPVC			AK	
7/26/95	1139	" "	NO WATER	TOPVC			AK	
8/[illegible]95	908	" "	NO READING	TOPVC			AK	NO WATER
8/26/95	1118	" "	NO READING	TOPVC			AK	NO WATER
9/30/95	1020	" "	NO READING	TOPVC			AK	NO WATER
10/28/95	1146	"	NO READING	"			AK	NO WATER
11/18/95	1210	" "	NO READING	TOPVC			AK	NO WATER
12/13/95	1430	" "	NO READING	TOPVC			TAL	"
1/4/96	1450	" "	No reading	TOPVC			WH	No water
1/15/96			weeper hole installed @ sump					
2/6/96	0814	" "	No Rdg				MS	No water
3/5/96	1512	" "	Dry	"			WH	
4/3/96	1421	" "	Dry	"			MS	
4/30/96	0902	" "	106.83	"			WH	
5/1/96	1012	" "	107.26	"			WH	
5/2/96	1243	" "	108.29	"			WH	
5/3/96	1156	" "	109.03	"			WH	
6/13/96	1108	" "	107.55	"			MS	
7/12/96	811	" "	111.07	"			MS	
8/8/96	1001	" "	111.04	"			MS	
9/6/96	1025	" "	111.10	"			MS	
2/4/97	1110	" "	100.70	"			SM	
5/9/97	1106	" "	104.78	"			JDR	
8/11/97	1301	" "	91.45	"			JDR	
11/6/97	1052	" "	86.24	"			JDR	
2/10/98	1508	" "	81.70	"			DTS	
5/26/98	1600	" "	78.73	"			JDR	
11/9/98	1601	"	78.22	"			BFP	
5/14/99	1243	"	66.37	"			BFP	
11/19/99	1445	"	66.35	"			BFP	
5/22/00	1435	"	72.48	"			MAM	

PZ-203-SS

WELL or DATE

PZ-204A-SS

WATER LEVEL DATA

WELL LOCATION

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
7/6/95	1054	ELEC PROBE	62.09	TOPVC			AK	
7/10/95	928	" "	68.60	TOPVC			AK	
7/14/95	953	" "	62.39	TOPVC			AK	
7/26/95	1103	" "	62.51	TOPVC			AK	
8/15/95	800	" "	62.31	TOPVC			AK	
8/26/95	1138	" "	62.63	TOPVC			AK	
9/30/95	959	" "	64.11	TOPVC			AK	
10/28/95	1030	" "	64.34	TOPVC			AK	
11/18/95	1110	" "	64.61	TOPVC			AK	
12/13/95	1033	" "	64.71	To PVC			TAL	
1/4/96	1503	" "	64.38	TOPVC			WH	[illegible]
2/6/96	0802	" "	62.78	"			MS	
3/5/96	1444	" "	63.01	"			WH	
4/2/96	1435	" "	62.70	"			MS	
4/30/96	1212	" "	61.73	"			WH	
5/1/96	1030	" "	61.49	"			WH	
5/2/96	1305	" "	61.45	"			WH	
5/3/96	1220	" "	61.47	"			WH	
6/13/96	0954	" "	62.09	"			MS	
7/12/96	0920	" "	62.63	"			MS	
8/8/96	0701	" "	63.62	"			MS	
8/22/96	1335	" "	64.09	"			MS	
8/22/96		don't -	purged to	84.16			MS	
9/6/96	0659	" "	64.75	"			MS	
2/3/97	1450	" "	64.58	"			SM	
5/9/97	1043	" "	63.51	"			JDR	
8/4/97	1234	" "	82.99	"			JDR	
11/6/97	1009	" "	63.36	"			JDR	
2/9/98	1321	" "	59.11	"			DTS	
5/28/98	1620	" "	56.01	"			JDR	
11/9/98	1548	"	56.60	"			BP	
5/14/99	1134	"	4303				BP	
11/19/99	1445	"	46.74				BP	
5/22/00	1530	"	54.30	"			MAM	

LOCATION

PROJECT

Golder Associates

PZ-204A-SS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-204-SS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
3/25/95	11:12	Elec. Probe	27.26	TOPVC			WH	
3/9/95	15:15	Elec. Probe	27.46	TOR			JBM	cap not vented
5/6/95	8:35	" "	27.62'	TOPVC			BT	
5/15/95	12:00	" "	27.78	TOPVC			WH	
5-24-95			26.74	TOPVC			AK	
5-31-95	12:00	" "	27.09	TOPVC			AK	
6-7-95	1044	" "	27.11	TOPVC			AK	
6-13-95	0734	" "	27.47	TOPVC			AK	
6/23/95	0753	" "	27.35	TOPVC			AK	
6/27/95	0926	" "	27.43	TOPVC			AK	
7/10/95	923	" "	27.93	TOPVC			AK	
7/26/95	1058	" "	28.76	TOPVC			AK	
8/14/95	756	" "	30.25	TOPVC			AK	
8/26/95	1136	" "	31.15	TOPVC			AK	
9/30/95	957	" "	37.81	TOPVC			AK	
10/28/95	1627	" "	39.99	TOPVC			AK	
11/18/95	1107	" "	39.06	TOPVC			AK	
12/13/95	1028	" "	39.92	TOPVC			TAL	
1/4/96	1535	" "	32.05	TOPVC			JBM	cap not vented
2/6/96	0800	" "	28.80	"			MS	
3/5/96	1442	" "	29.89	"			WH	
4/2/96	1433	" "	29.61	"			MS	
4/30/96	1211	" "	28.45	"			WH	
5/1/96	1028	" "	28.50	"			WH	
5/2/96	1307	" "	28.44	"			WH	
5/3/96	1222	" "	28.44	"			WH	
6/3/96	0952	" "	28.18	"			MS	
7/12/96	0928	" "	29.40	"			MS	
8/8/96	0700	" "	35.35	"			MS	
9/6/96	0657	" "	41.33	"			MS	double checks
2/3/97	1455	" "	42.54	"			SM	
5/9/97	1046	" "	36.40	"			JDR	
8/11/97	1232	" "	57.24	"			JDR	
11/6/97	0905	" "	42.85	"			JDR	14' of heavy iron staining
2/10/98	1514	" "	35.11	"			DTS	on tape "

PZ-204-SS

Water Level Data

Well: PZ-204-55

Well Location

Measuring Point

Elevation: Measuring Point

Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
2/10/98	1514	Elec. probe	35.11	TOP PVC			DTB	iron staining on tape
5/26-28/98	~	unable to remove well cap from well, cap is stuck, C-900 probe fitting attached by LF personell						
11/9/98	1550		29.00				BFP	
5/14/99	1138		21.22				BFP	
11/19/99	1445		27.03				BFP	
5/22/00	1531	"	21.94	"			MAM	

PZ-205-AS

WELL or DATE

WATER LEVEL DATA

WELL LOCATION

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
6-6-95	1204	ELEC PROBE	27.33	TOPVC			AK	
6-7-95	1007	" "	26.25	TOPVC			AK	
6/27/95	0904	" "	26.58	TOPVC			AK	
7/5/95	1018	" "	26.59	TOPVC			AK	
7/10/95	842	" "	26.59	TOPVC			AK	
7/26/95	1038	" "	26.66	TOPVC			AK	
8/8/95	1000	" "	26.34	TOPVC			AK	
8/15/95	732	" "	26.64	TOPVC			AK	
8/26/95	1237	" "	26.93	TOPVC			AK	
9/30/95	929	" "	28.47	TOPVC			AK	
10/28/95	940	" "	29.09	TOPVC			AK	
11/18/95	1018	" "	29.33	TOPVC			AK	
12/15/95	837	" "	29.80	TOPVC			TAC	
1/4/96	1559	" "	30.01	TOPVC			[illegible]	[illegible]
2/6/96	0843	" "	30.45	"			MS	
3/5/96	1548	" "	29.95	"			WH	
4/2/96	1536	" "	31.14	"			MS	
4/30/96	0936	" "	30.65	"			WH	
5/1/96	1108	" "	30.54	"			WH	
5/2/96	1334	" "	30.39	"			WH	
5/3/96	1254	" "	30.31	"			WH	
6/13/96	1045	" "	27.20	"			MS	
7/12/96	1333	" "	27.28	"			MS	
8/8/96	1127	" "	27.89	"			MS	
9/6/96	1048	" "	28.56	"			MS	
2/3/97	1436	" "	29.18	"			[illegible]	
5/9/97	1504	" "	27.16	"			JDR	
8/11/97	1214	" "	28.87	"			JDR	
11/6/97	0936	" "	26.63	"			JDR	
2/9/98	1309	" "	29.40	"			DTS	
5/26/98	1523	" "	27.11	"			JDR	
11/9/98	1530	"	27.56				BFP	
5/14/99	1056	"	26.97				BFP	
5/22/00	1001	"	31.94	"			MAH	

Golder Associates

PZ-205-AS

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION P2-205-SS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-23-95	1120	Elec probe	34.42'	bgs			AK	unfinished piezometer
6-6-95	0740	" "	34.06	bgs			AK	
6-7-95	0955	" "	72.58	bgs			AK	BAILED WITHIN 24 HRS OF READ
6-9-95	1030	" "	26.59	TOPVC			AK	
6-16-95	1216	" "	36.81	TOPVC			AK	
6/27/95	0901	" "	37.32	TOPVC			AK	
7/10/95	838	" "	37.56	TOPVC			AK	
7/26/95	1036	" "	37.74	TOPVC			AK	
8/15/95	729	" "	37.65	TOPVC			AK	
8/26/95	1239	" "	38.33	TOPVC			AK	
9/30/95	926	" "	40.03	TOPVC			AK	
10/28/95	938	" "	40.09	TOPVC			AK	
11/18/95	1015	" "	40.50	TOPVC			AK	
12/15/95	839	" "	41.28	TOPVC			TAL	
1/4/96	1557	" "	41.50	TOPVC			WH	WATER PIPE FROZE
2/6/96	0846	" "	41.85	"			MS	
3/5/96	1545	" "	42.68	"			WH	
4/2/96	1538	" "	42.67	"			MS	
4/30/96	0934	" "	42.11	"			WH	
5/1/96	1107	" "	41.93	"			~~MS~~ WH	
5/2/96	1333	" "	41.80	"			WH	
5/3/96	1252	" "	41.65	"			WH	
6/13/96	1043	" "	38.53	"			MS	
7/12/96	1333	" "	38.81	"			MS	
8/8/96	1029	" "	39.22	"			MS	
9/6/96	1050	" "	38.72	"			MS	
2/3/97	1435	" "	40.38	"			SM	
5/9/97	1506	" "	38.25	"			JDR	
8/11/97	1212	" "	39.69	"			JDR	
11/6/97	0934	" "	39.80	"			JDR	settlement around is Approx 6" under concrete
2/9/98	1308	" "	38.88	"			DTS	
5/26/98	1526	" "	36.59	"			PDR	" " " "
11/9/98	1532	"	36.34				BFP	
5/14/99	1056	"	31.99				BFP	

Golder Associates

P2-205-SS

Water Level Data

Well: P2-205-55

Well Location P2-205-55 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/22/00	1006	Elec. probe	32.33	PVC			MAM	

WELL or DATE

WATER LEVEL DATA

WELL LOCATION PZ-206-SS

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
3-11-95	1040	plopper	26.6	Corehole - bgs ~~B.G.S~~	26.6		AMH	
3-25-95								
4-9-95	1736	electric probe	29.20		~~29.20~~		DDM	from top of 6" casing
4-21-95		ELEC PROBE	29.41	TOP OF CASING				~ 1.5' above grnd
5-5-95	1255	" "	44.62	TOPVC			BT	
5/16/95	815	" "	42.73	TOPVC			AK	
5-24-95	1053	" "	40.71	TOPVC			AK	
5-31-95	1415	" "	40.11	TOPVC			AK	
6-7-95	0941	" "	39.75	TOPVC			AK	
6/27/95	0845	" "	40.16	TOPVC			AK	
7/10/95	703	" "	40.63	TOPVC			AK	
7/26/95	1022	" "	41.16	TOPVC			AK	
8/15/95	714	" "	41.32	TOPVC			AK	
8/26/95	1255	" "	41.98	TOPVC			AK	
9/30/95	910	" "	44.71	TOPVC			AK	
10/28/95	925	" "	44.86	TOPVC			AK	
11/18/95	933	" "	45.01	TOPVC			AK	
12/14/95	1015	" "	[illegible]	TOPVC			TAL	Probe is wet - Bad no reading
1/4/96	1627	" "	46.57	TOPVC			[illegible]	Borehole - Sside
2/6/96	0859	" "	46.34	"			MS	
3/5/96	1639	" "	46.67	"			WH	
4/2/96	1607	" "	46.40	"			MS	
4/30/96	0957	" "	45.75	"			WH	
5/1/96	1135	" "	45.60	"			WH	
5/2/96	1400	" "	45.49	"			WH	
5/3/96	1302	" "	45.39	"			WH	
6/13/96	1327	" "	40.89	"			MS	
7/12/96	1401	" "	41.31	"			MS	
8/8/96	1050	" "	41.71	"			MS	
9/6/96	1103	" "	41.92	"			MS	
2/4/97	1031	" "	42.56	"			SM	
5/9/97	1456	" "	40.22	"			JDR	
8/11/97	1159	" "	41.88	"			JDR	
11/6/97	0920	" "	41.15	"			JDR	

LOCATION

PROJECT

Golder Associates

PZ-206-SS

Water Level Data

Well: PZ-206-55

Well Location PZ-206-55 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
2/10/98	1542	elec. probe	40.38	top PVC			DTB	
5/26/98	1513	"	38.36	"			PDR	
11/9/98	1524		37.74	"			BFP	
5/14/99	1029	"	31.72	"			BFP	
11/19/99	1445	"	36.93	"			BFP	
5/22/06	1050	"	35.20	"			MAM	

PZ-206-55

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-207-AS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
5-5-95	1315	ELEC PROBE	31.79'	TOPVC			BT	
5-24-95	1436	" "	27.29'	TOPVC			AK	
6-7-95	0902	" "	AK 626.69	TOPVC			AK	
6/27/95	0802	" "	27.63	TOPVC			AK	
7/6/95	723	" "	27.82	TOPVC			AK	
7/10/95	758	" "	27.89	TOPVC			AK	
7/11/95	859	" "	27.82	TOPVC			AK	
7/26/95	1216	" "	28.16	TOPVC			AK	
8/15/95	1032	" "	28.15	TOPVC			AK	
8/26/95	1148	" "	28.66	TOPVC			AK	
9/36/95	831	" "	30.55	TOPVC			AK	
10/28/95	854	" "	31.28	TOPVC			AK	
11/18/95	941	" "	31.70	TOPVC			AK	
12/14/95	948	" "	32.38	TOPVC			TAL	
1/24/96	1301	" "	32.47	TOPVC			AK	weight to S. side
2/6/96	0934	" "	33.05	"			MS	
3/4/96	1626	" "	33.60	"			MS	
4/3/96	0725	" "	33.91	"			MS	
4/30/96	1034	" "	32.93	"			WH	
5/1/96	1337	" "	32.74	"			WH	
5/2/96	1440	" "	32.52	"			WH	
5/3/96	1343	" "	32.45	"			WH	
6/13/96	0837	" "	28.58	"			MS	
7/12/96	1104	" "	29.05	"			MS	
8/8/96	0838	" "	29.73	"			MS	
9/6/96	0933	" "	30.74	"			MS	
2/4/97	0910	" "	31.60	"			SM	
5/9/97	1310	" "	28.85	"			JDR	
8/11/97	1121	" "	31.13	"			JDR	
11/6/97	0831	" "	32.28	"			JDR	
2/9/98	1235	" "	32.02	"			DTS	
5/26/98	1400	" "	28.46	"			DR	
11/9/98	1236	"	29.61				DFP	
5/14/99	0854	"	28.66				DFP	

Golder Associates

PZ-207-AS

Water Level Data

Well: PZ-207-45

Well Location PZ-207-45 Measuring Point

Elevation: Measuring Point Ground Level

Well or Date	Time	Measuring Device	Reading	Corrections or Conversions	Water Level		By	Comments
					Depth	Elevation		
5/22/00	1145	Elec. probe	34.86	To PVC			MTM	

WELL or DATE

PZ-208-SS

WATER LEVEL DATA

WELL LOCATION

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
7/11/95	731	Elec Probe	37.48	TOPVC			AK	
8/4/95	1005	" "	37.65	TOPVC			AK	
8/26/95	1621	" "	38.65	TOPVC			AK	
9/30/95	1057	" "	42.62	TOPVC			AK	
10/28/95	1408	" "	44.39	TOPVC			AK	
11/8/95	1327	" "	45.42	TOPVC			AK	
12/15/95	1027	" "	47.28	TOPVC			JAC	
1/4/96	1315	" "	45.65	TOPVC			WH	Weed hole - SS
2/6/96	1027	" "	45.32	"			MS	
3/4/96	1704	" "	47.84	"			MS	
4/3/96	0850	" "	45.38	"			MS	
4/30/96	1050	" "	41.65	"			WH	
5/1/96	1322	" "	41.58	"			WH	
5/2/96	1532	" "	41.71	"			WH	
5/3/96	1415	" "	41.71	"			WH	
6/13/96	1017	" "	39.43	"			MS	
7/12/96	1237	" "	39.52	"			MS	
8/8/96	1215	" "	39.70	"			MS	
8/22/96	0715	" "	42.03	"			MS	
8/22/96	didn't - purged to		95.39				MS	
9/6/96	0927	" "	44.08	"			MS	
2/4/97	1108	" "	41.10	"			SM	
5/9/97	1245	" "	38.82	"			JDR	
8/11/97	1053	" "	43.49	"			JDR	
11/6/97	0959	" "	42.56	"			JDR	
5/26/98	1336	" "	32.80	"			JDR	
11/9/98	1211	" "	35.51	"			BP	
11/19/99	1445	" "	32.77	"			BP	
5/22/00	0935	" "	31.24	"			MAM	

Golder Associates

PZ-208-SS

WELL or DATE _____

WATER LEVEL DATA Pz-301-SS

WELL LOCATION Pz-301-SS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10/22/95	1443	elec. probe	157.56'	TOPVC			BT	prior to slug out test
10/28/95	1036	" "	156.62	"			AK	
11/18/95	1115	" "	157.52	"			AK	
12/13/95	1043	" "	130.52	"			TAL	
12/20/95	1222	" "	126.65	TOPVC			LWH	
12/24/95	1446	" "	125.46	TOPVC			MS	
12/31/95	1420	" "	120.90	"			MS	
1/4/96	1515	" "	119.06	TOPVC			WH	
2/5/96	1320	" "	107.85	"			MS	
3/4/96	1212	" "	99.58	"			MS	
4/2/96	1449	" "	94.54	"			MS	
4/30/96	1205	" "	91.10	"			WH	
5/1/96	1037	" "	90.99	"			WH	
5/2/96	1258	" "	90.85	"			WH	
5/3/96	1212	" "	90.77	"			WH	
6/13/96	10017	" "	87.36	"			MS	
7/12/96	0936	" "	85.95	"			MS	
8/8/96	0708	" "	85.27	"			MS	
8/20/96	1230	" "	85.06	"			MS	purged 105.2
8/21/96		development - purged		to ~161.5			MS	
9/6/96	0706	" "	150.39	"			MS	
2/3/97	1500	" "	92.38	"			SM	
5/9/97	1124	" "	119.48	"			JDR	

LOCATION _____

PROJECT _____

Golder Associates

12-301-SS

WELL or DATE _____

WATER LEVEL DATA PZ-302-AS

WELL LOCATION PZ-302-AS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING (Ft)	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10-25-95	1035	ELECTROBE	18.97	TOPVC			MKS	Prior to slug testing
10/28/95	1100	Elec. Probe	19.09	TOPVC			AK	
11/18/95	1132	" "	19.34	TOPV			AK	
12/13/95	1125	" "	19.56	TO PVC			TAC	
1/4/96	1117	" "	20.08	TOPVC			WK	Weight in Well
2/6/96	0750	" "	20.62	"			MS	
3/5/96	1431	" "	21.15	"			WH	
4/3/96	0819	" "	21.39	"			MS	
4/30/96	1538	" "	20.50	"			WH	
5/3/96	1535	" "	20.16	"			WH	
6/13/96	1138	" "	16.79	"			MS	
7/12/96	0945	" "	17.30	"			MS	
8/8/96	0714	" "	17.87	"			MS	
9/6/96	0712	" "	18.65	"			MS	
2/3/97	1631	" "	19.20	"			SM	
5/9/97	1011	" "	17.10	"			JDR	
5/22/00	1652	"	22.65	"			MM	

LOCATION

PROJECT

Golder Associates

PZ-302-AS

WELL or DATE _____

WATER LEVEL DATA PZ-302-AI

WELL LOCATION PZ-302-AI

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10/25/95	1035	ELEC. PROBE	18.90	TOPVC			MJS	Prior to slug testing
10/28/95	1102	Elec Probe	18.99	TOPVC			AV	
11/8/95	1135	" "	19.15	TOPVC			"	
12/13/95	1128	" "	19.42	To PVC			TAL	
[illegible]	1219	" "	19.58	TOPVC			[illegible]	[illegible]
2/6/96	0748	" "	20.49	"			MS	
3/5/96	1429	" "	21.07	"			WH	
4/3/96	0830	" "	24.40	"			MS	
4/30/96	1540	" "	20.38	"			WH	
5/3/96	1533	" "	20.05	"			WH	
6/13/96	1140	" "	16.79	"			MS	
7/12/96	0948	" "	17.10	"			MS	
8/8/96	0716	" "	17.74	"			MS	
9/16/96	0714	" "	18.49	"			MS	
2/3/97	1630	" "	19.13	"			SM	
5/9/97	1013	" "	16.90	"			JDR	
5/22/00	1655	"	22.22	"			MAM	

LOCATION

PROJECT

Golder Associates

PZ-302-A1

use dedicate w.l. meter

WELL or DATE

WATER LEVEL DATA PZ-303-AS

WELL LOCATION PZ-303-AS

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10/28/95	1108	ELEC. PROBE	21.99'	TOPVC			AK	
11/18/95	1138	" "	21.17'	TOPVC			AK	
12/13/95	1145	" "	21.44'	To PVC			TAC	
1/4/96	[illegible]	" "	21.90	TOPVC			WH	No W [illegible]
1/15/96		[illegible]	hole	installed		N-side		
2/6/96	0739	" "	22.54	TOPVC			MS	
3/5/96	1414	" "	23.15	"			WH	
4/3/96	0824	" "	23.41	"			MS	
4/30/96	1530	" "	22.59	"			WH	
5/3/96	1526	" "	22.19	"			WH	
6/13/96	1152	" "	18.81	"			MS	
7/12/96	0953	" "	18.95	"			MS	
8/8/96	0726	" "	19.62	"			MS	
8/27/96	0650	" "	20.18	"			MS	
8/27/96	purged	12 gal,	w.l.	20.23			MS	
9/6/96	0724	" "	20.42	"			MS	
2/3/97	1622	" "	21.20	"			SM	
5/9/97	1000	" "	19.00	"			JDR	
8/22/00	1620	"	24.26	"			MAM	

LOCATION

PROJECT

Golder Associates

PZ-303-AS

WELL or DATE _____

WATER LEVEL DATA PZ-304-AS

WELL LOCATION PZ-304-AS

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10/28/95	1117	ELEC. PROBE	21.52'	TOPVC			AK	
11/8/95	1456	" "	21.56	TOPVC			AK	
11/18/95	1144	" "	21.80	TOPVC			AK	
12/13/95	1156	" "	22.08	TOPVC			JAC	
1/4/96	1226	" "	22.58	TOPVC			WH	water in bottle
2/6/96	0734	" "	23.19	"			MS	
3/5/96	1407	" "	23.78	"			WH	
4/3/96	0828	" "	24.12	"			MS	
4/30/96	1528	" "	23.04	"			WH	
5/3/96	1524	" "	22.64	"			WH	
6/13/96	1154	" "	19.27	"			MS	
7/12/96	0956	" "	19.57	"			MS	
8/8/96	0731	" "	20.21	"			MS	
8/26/96	1530	" "	20.59	"			MS	
8/26/96 - dev'd + purged			12 gal	+ W.L. 20.58			MS	
9/6/96	0731	" "	21.04	"			MS	
2/3/97	1614	" "	21.82	"			SM	
5/9/97	0957	" "	19.45	"			JDR	
5/23/00	1630	"	24.84	"			MAM	

LOCATION _____

PROJECT _____

Golder Associates

PZ-304-AS

WELL or DATE _____

WATER LEVEL DATA PZ-304-AI

WELL LOCATION PZ-304-AI

MEASURING POINT _____

ELEVATION: MEASURING POINT _____

GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10/28/95	1114	ELEC. PROBE	21.83'	TOPVC			AK	
11/8/95	1556	" "	21.56	TOPVC			AK	
11/18/95	1142	" "	22.04	TOPVC			AK	
12/13/95	1452	" "	22.36	TOPVC			JAC	
1/4/96	1728	" "	22.86	TOPVC			[illegible]	[illegible]
2/6/96	0736	" "	23.45	"			MS	
3/5/96	1409	" "	24.06	"			WH	
4/3/96	0830	" "	24.40	"			MS	
4/30/96	1526	" "	23.29	"			WH	
5/3/96	1523	" "	22.89	"			WH	
6/13/96	1156	" "	19.54	"			MS	
7/12/96	0958	" "	19.82	"			MS	
8/8/96	0729	" "	20.48	"			MS	
8/26/96	1315	" "	20.88	"			MS	
8/26/96	dwl + pumped		12 gal	w.l. 20.90			MS	
9/6/96	0734	" "	21.29	"			MS	
2/3/97	1610	" "	22.10	"			SM	
5/9/97	0955	" "	19.72	"			JDR	
8/22/00	1628	"	25.10	"			MAM	

Golder Associates

PZ-304-AI

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION PZ-305-AI

MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10/28/95	1300	Elec. Probe	29.18'	TOPVC			AK	
11/18/95	940	" "	27.48	TOPVC			AK	
12/15/95	1329	" "	27.99	TOPVC			AK	
1/4/96	1631	" "	28.25 TOPVC				WH	No weight
1/15/96		weep hole installed N. side						
2/2/96	0859	Elec. Probe	28.72	TOPVC			MS	
3/5/96	1637	" "	29.35	"			WH	
4/3/96	1612	" "	29.49	"			MS	
4/30/96	1003	" "	29.06	"			WH	
5/1/96	1139	" "	28.94	"			WH	
5/2/96	1403	" "	28.71	"			WH	
5/3/96	1306	" "	28.63	"			WH	
6/13/96	1330	" "	24.92	"			MS	
7/12/96	1403	" "	25.11	"			MS	
8/8/96	1053	" "	25.81	"			MS	
9/6/96	1107	" "	26.60	"			MS	
2/4/97	1029	" "	27.40	"			SM	
5/9/97	1514	" "	25.04	"			JDR	
8/11/97	1203	" "	26.88	"			JDR	
11/6/97	0917	" "	27.88	"			JDR	
2/10/98	1546	" "	27.69	"			DTB	
5/26/98	1511	" "	25.05	"			JDR	
5/14/99	1013	" "	25.03	"			BFP	
11/19/99	1445	" "	28.88	"			BFP	
5/22/00	1015	" "	30.49	"			MAM	

PZ-305-AI

use dedicated w.l. indicator WELL or DATE LR-100

WATER LEVEL DATA

WELL LOCATION LR-100 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10-18-95	1055	elec probe	18.04'	TOPVC			BT	
10/20/95	1443	" "	18.44	TOPVC			AJC	
11/13/95	1002	" "	18.70	TOPVC			AJC	
12/15/95	1255	" "	19.22	TOPVC			TA	
1/4/96	1657	" "	19.35	TOPVC			WH	WT-4.9°C 12/5
2/5/96	1621	" "	18.98	"			MS	
3/4/96	1459	" "	18.52	"			MS	
4/3/96	0809	" "	18.51	"			MS	
4/30/96	1406	" "	17.87	"			WH	
5/3/96	1536	" "	17.48	"			WH	
6/13/96	0930	" "	17.10	"			MS	
7/12/96	1155	" "	17.37	"			MS	
8/8/96	0931	" "	18.28	"			MS	
9/6/96	0957	" "	18.74	"			MS	
2/4/97	1145	" "	17.25	"			SM	
5/9/97	1531	" "	17.70	"			JDR	
5/22/00	1657	"	18.23	"			MAM	

LOCATION

PROJECT

use dedicated w.l. indicator

WELL or DATE LR-102

WATER LEVEL DATA

WELL LOCATION LR-102

MEASURING POINT

ELEVATION: MEASURING POINT TOPVC

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10-18-95	1025	elec probe	61.03				BT	
10/28/95	1250	" "	59.45	TOPVC			AR	
11/8/95	1309	" "	61.23	TOPVC			AK	
11/18/95	953	" "	61.14	"			AK	
12/15/95	1241	" "	61.21	"			JAL	
1/4/96	[illegible]	" "	61.24	TOPVC			[illegible]	[illegible]
2/5/96	1612	" "	61.34	"			MS	
3/4/96	1444	" "	61.30	"			MS	
4/3/96	0750	" "	61.01	"			MS	
4/30/96	1358	" "	61.23	"			WH	
5/3/96	1548	" "	61.22	"			WH	
6/13/96	0916	" "	59.32	"			MS	
7/12/96	1145	" "	59.70	"			MS	
8/8/96	0921	" "	60.35	"			MS	
9/6/96	0947	" "	60.85	"			MS	
2/3/97	1345	" "	60.39	"			SM	
5/9/97	1546	" "	60.25	"			DR	
5/22/00	1702	"	59.73	"			MAM	

LOCATION

PROJECT

Golder Associates

LR-102

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION LR-103 MEASURING POINT TOC

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10/28/95	1240	Elec Probe	29.18'	TOPVC			AK	
10/30/95	1630	Elec. Probe	29.15'	TOPVC			MRS	Prior to slug testing
11/18/95	944	" "	29.42	TOPVC			AK	
12/5/95	1430	" "	29.96	TO PVC			TAC	
1/4/96	1451	" "	30.28	TOPVC			DR	No well hole
2/5/96	1242	"	30.70	"			MS	Drilled over hole
3/4/96	1203	" "	31.30	"			MS	
4/2/96	1659	" "	31.57	"			MS	
4/30/96	1422	" "	30.46	"			WH	
5/1/96	1203	" "	30.87	"			WH	
5/2/96	1421	" "	30.60	"			WH	
5/3/96	1325	" "	30.53	"			WH	
6/13/96	1033	" "	26.79	"			MS	
7/12/96	1412	" "	27.03	"			MS	
8/8/96	1101	" "	27.76	"			MS	
9/6/96	1128	" "	28.55	"			MS	
2/4/97	1009	" "	29.35	"			SM	
5/9/97	1521	" "	27.05	"			DR	
5/22/00	1010	"	27.09	"			MAM	

LOCATION

PROJECT

WELL or DATE _____

WATER LEVEL DATA LR-104

WELL LOCATION LR-104 MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10/28/95	1239	ELEC. PROBE	27.69	TOPVC			AK	
11/18/95	938	" "	27.53	TOPVC			AK	
12/15/95	1325	" "	28.38	TO PVC			TAL	
1/4/96	1634	" "	28.72	TOPVC			WH	NP 27.58
1/15/96		new hole installed N side						
2/6/96	0902	" "	29.17	TOPVC			MS	
3/5/96	1635	" "	29.78	"			WH	
4/3/96	1614	" "	29.91	"			MS	
4/30/96	1002	" "	29.54	"			WH	
5/1/96	1139	" "	29.42	"			WH	
5/2/96	1402	" "	29.19	"			WH	
5/3/96	1304	" "	29.14	"			WH	
6/13/96	1332	" "	25.36	"			MS	
7/12/96	1405	" "	25.58	"			MS	
8/8/96	1055	" "	26.27	"			MS	
9/6/96	1120	" "	27.03	"			MS	
2/4/97	1012	" "	27.84	"			SM	
5/9/97	1511	" "	25.60	"			JDR	
8/11/97	1201	" "	27.40	"			JDR	
11/6/97	0915	" "	28.33	"			JDR	
2/10/98	1545	" "	28.12	"			DTB	
5/26/98	1508	" "	25.45	"			JDR	
11/9/98	1520	"	26.12	"			BFP	
5/14/99	1013	"	26.47	"			BFP	
11/19/99	1445	"	29.27	"			BFP	
5/22/00	1013	"	30.94	"			MAM	

LOCATION

PROJECT

Golder Associates

LR-104

use dedicated w.l. indicator WELL or DATE

WATER LEVEL DATA LR-105

WELL LOCATION LR-105 MEASURING POINT +

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
10-18-95	1100	elec. probe	34.26'	TOPVC				
10/28/95	1258	" "	34.98'	TOPVC			AK	
11/8/95	1335	" "	34.24	TOPVC			AK	
11/18/95	957	" "	34.35	TOPVC			AK	
12/16/95	1248	" "	34.41	TOPVC			TAC	
1/4/96	1706	" "	32.90	TOPVC			WH	weather: ice edge
2/5/96	1617	" "	33.39	"			MS	
3/4/96	1454	" "	33.18	"			MS	
4/3/96	0802	" "	33.09	"			MS	difficult to read
4/30/96	1402	" "	33.40	"			WH	
5/3/96	1545	" "	33.36	"			WH	
6/13/96	0922	" "	33.18	"			MS	
7/12/96	1151	" "	33.08	"			MS	
8/8/96	0927	" "	28.95	"			MS	
9/6/96	0952	" "	33.18	"			MS	
2/4/97	1210	" "	33.00	"			SM	
5/9/97	1540	" "	32.62	"			PDR	
5/23/00	1720	"	33.21	"			MH	

LOCATION

PROJECT

Golder Associates

LR-105

WATER LEVEL DATA

WELL LOCATION MW-F-1-S MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1410	Fl. Probe	33.02	TOPVC			JA	
12/20/95	1306	" "	29.96	TOPVC			JDH	
12/24/95	1605	" "	29.88	TOPVC			MS	
12/26/95	1116	" "	29.90	TOPVC			MS	
12/31/95	1520	" "	30.01	TOPVC			MS	
1/4/96	1446	" "	PROBE is stuck/down				DH	
2/6/96	0920	" "	30.71	TOPVC			MS	
3/5/96	1620	" "	31.39	"			WH	
4/2/96	1647	" "	31.64	"			MS	
4/30/96	1016	" "	31.17	"			WH	
5/1/96	1158	" "	31.06	"			WH	
5/2/96	1419	" "	30.82	"			WH	
5/3/96	1316	" "	30.74	"			WH	
6/13/96	1311	" "	26.85	"			MS	
7/12/96	1358	" "	27.08	"			MS	
8/8/96	1045	" "	27.65	"			MS	
9/6/96	1113	" "	28.56	"			MS	
2/4/97	1025	" "	29.48	"			SM	
5/9/97	1444	" "	26.94	"			PDR	
8/11/97	1149	" "	28.94	"			JDR	
11/6/97	0856	" "	29.99	"			JDR	
2/10/98	1554	" "	29.78	"			DH	
5/26/98	1453	" "	26.79	"			PDR	
11/9/98	1438	" "	27.61	"			BFP	
5/22/06	1104	" day	@ 32.46	"			MAM	

LOCATION

PROJECT

Golder Associates

MW-F-1-S

WATER LEVEL DATA

WELL LOCATION MW-F-1-D MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1412	FL PROBE	33.34	TO PVC			TAL	
12/20/95	1304	" "	30.30	TO PVC			WH	
12/24/95	1603	" "	30.19	TO PVC			MS	
12/26/95	1117	" "	30.20	TO PVC			MS	
12/31/95	1512	" "	30.33	TO PVC			MS	
1/4/96	1645	" "	30.62	TO PVC			DM	
2/6/96	0920	" "	31.08	"			MS	
3/5/96	1619	" "	31.74	"			WH	
4/2/96	1650	" "	31.93	"			MS	
4/30/96	1014	" "	31.45	"			WH	
5/1/96	1157	" "	31.33	"			WH	
5/2/96	1417	" "	31.05	"			MS	
5/3/96	1317	" "	31.00	"			MS	
6/13/96	1313	" "	27.10	"			MS	
7/12/96	1359	" "	27.37	"			MS	
8/8/96	1046	" "	28.07	"			MS	
9/6/96	1114	" "	28.88	"			MS	
2/4/97	1030	" "	29.76	"			SM	
5/9/97	1441	" "	27.26	"			JDR	
8/11/97	1147	" "	29.26	"			JDR	
11/6/97	0854	" "	30.31	"			JDR	
2/10/98	1552	" "	30.09	"			DTB	
5/26/98	1455	" "	27.10	"			JDR	
5/22/00	1102		—					could not get reading - PVC bent at 45° angle - probe wouldn't go down

Golder Associates

MW-F1-D

WELL or DATE X

MW-1201

WATER LEVEL DATA MW-1201

WELL LOCATION MW-1201 MEASURING POINT N. on Riser

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION

PROJECT LAIDLAW LDU-2 RIFS/RD 913-2383.202

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
4-26-95	1630	ELEC PROBE	123.12	TOR			MDA	
5-5-95	1650	" "	115.91	TOR			MDA	
5-25-95	1035	" "	134.05	TOPVC TOR			AIC	
6/27/95	1050	" "	35.58	TOPVC TOR			AK	
7/11/95	712	" "	55.10	TOR			AIC	
7/26/95	1156	" "	90.09	TOR			AK	
8/15/95	925	" "	99.49	TOPVC			AK	
8/26/95	1122	" "	117.12	TOPVC			AIC	
9/30/95	1040	" "	104.41	TOR			AK	
10/28/95	1205	" "	107.17	TOR			AIC	
11/18/95	1145	" "	107.54	TOR			AK	
12/13/95	1500	" "	109.54	TOPVC			TAL	
1/4/96	1428	" "	106.43	TOPVC			WH	
2/6/96	1130	" "	103.83	"			MS	
3/5/96	1528	" "	109.50	"			WH	
4/2/96	1354	" "	102.98	"			MS	
4/30/96	0841	" "	103.11	"			WH	
5/1/96	0955	" "	102.82	"			WH	
5/2/96	1040	" "	102.85	"			SCS	
6/13/96	1121	" "	103.60	"			MS	
7/12/96	1301	" "	102.08	"			MS	
8/8/96	0949	" "	104.01	"			MS	
9/6/96	1012	" "	108.65	"			MS	
2/4/97	1138	" "	96.70	"			SM	
5/9/97	1053	" "	95.29	"			JDR	H2O in ANNULAR SPACE between wellcasg & steelcs
8/11/97	1322	" "	94.04	"			JDR	" " " "
11/6/97	1035	" "	88.25	"			JDR	VAPOR CAP outright
2/9/98	1355	" "	75.37	"			DTS	
5/26/98	1244	" "	82.64	"			JDR	
11/9/98	1613	" "	74.87	"			BFP	
5/22/00	1500	"	62.42	"			MAM	

MW-1201
MW-1201

WELL or DATE X

MW-1204

WATER LEVEL DATA MW-1204

WELL LOCATION MW-1204 Cased and set in circular concrete pad

MEASURING POINT North on Riser

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION

PROJECT Lancaster/NW-2 RIFS/MO 943-2848.202

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
4/26/95	1308	ELEC. PROBE	169.74	TOR			MDA	
5-7-95	1100	" "	166.28	TOR			MDA	
5-25-95	1011	" "	124.20	~~TOPVC~~ TOR			AK	
6-7-95	1054	" "	148.38	~~TOPVC~~ TOR			AK	
6/27/95	0947	" "	151.80	~~TOPVC~~ TOR			AK	
7/10/95	939	" "	149.44	TOR			AK	
7/26/95	1127	" "	155.62	TOR			AK	
8/15/95	813	" "	128.36	TOR			AK	
9/30/95	1010	" "	180.06	TOR			AK	DOUBLE CHECKED
10/28/95	1135	" "	161.28	TOR			AK	
11/18/95	1157	" "	182.40	TOR			AK	
12/15/95	952	" "	176.34	TOR			TM	
1/4/96	1501	" "	178.62	TOR			AK	
2/6/96	0908	" "	129.06	"			MS	
3/5/96	1503	" "	166.60	"			WH	
4/2/96	1428	" "	153.07	"			MS	Double checked
4/30/96	0915	" "	143.70	"			WH	
5/1/96	1022	" "	141.76	"			WH	
5/2/96	1015	" "	141.03	"			SCS	
5/3/96	1206	" "	141.26	"			WH	
6/13/96	1058	" "	125.28	"			MS	Double checked
7/12/96	1318	" "	152.69	"			MS	" "
8/8/96	1006	" "	132.50	"			MS	" "
9/6/96	1033	" "	157.19	"			MS	
2/4/97	1100	" "	141.66	"			SM	
5/9/97	1113	" "	146.22	"			JDR	
8/11/97	1254	" "	135.61	"			JDR	
11/6/97	1017	" "	139.15	"			JDR	
2/9/98	1326	" "	130.13	"			DTS	
5/26/98	1610	" "	130.36	"			JDR	
11/9/98	1554	" "	95.77	"			BFP	
5/14/99	1158	" "	68.13	"			BFP	
11/19/99	1445	" "	113.59	"			BFP	
5/22/00	1515	" "	—	obstruction @	86.89 ft		MAM	

115.91

Golder Associates

MW-1204
MW-1204

Note: use dedicated w.l. meter

WELL or DATE _____

WATER LEVEL DATA

Q-71

WELL LOCATION _____
W end of quarry; 14" ϕ steel, 9' stick-up

MEASURING POINT TOR at elevation pt (el. 457.30) 457.30

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
3/4/96	1530	Elec Probe	92.40				MS	
4/2/96	1638	" "	92.06				MS	v. difficult to read.
4/30/96	1000	" "	could not get accurate reading				WH	
6/13/96	1430	" "	71.5?	92.3? inaccurate reading			MS	
7/12/96	1220	" "	75'?	95'? "		"	MS	

LOCATION

PROJECT

S-1

WATER LEVEL DATA

WELL LOCATION S-1 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1059	Elec. Probe	15.32	TOPVC				Bottom 5 ft of casing tested by MH
2/5/95	1420	" "	16.14	"			← MH	
3/4/96	1252	" "	16.74	"			MS	
4/2/96	1510	" "	16.94	"			M-H	
4/30/96	1510	" "	15.62	"			WH	
5/1/96	1430	" "	15.38	"			WH	
5/2/96	1533	" "	15.10	"			WH	
5/3/96	1512	" "	15.00	"			WH	
6/13/96	0741	" "	11.56	"			MS	
7/12/96	1013	" "	12.14	"			MS	
8/8/96	0745	" "	12.84	"			MS	
9/6/96	0752	" "	13.74	"			MS	
2/3/97	1512	" "	14.75	"			SM	
5/9/97	0940	" "	12.06	"			PDR	
5/22/00	1556		17.87	"			MAM	

LOCATION

PROJECT

Golder Associates

S-1

S-5✓

WATER LEVEL DATA

WELL LOCATION S-5 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95		ELEC PROBE	37.34				TAC	
2/6/96	0956	" "	38.09				MS	
3/4/96	1639	" "	38.60				MS	
4/2/96			38.96				M-H	
4/30/96	1557	" "	38.25				WH	
5/1/96	1342	" "	38.12				WH	
5/2/96	1443	" "	37.90				WH	
5/3/96	1406	" "	37.79				WH	
6/13/96	1346	" "	33.82				MS	
7/12/96	1433	" "	34.10				MS	
8/8/96	1122	" "	34.73				MS	
9/6/96	1153	" "	34.52				MS	
2/3/97	1417	" "	36.38				SM	
5/9/97	1425	" "	33.56				JDR	
8/11/97	1135	" "	35.60				JDR	
11/6/97	0839	" "	36.98				JDR	
2/10/98	1419	" "	36.45				DS	
5/26/98	1417	" "	32.67				JDR	
11/9/98	1250	"	34.32				BFP	
5/14/99	0916	"	32.91				BFP	
11/19/99	1445	"	37.22				BFP	
5/22/00	1132	"	39.03				MA-M	

LOCATION

PROJECT

Golder Associates

S-5

WELL or DATE

S-8 / WATER LEVEL DATA

WELL LOCATION S-8 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1135	ELECT. PROBE	13.02'	TOPVC			JAL	
2/5/96	1448	" "	13.67	"			MS	
3/4/96	1321	" "	14.33	"			MS	
4/2/96			14.50	"			M-H	
4/30/96	1458	" "	13.03	"			WH	
5/3/96	1458	" "	12.58	"			WH	
6/13/96	0805	" "	8.52	"			MS	
7/12/96	1039	" "	9.36	"			MS	
8/8/96	0803	" "	10.04	"			MS	
9/6/96	0815	" "	11.15	"			MS	
2/3/97	1550	" "	12.40	"			SM	
5/9/97	0905	" "	9.21	"			PR	

Golder Associates

S-8

S-10 /

WATER LEVEL DATA

WELL LOCATION 5-10 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1225	ELEC. PROBE	49.40	TOPVC			TAL	NO S.U. No CAP
2/5/96	1601	" "	49.88	"			MS	
3/4/96	1432	" "	50.45	"			MS	
4/2/96			50.85	"			M-H	
4/30/96	1312	" "	49.87	"			WH	
5/3/96	1554	" "	49.26	"			WH	
6/13/96	0910	" "	45.38	"			MS	
7/12/96	1140	" "	45.81	"			MS	
8/8/96	0902	" "	46.19	"			MS	
9/6/96	0941	" "	47.40	"			MS	
2/3/97	1147	" "	48.60				SM	
5/9/97	1354	" "	45.57	"			DR	
5/22/00	1115	"	51.67	"			MAM	

LOCATION

PROJECT

Golder Associates

S-10

S-51-M WATER LEVEL DATA

WELL LOCATION S-51 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/13/95	1051	Electric Probe	17.66	To MVC			TAL	
2/5/96	1631	" "	18.42	"			MS	Maybe S-51-M
3/4/96	1516	" "	19.16	"			MS	
4/2/96			19.09	"			M-H	
4/30/96	1222	" "	18.50	"			WH	
5/1/96	1050	" "	18.46	"			WH	
5/2/96	1315	" "	18.38	"			WH	
5/3/96	1228	" "	18.32	"			WH	
6/13/96	0944	" "	13.55	"			MS	Old checked
7/12/96	0911	" "	15.52	"			MS	
8/8/96	0657	" "	16.21	"			MS	
9/6/96	0653	" "	17.14	"			MS	
2/3/97	1945	" "	17.50	"			SM	
5/9/97	1085	" "	15.31	"			TDR	
5/23/00	1255	in the	middle	of a	pond			

Golder Associates

S-51

S-61 / WATER LEVEL DATA

WELL LOCATION S-61 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1548	Elect. Probe	18.58				TAC	
2/5/96	1437	" "	19.39				MS	
3/4/96	1259	" "	20.01				MS	
4/2/96			20.29				M-H	
4/30/96	1351	" "	19.28				WH	
5/3/96	1622	" "	18.66				WH	
6/13/96	0755	" "	14.69				MS	
7/12/96	1025	" "	14.99				MS	
8/8/96	0752	" "	15.99				MS	
9/6/96	0802	" "	15.01				MS	
2/3/97	1255	" "	18.16				SM	
5/9/97	0930	" "	15.14				PDR	
5/22/04	1550	"	19.47				MAM	

LOCATION

PROJECT

Golder Associates

S-61

S-75 / WATER LEVEL DATA

WELL LOCATION S-75 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1305	ELEC. PROBE	29.32	TOP PVC			TAL	
2/5/96	1657	" "	29.87	"			MS	
3/4/96	1503	" "	29.90	"			MS	
4/2/96			29.89	"			M-H	
4/30/96	1552	" "	29.70	"			WH	
5/3/96	1543	" "	28.91	"			WH	
6/13/96	0927	" "	26.23	"			MS	
7/12/96	1159	" "	27.40	"			MS	
8/8/96	0935	" "	27.40	"			MS	
9/6/96	1001	" "	28.89	"			MS	
2/4/97	1205	" "	28.30	"			SM	
5/9/97	15:35	" "	27.60	"			FDR	
5/22/00	1635	well riser broken at	ground	level			MAM	

Golder Associates

S-75

S-82

WELL or DATE

WATER LEVEL DATA

WELL LOCATION S-82 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1043	ELEC. PROBE	18.82'	TO PVC			JAL	
2/6/96	0737	" "	19.76	"			MS	
3/5/96	1401	" "	20.38	"			WH	
4/2/96			20.61	"			M-H	
4/30/96	1519	" "	19.58	"			WH	
5/3/96	1518	" "	19.08	"			WH	
6/13/96	1201	" "	15.37	"			MS	
7/12/96	1004	" "	15.83	"			MS	
8/8/96	0736	" "	16.52	"			MS	
9/6/96	0740	" "	17.40	"			MS	
2/3/97	1557	" "	18.43	"			SM	
5/9/97	0944	" "	15.73	"			PDR	
5/22/00	1602	"	21.45	"			MAN	

Golder Associates

S-82

S-84 ✓

WELL or DATE S-84

WATER LEVEL DATA

WELL LOCATION S-84 Just inside main gate

MEASURING POINT Top of PC ; TOPVC is ~2-3' down

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/6/96	1008	Elec. Probe	28.72	TOR			MS	
3/4/96	1647	" "	could not reach PVC cap to open riser				MS	
4/2/96			27.07	"			M-H	
6/13/96	1355	" "	could not reach cap to open riser				MS	
7/2/96	1059	" "	22.38	- TOPVC -			MS	
8/8/96	0833	" "	23.07	"			MS	
9/6/96	0930	" "	24.10	"			MS	
2/4/97	0845	" "	24.76	"			SM	
5/9/97	1258	" "	22.15	"			JDR	
8/11/97	1105	" "	24.47	"			JDR	
11/6/97	0827	" "	25.60	"			JDR	
~~11/26/98~~								
6/26/98	1356	" "	21.57	"			BFP	
11/9/98	1228	"	22.95	"			BFP	
5/14/99	0833	"	21.83				BFP	
11/9/99	1445	"	26.50	"			BFP	
5/22/00	1148	"	28.15	"			MAM	

LOCATION

PROJECT

Golder Associates

S-84

S-88 ✓

WELL or DATE 5-88

WATER LEVEL DATA

WELL LOCATION S-88
Concrete plant area, across ditch from LR-103

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1250	Elec. Probe	32.14	TOPVC			MS	PC bent
3/5/96	1628	" "	32.86	"			WH	
4/2/96			33.11	"			M-H	
4/30/96	1415	" "	32.40	"			WH	
5/1/96	1146	" "	32.34	"			WH	
5/2/96	1408	" "	32.08	"			WH	
5/3/96	1306	" "	32.04	"			WH	
6/13/96	1335	" "	28.26	"			MS	
7/12/96	1408	" "	28.52	"			MS	
8/8/96	1058	" "	29.20	"			MS	
9/6/96	1624	" "	30.02	"			MS	
2/4/97	1002	" "	30.86	"			SM	
5/9/97	1579	" "	28.40	"			PDR	csg broken @ ground
8/11/97	1206	" "	30.41	"			JDR	csg broken @ ground
11/6/97	0913	" "	31.34	"			JDR	" " " "
5/26/98	1503	" "	28.45	"			PDR	" " " "
11/9/98	1514		29.11				BFP	
5/14/99	1022		29.44				BFP	
5/22/00	1026		34.03				MAM	

LOCATION

PROJECT

Golder Associates

S-88

WELL or DATE

I-2

WATER LEVEL DATA

WELL LOCATION I-2

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1058	ELEC. PROBE	15.40	TO PVC			Melanie Hunt	provided WL
2/5/96	1418	" "	16.06	"			MS	
3/4/96	1250	" "	16.67	"			MS	
4/2/96			16.90	"			M-H	
4/30/96	1512	" "	15.80	"			WH	
5/1/96	1432	" "	15.60	"			WH	
5/2/96	1534	" "	15.37	"			WH	
5/3/96	1510	" "	15.26	"			WH	
6/13/96	0743	" "	11.48	"			MS	
7/12/96	1002	" "	12.06	"			MS	
8/8/96	0743	" "	12.75	"			MS	
9/6/96	0750	" "	13.68	"			MS	
2/3/97	1515	" "	14.74	"			SM	
5/9/97	0937	" "	11.95	"			FOR	
5/22/00	1555	"	17.85	"			MAM	

I-4 WATER LEVEL DATA

WELL LOCATION I-4 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1352	ELEC. PROBE	37.32	TOPO			TAC	
2/6/96	0953	" "	38.04	"			MS	
3/4/96	1644	" "	38.45	"			MS	
4/2/96			38.92	"			M-H	
4/30/96	1559	" "	38.12	"			WH	
5/1/96	1343	" "	37.99	"			WH	
5/2/96	1444	" "	37.75	"			WH	
5/3/96	1407	" "	37.64	"			WH	
6/13/96	1348	" "	33.68	"			MS	
7/12/96	1435	" "	34.05	"			MS	
8/8/96	1124	" "	34.73	"			MS	
9/6/96	1156	" "	34.58	"			MS	
2/3/97	1415	" "	36.46	"			SM	
5/9/97	1423	" "	33.75	"			JDR	
8/11/97	1133	" "	35.90	"			JDR	
11/6/97	0837	" "	36.96	"			JDR	
2/10/98	1418	" "	36.70	"			DB	
5/26/98	1415	" "	33.43	"			JDR	
11/9/98	1251	"	34.30	"			BFP	
5/14/99	0912	"	33.52	"			BFP	
11/9/99	1405	"	37.66	"			BFP	
5/22/00	1134	"	34.40	"			MAM	

Golder Associates

I-4

WELL or DATE

I-7

WATER LEVEL DATA

WELL LOCATION I-7

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1125	ELEC. PROBE	15.92	TOPVC			JAL	
2/5/96	1440	" "	16.66	"			MS	
3/4/96	1308	" "	17.28	"			MS	
4/2/96		"	17.52	"			M-H	
4/30/96	1504	" "	16.46	"			~~MS~~ WH	
5/3/96	1504	" "	15.84	"			WH	
6/13/96	0759	" "	11.71	"			MS	
7/12/96	1033	" "	12.42	"			MS	
8/8/96	0758	" "	13.11	"			MS	
9/6/96	0808	" "	14.12	"			MS	
2/3/97	1535	" "	15.38	"			SM	
5/9/97	0920	" "	12.27	"			PDR	

Golder Associates

I-7

I-9

WATER LEVEL DATA

WELL LOCATION I-9 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1041	ELEC. PROBE	19.92	TO PVC			TAL	
2/6/96	0721	" "	20.58	"			MS	Map shows as I-7
3/5/96	1355	" "	21.17	"			MS	
4/2/96			21.40	"			M-H	
4/30/96	1517	" "	20.36	"			WH	
5/3/96	1515	" "	19.87	"			WH	
6/13/96	1204	" "	16.18	"			MS	
7/12/96	1006	" "	16.64	"			MS	
8/8/96	0737	" "	17.32	"			MS	
9/6/96	0742	" "	18.20	"			MS	
2/3/97	1557	" "	19.24	"			SM	
5/9/97	0945	" "	16.52	"			DOR	
5/22/00	1605	"	22.23	"			MAM	

I-11

WATER LEVEL DATA

WELL LOCATION I-11 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1227	ELEC. PROBE	49.10	TOPVC			JAC	
2/5/96	1609	" "	49.86	"			MS	
3/4/96	1429	" "	50.42	"			MS	
4/2/96			50.75				M-H	
4/30/96	1313	" "	49.79	"			WH	
5/31/96	1552	" "	49.16	"			WH	
6/13/96	0912	" "	45.26	"			MS	
7/12/96	1142	" "	45.78	"			MS	
8/8/96	0904	" "	46.49	"			MS	
9/6/96	0943	" "	47.38	"			MS	
2/3/97	1145	" "	48.60	"			SM	
5/9/97	1352	" "	45.53	"			[illegible]	
5/22/00	1116	"	51.65	"			MAM	

LOCATION

PROJECT

I-62

WATER LEVEL DATA

WELL LOCATION I-62 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1602	EL. PROBE	15.18				JK	
2/5/96	1538	" "	15.87				MS	
3/4/96	1413	" "	16.51				MS	
4/2/96			16.71				M-H	
4/30/96	1326	" "	15.50				WH	
5/3/96	1614	" "	14.86				WH	
6/13/96	0853	" "	10.81				MS	
7/12/96	1116	" "	11.58				MS	
8/8/96	0848	" "	12.28				MS	
9/6/96	0909	" "	13.29				MS	
2/3/97	1316	" "	14.60				SM	
5/9/97	0911	" "	11.44				PDR	

LOCATION

PROJECT

Golder Associates

I-62

I-65

WATER LEVEL DATA

WELL LOCATION I-65 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1516	EL. PROBE	10.74	TOPVC			JHL	
2/5/96	1505	" "	11.40	"			MS	
3/4/96	1333	" "	12.07	"			MS	
4/2/96			12.31	"			M-H	
4/30/96	1445	" "	11.08	"			WH	
5/3/96	1643	" "	10.53	"			WH	
6/13/96	0819	" "	6.34	"			MS	
7/12/96	1047	" "	7.13	"			MS	
8/8/96	0814	" "	7.83	"			MS	
9/6/96	0831	" "	8.91	"			MS	
2/3/97	1210	" "	10.15	"			SM	
5/9/97	1325	" "	7.00	"			PDR	
5/22/00	1340	"	10.23	"			MAM	

Golder Associates

I-65

I-66

WELL or DATE I-66

WATER LEVEL DATA

WELL LOCATION I-66 in ditch along St Charles Rock Rd

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1515	Elec. Probe	11.38	TOPVC			MS	
12/15	1537	" "	10.78	TOPVC			TL	
3/4/96	1343	" "	12.07	"			MS	
4/2/96			12.28				M-H	
4/30/96	1452	" "	11.11	"			WH	
5/3/96	1610	" "	10.61	"			WH	
6/13/96	0924	" "	6.53	"			MS	
7/12/96	1052	" "	7.26	"			MS	
8/8/96	0824	" "	7.97	"			MS	
9/6/96	0838	" "	9.05	"			MS	
2/3/97	1200	" "	10.06	"			JM	
5/9/97	1330	" "	9.09	"			PDR	
5/22/00	1350	"	11.60	"			MAH	

I-67

WELL or DATE I-67

WATER LEVEL DATA

WELL LOCATION I-67
In ditch along St. Charles Rock Rd

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1521	Elec. Probe	11.26	TOPVC			MS	
2/15/96	1533	" "	10.72	"			TL	
3/4/96	1350	" "	11.94	"			MS	
4/2/96			12.16	"			M-H	
5/3/96	1636	" "	10.36	"			WH	
6/13/96	0931	" "	6.61	"			MS	
7/12/96	1056	" "	7.28	"			MS	
8/8/96	0826	" "	7.99	"			MS	
9/6/96	0923	" "	9.09	"			MS	
2/4/97	0830	" "	9.78	"			SM	
5/9/97	1336	" "	7.10	"			QR	
5/22/00	1310	"	11.63	"			MAH	

Golder Associates

I-67

WELL or DATE I-68

WATER LEVEL DATA

WELL LOCATION I 68 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/14/95	923	ELEC PROBE	19.32	TOPVC			TAL	No Cap
2/6/96	1012	" "	19.96	"			MS	
3/4/96	1652	" "	20.48	"			MS	
4/2/96			20.64	"			M-H	
4/30/96	1045	" "	19.03	"			WH	
5/1/96	1332	" "	19.08	"			WH	
5/2/96	1450	" "	19.01	"			WH	
5/3/96	1631	" "	18.88	"			WH	
6/13/96	1213	" "	15.18	"			MS	
7/12/96	1440	" "	16.03	"			MS	
8/8/96	1129	" "	16.75	"			MS	
9/6/96	1203	" "	17.72	"			MS	
2/4/97	0827	" "	18.19	"			SM	
5/9/97	1254	" "	15.78	"			JDR	PVC csg loose @ at ground level. notes; inside steel c
8/11/97	1057	" "	18.13	"			JDR	" " " "
11/5/97	0806	" "	19.21	"			JDR	" " " "
2/10/98	1426	" "	18.88	"			DB	
5/26/98	1348	" "	15.03	"			JDR	" " " "
11/9/98	1220	" "	16.56	"			BFP	
5/14/99	0839	" "	15.27	"			BFP	
11/19/99	1320	" "	20.09	"			BFP	
5/22/00	0943	" "	21.70	"			MA	

I-73

WATER LEVEL DATA

WELL LOCATION I-73 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	848	ELEC. PROBE	30.68	TOPVC				No Cap
2/5/96	1257	" "	31.37	"			MS	Broken Image
3/5/96	1632	" "	31.95	"			MS	No PVC cap steel cap marked off
4/2/96			32.35	"			M-H	
4/30/96	1411	" "	31.65	"			WH	
5/1/96	1143	" "	31.50	"			WH	
5/2/96	1406	" "	31.39	"			WH	
5/3/96	1303	" "	31.25	"			WH	
6/13/96	1039	" "	27.34	"			MS	
7/12/96	1341	" "	28.03	"			MS	
8/8/96	1032	" "	28.55	"			MS	
9/6/96	1053	" "	29.33	"			MS	
2/4/97	1047	" "	29.50	"			SM	
5/9/97	1508	" "	27.77	"			JDR	PVC csg broken @ grade level, holes in steel csg
8/11/97	1209	" "	29.56	"			JDR	" " "
11/6/97	0932	" "	30.41	"			JDR	" " "
2/10/98	1537	" "	30.27	"			DJS	
5/26/98	1530	" "	27.77	"			JDR	" " "
11/9/98	1528	"	28.09	"			BAP	" "
5/14/99	1050	"	27.37	"			BAP	" "
11/19/99	1445	"	31.01	"			BAP	" "
5/22/00	0955	"	32.76	"			MAM	

Golder Associates

I-73

D-3

WATER LEVEL DATA

WELL LOCATION D-3 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1350	ELEC. PROBE	39.02	TO PVC			TAC	NO ED NO CA
2/6/96	0950	" "	39.82	"			MS	
3/4/96	1642	" "	~~40.~~ 40.35	"			MS	
4/2/96			40.70				MS	
4/30/96	1601	" "	39.88				WH	
5/1/96	1345	" "	39.78	"			WH	
5/2/96	1446	" "	39.52	"			WH	
5/3/96	1408	" "	39.44	"			WH	
6/13/96	1350	" "	35.42	"			MS	
7/12/96	1437	" "	35.86	"			MS	
8/8/96	1126	" "	36.59	"			MS	
9/6/96	1159	" "	38.32	"			MS	
2/3/97	1412	" "	38.32	"			SM	
5/9/97	1420	" "	35.60	"			JDR	
8/4/97	1131	" "	37.80	"			JDR	
11/6/97	0835	" "	38.89	"			JDR	
2/10/98	1421	" "	38.61	"			DTS	
5/26/98	1413	" "	35.35	"			DR	
11/9/98	1253	"	36.21	"			BAP	
5/14/99	0908	"	35.52	"			BAP	
11/9/99	1445	"	39.68	"			BAP	
5/22/00	1135	"	41.40	"			MAM	

LOCATION

PROJECT

Golder Associates

D-3

WELL or DATE

D-6

WATER LEVEL DATA

WELL LOCATION D-6 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1114	ELEC PROBE	16.46	TOPVC			TAC	
2/5/96	1429	" "	17.31	"			MS	
3/4/96	1303	" "	17.91	"			MS	
4/2/96			18.16	"			M-H	
4/30/96	1506	" "	17.07	"			WH	
5/3/96	1506	" "	16.51	"			WH	
6/13/96	0750	" "	12.54	"			MS	
7/12/96	1030	" "	13.20	"			MS	
8/8/96	0755	" "	13.87	"			MS	
9/6/96	0805	" "	14.85	"			MS	
2/3/97	1525	" "	16.00	"			SM	
5/9/97	0923	" "	13.04	"			DR	
5/22/00	1545	"	19.02	"			MA	

Golder Associates

D-6

D-12

WATER LEVEL DATA

WELL LOCATION D-12 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1230	ELEC. PROBE	48.96	TO PVC			TAC	
2/5/96	1559	" "	49.52	"			MS	
3/4/96	1435	" "	50.16	"			MS	
4/2/96			50.42				M-H	
4/30/96	1311	" "	49.47	"			WH	
5/2/96	1555	" "	48.85	"			WH	
6/13/96	0908	" "	49.14	"			MS	
7/12/96	1138	" "	45.50	"			MS	
8/8/96	0906	" "	46.19	"			MS	
9/6/96	0939	" "	47.05	"			MS	
2/3/97	1148	" "	48.24	"			SM	
5/9/97	1355	" "	45.20	"			[illegible]	
5/22/00	1112	"	51.32	"			M&M.	

LOCATION

PROJECT

Golder Associates

D-12

D-13

WATER LEVEL DATA

WELL LOCATION D-13 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1440	EL. PROBE	39.96'	TO PVC			JAC	
2/5/96	1550	" "	40.66	"			MS	
3/4/96	1350	" "	41.24	"			MS	
4/2/96			41.49	"			M-H	
4/30/96	1337	" "	40.40	"			WH	
5/31/96	1557	" "	39.78	"			WH	
6/13/96	0903	" "	35.69	"			MS	
7/12/96	1132	" "	36.37	"			MS	
8/8/96	0912	" "	37.71	"			MS	
9/6/96	0848	" "	38.18	"			MS	
2/3/97	1155	" "	39.24	"			SM	
5/9/97	1344	" "	36.08	"			PR	
5/22/00	1320	"	42.22	"			MSM	

LOCATION

PROJECT

D-14

WATER LEVEL DATA

WELL LOCATION D-14 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1403	EL. PROBE	58.42	TOPVC			TAL	
2/6/96	1001	" "	58.84	"			MS	
3/4/96	1549	" "	59.23	"			MS	
4/2/96			59.69	"			M-H	
4/30/96	1554	" "	58.70	"			WH	
5/1/96	1410	" "	57.96	"			WH	
5/2/96	1428	" "	57.69	"			WH	
5/3/96	1333	" "	57.75	"			WH	
6/13/96	1024	" "	56.18	"			MS	
7/12/96	1418	" "	56.11	"			MS	
8/8/96	1108	" "	56.75	"			MS	
9/6/96	1134	" "	57.40	"			MS	
2/4/97	1000	" "	57.30	"			SM	
5/9/97	1432	" " well obstructed @ 36.4' BTOPVC, concrete heaved 1/2' above ground level						
5/22/00	1410.	well is obstructed @ 25.78 ft					MAM	

LOCATION

PROJECT

Golder Associates

D-14

WELL or DATE

D-81

WATER LEVEL DATA

WELL LOCATION D-81

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/13/95	1132	Elec. Probe	19.19	To PVC			TAL	
2/6/96	0746	" "	20.28	"			MS	
3/5/96	1424	" "	20.90	"			WH	
4/2/96			21.11	"			M-H	
4/30/96	1536	" "	20.42	"			WH	
5/3/96	1530	" "	19.77	"			WH	
6/13/96	1144	" "	16.51	"			MS	
7/12/96	0949	" "	16.88	"			MS	
8/8/96	0719	" "	17.50	"			MS	
9/6/96	0717	" "	18.22	"			MS	
2/3/97	1627	" "	18.73	"			SM	
5/9/97	1002	" "	16.73	"			PDR	

Golder Associates

D-81

D-83

WATER LEVEL DATA

WELL LOCATION D-83 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1611	EL PROBE	17.46	TOPVC			DMC	
2/5/96	1586	" "	18.19	"			MS	
3/4/96	1415	" "	18.82	"			MS	
4/2/96			19.01	"			M-H	
4/30/96	1324	" "	17.72	"			WH	
5/3/96	1612	" "	17.83	"			WH	
6/13/96	0855	" "	13.12	"			MS	
7/12/96	1118	" "	13.85	"			MS	
8/8/96	0851	" "	14.63	"			MS	
9/6/96	0913	" "	15.61	"			MS	
2/3/97	1315	" "	16.94	"			SM	
5/9/97	0913	" "	13.70	"			PDR	

LOCATION

PROJECT

Golder Associates

D-83

WELL or DATE _____

D-85

WATER LEVEL DATA

WELL LOCATION D-85 MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/14/95	902	ELEC. PROBE	32.34	To PVC			TAL	
2/6/96	1005	" "	26.52	"			MS	
3/4/96	1649	" "	27.13	"			MS	
4/2/96			27.39	"			M-H	
4/30/96	1604	" "	26.08	"			WH	
5/1/96	1735	" "	26.04	"			WH	
5/2/96	1447	" "	25.85	"			WH	
5/3/96	1410	" "	25.80	"			WH	
6/13/96	1354	" "	21.98	"			MS	
7/12/96	1101	" "	22.61	"			MS	
8/8/96	0835	" "	23.29	"			MS	
9/6/96	0928	" "	24.30	"			MS	
2/4/97	0900	" "	25.10	"			SM	
5/9/97	1300	" "	22.39	"			JDR	
8/11/97	1107	" "	24.68	"			JDR	
11/6/97	0825	" "	25.81	"			JDR	
2/10/98	1430	" "	25.53	"			DTS	
5/26/98	1353	" "	21.99	"			JDR	
11/9/98	1226	" "	23.27	"			BFP	
5/14/99	0828	" "	22.11	"			BFP	
11/19/99	1445	" "	26.63	"			BFP	
5/22/00	1147	" "	28.40	"			MAM	

Golder Associates

D-85

D-87

WATER LEVEL DATA

WELL LOCATION D-87 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1215	ELEC. PROBE	31.32	TOPVC			TAC	
2/6/96	0929	" "	32.62	"			MS	
3/4/96	1629	" "	33.12	"			MS	
4/2/96			33.54	"			M-H	
4/30/96	1253	" "	32.71	"			WH	
5/1/96	1416	" "	32.55	"			WH	
5/2/96	1426	" "	32.31	"			WH	
5/3/96	1328	" "	32.22	"			WH	
6/13/96	1304	" "	28.23	"			MS	
7/12/96	1106	" "	28.71	"			MS	
8/8/96	0841	" "	29.39	"			MS	
9/6/96	0936	" "	30.27	"			MS	
2/3/97	1330	" "	31.26	"			SM	
5/9/97	1358	" "	28.55	"			PDR	
5/22/00	1119	"	34.40	"			MAS	

Golder Associates

D-87

WELL or DATE

D-93

WATER LEVEL DATA

WELL LOCATION D-93

MEASURING POINT

ELEVATION: MEASURING POINT

GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1045	ELEC. PROBE	18.74	TO PVC			JAL	
2/6/96	0721	" "	19.66	"			MS	
3/5/96	1357	" "	20.29	"			WH	
4/2/96			20.51	"			M-H	
4/30/96	1518	" "	19.43	"			WH	
5/3/96	1516	" "	18.96	"			WH	
6/13/96	1202	" "	15.29	"			MS	
7/12/96	1008	" "	15.76	"			MS	
8/8/96	0739	" "	16.47	"			MS	
9/6/96	0744	" "	17.30	"			MS	
2/3/97	1558	" "	18.36	"			SM	
5/9/97	0943	" "	15.63	"			PDR	
5/22/00	1612	"	21.32	"			MAM	

WELL or DATE

MW-101 WATER LEVEL DATA

WELL LOCATION MW-101 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1128	ELEC. PROBE	15.78	TO PVC			TAC	
2/6/96	1442	" "	16.50	"			MS	
3/4/96	1311	" "	17.15	"			MS	
4/2/96			17.37	"			M-H	
4/30/96	1502	" "	16.32	"			WH	
5/3/96	1502	" "	15.66	"			WH	
6/13/96	0803	" "	11.55	"			MS	
7/12/96	1036	" "	12.23	"			MS	damaged AC
8/8/96	0800	" "	12.94	"			MS	
9/6/96	0812	" "	13.98	"			MS	
2/3/97	1545	" "	15.23	"			SM	
5/9/97	0917	" "	12.10	"			PDR	

Golder Associates

MW-101

WELL or DATE

MW-102

WATER LEVEL DATA

WELL LOCATION MW-102 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING OEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/05/95	1110	ELEC PROBE	17.04	TO PVC			TAL	
2/5/96	1426	" "	17.80	"			MS	
3/4/96	1306	" "	18.42	"			MS	
4/2/96			18.67	"			M-H	
4/30/96	1508	" "	17.64	"			WH	
5/3/96	1508	" "	17.08	"			WH	
6/13/96	0758	" "	13.12	"			MS	
7/12/96	1016	" "	13.70	"			MS	
8/8/96	0749	" "	14.36	"			MS	
9/6/96	0756	" "	15.34	"			MS	
2/3/97	1520	" "	16.52	"			SM	
5/9/97	0934	" "	13.58	"			PDR	
5/22/00	1552	" "	17.93	"			MA	

Golder Associates

MW-102

WELL or DATE

MW-103

WATER LEVEL DATA

WELL LOCATION MW-103 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/13/95	1204	ELEC. PROBE	8.72'	TO PVC			JAL	NOT MARKED NO CAP
2/6/96	0731	" "	9.81	"			MS	
3/5/96							WH	could not open
3/4/96	1603	" "	10.24	"			MS	
4/2/96			10.61	"			MH	
4/30/96	1523	" "	9.26	"			~~MS~~	WH
5/2/96	1539	" "	8.82	"			~~MS~~	WH
5/3/96	1521	" "	8.70	"			WH	
6/13/96	1159	" "	5.94	"			MS	NO LOCK
7/12/96	1001	" "	6.14	"			MS	NO LOCK
8/8/96	0733	" "	6.82	"			MS	
9/6/96	0737	" "	7.62	"			MS	
2/3/97	1605	" "	8.36	"			SM	
5/9/97	0952	" "	6.12	"			DR	
5/22/00	1615	"	11.50	"			MH	

MW-103

MW-104

WATER LEVEL DATA

WELL LOCATION MW-104 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/13/95	1140	Elec. Probe	9.22	To PVC			JAL	
2/6/96	0742	" "	10.32	"			MS	
3/5/96	1420	" "	10.96	"			~~MS~~	CWH
4/2/96			11.11	"			M-H	
4/30/96	1532	" "	9.98	"			~~MS~~	CWH
5/3/96	1529	" "	9.78	"			WH	
6/13/96	1147	" "	6.56	"			MS	
7/12/96	0951	" "	6.90	"			MS	damaged PC
8/8/96	0721	" "	7.55	"			MS	
9/6/96	0720	" "	8.31	"			MS	
2/3/97	1620	" "	8.94	"			SM	
5/9/97	1005	" "	6.82	"			~~MS~~	
5/22/00	1647	"	12.05	"			MAM	

Golder Associates

MW-104

MW-107

WATER LEVEL DATA

WELL LOCATION MW-107 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

LOCATION

PROJECT

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
12/10/95	1020	ELEC PROBE	6.46	TO PVC			TAC	
2/5/96	1348	" "	6.70	"			MS	
3/4/96	1242	" "	6.66	"			MS	
4/2/96		" "	5.68	"			M-H	
4/30/96	1630	" "	4.83	"			WH	
5/3/96	1652	" "	4.35	"			WH	
6/13/96	0704	" "	4.90	"			MS	
7/12/96	0901	" "	6.29	"			MS	
8/8/96	0643	" "	6.49	"			MS	
9/6/96	0645	" "	6.83	"			MS	
2/3/97	0915	" "	5.30	"			SM	
5/9/97	0843	" "	5.82	"			PDR	

Golder Associates

MW-107

MW-F3

WATER LEVEL DATA

WELL LOCATION MW-F3 MEASURING POINT

ELEVATION: MEASURING POINT GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
12/15/95	1444	EL. PROBE	38.08	TOPVC			JAC	
2/5/96	1552	" "	38.71	"			MS	
3/4/96	1354	" "	39.36	"			MS	
4/2/96			39.60	"			M-H	
~~3/8/96 MW-F3~~	1335	" "	38.49	"			WH	
5/3/96	1602	" "	37.88	"			WH	
6/13/96	0905	" "	33.87	"			MS	
7/12/96	1116	" "	34.54	"			MS	
8/8/96	0915	" "	35.35	"			MS	
9/6/96	0843	" "	36.33	"			MS	
2/3/97	1230	" "	37.38	"			SA	
5/9/97	1316	" "	30.01	"			PDR	(?) error ?
5/22/00	1345	well is broken off					MAH	

LOCATION

PROJECT

Golder Associates

MW-F3

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION MW-F2 [redacted] MEASURING POINT _____

ELEVATION: MEASURING POINT _____ GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
3/5/96	1416	Elec. Pmp	25.10	TOPVC			WH	strong petroleum odor, gas visibly venting
6/13/96	1150	" "	7.77	"			MS	? rdg
7/12/96	0955	" "	20.91	"			MS	
8/8/96	0724	" "	21.45	"			MS	
9/6/96	0727	" "	22.45	"			MS	
2/4/97	1145	" "	23.00	"			SA	
5/9/97	1002	well exposed, no protective csg, no cap, strong pet. odor, not measured						

LOCATION _____

PROJECT _____

Golder Associates

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION SG-1 MEASURING POINT _____

ELEVATION: MEASURING POINT 438.557 MSL GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1451	visual	Dry				MS	
3/4/96	1323	"	Dry				MS	
4/2/96		"	Dry				MH	
4/30/96		" gauge	0.5				WH	
5/3/96		"	Dry				WH	
6/13/96	0807	"	3.1				MS	
7/12/96	1041	"	2.0				MS	
8/8/96	0805	"	1.4				MS	
9/6/96	0824	"	dry				MS	
2/3/97	1552	"	dry				MS	
5/9/97	0900	"	2.00				[illegible]	
5/22/00	1355	"	dry	"			MAM	

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION SG-2 MEASURING POINT _____

ELEVATION: MEASURING POINT 438.84 MSL GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1451	visual	dry				MS	
3/4/96	1323	"	dry				MS	
4/2/96		"	dry				MS	
5/3/96		"	dry				WH	
6/13/96	0807	"	2.79				MS	
7/12/96	1041	"	1.8				MS	
8/8/96	0805	"	1.2				MS	
9/6/96	0824	"	dry				MS	
2/3/97	1552	"	dry				SM	
5/9/97	0900	"	1.85				PDR	
5/22/00	1355	"	dry	"			MAM	

LOCATION

PROJECT

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION SG-3 MEASURING POINT _____

ELEVATION: MEASURING POINT 440.73 msl GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1457	Visual	Dry				MS	
3/4/96	1325	"	Dry				MS	
4/2/96		"	Dry				M-H	
4/30/96			could not read - below gauge				W/H	
6/13/96	0809	"	1.9				MS	
7/12/96	1043	"	~ -0.1				MS	
8/8/96	0808	"	~ -0.7				MS	
9/6/96	0819	"	dry				MS	
2/9/97	1551	"	dry				SM	
5/9/97	0900	"	dry				[illegible]	

LOCATION

PROJECT

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION SG-4 MEASURING POINT _____

ELEVATION: MEASURING POINT 441.05 msl GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1451	Visual	Dry				MS	
3/4/96	1325	"	Dry				MS	
4/2/96		"	Dry				MH	
4/30/96		Gauge	2.5' below	bottom of gauge ft			WH	
5/3/96		"	3.5' below	" "	"		WH	
6/13/96	0809	"	1.7				MS	
7/12/96	1043	"	~0.3				MS	
8/8/96	0808	"	~-0.9				MS	
9/6/96	0819	"	dry				MS	
2/3/97	1551	"	dry				SM	
5/9/97	0900	"	dry				DR	

LOCATION _____

PROJECT _____

Golder Associates

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION SG-5 MEASURING POINT _____

ELEVATION: MEASURING POINT 460.94 msl GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1545	Visual	Dry				MS	
3/4/96	1359	"	Dry				MS	
4/2/96		"	Dry				M-H	
4/30/96							WH	0.02 below top of gauge
5/3/96	1600	"					WH	0.05 below top of gauge
6/13/96	0901	"	2.4				MS	
7/2/96	1127	"	Dry				MS	
8/8/96	0856	"	Dry				MS	
9/6/96	0855	"	dry				MS	
2/3/97	1225	"	dry				JM	
5/9/97	1347	"	dry				AR	
5/22/00	1330		dry				MAM	

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION SG-6 (5 gauge) MEASURING POINT _____

ELEVATION: MEASURING POINT 437.28 msl GROUND LEVEL _____

LOCATION _____

PROJECT _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1415	visual	dry				MS	
3/4/96	1248	"	dry				MS	
4/2/96		"	dry				M.N	
4/30/96		gauge	0.9				WH	
5/1/96	1420	"	1.0				WH	
5/2/96	1440	"	1.0				WH	
5/3/96	1514	"	1.0				WH	
6/13/96	0732	"	1.7				MS	
7/12/96	1010	"	1.8				MS	
8/8/96	0741	"	1.0				MS	
9/6/96	0746	"	dry				MS	
2/1/97	1555	"	0.6				SM	
5/9/97	0942	"	1.65				DR	
5/22/00	1551		dry				MH	

Golder Associates

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION SG-7 (N gauge) | MEASURING POINT _____

ELEVATION: MEASURING POINT 437.01 msl | GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
2/5/96	1115	visual	dry				MS	
3/4/96	1248	"	Dry				MS	
4/2/96		"	Dry				M-M	
4/30/96		gauge	1.0				WH	
5/1/96	1450	"	1.2				WH	
5/2/96		"	1.2				WH	
5/3/96	1514	"	1.2				WH	
6/13/96	0732	"	1.9				MS	
7/12/96	1010	"	2.0				MS	
8/8/96	0741	"	1.2				MS	
9/6/96	0746	"	~0.4				MS	
2/3/97	1555	"	0.8				SA	
5/9/97	0941	"	2.00 - gauge not securely fastened to post				PR	
5/22/00	1554		dry				MAM	

LOCATION

PROJECT

WATER LEVEL DATA

WELL LOCATION SG 8, 11 Southern Staff Gauges

MEASURING POINT

ELEVATION: MEASURING POINT [illegible]

GROUND LEVEL

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH'	WATER LEVEL ELEVATION	BY	COMMENTS
SG	1538	gauge	1.68				BR	ice
SG	1538	gauge	1.68				BR	ice
SG 2/5/96	1329	"	1.78				MS	ice, ambient
3/4/96	1220	"	Dry				MS	
3/5/96	1507	"	1.6'				WH	
			Repaired and resurveyed 3/25/96					
		New 5' elevation SG-8 = 435.38						
		Note that gauge now leans ~20° from vertical.						
(A) To calculate w.l. elevation, use: 435.38 [(5.0 - 5.0 reading) * sin 70]								
4/2/96	1503	gauge	3.52	see (A)		433.99	MRS	windy, waves
4/30/96	1216	"	2.50	"			WH	
5/1/96		"	2.57	"			WH	
5/2/96	1310	"	2.57	"			WH	
5/3/96	1220	"	2.54	"			WH	
6/13/96	0940	"	3.38	"			MS	
7/12/96	0905	"	3.39	"			MS	
8/8/96	0650	"	2.64	"			MS	
9/6/96	0649	dry					MS	
2/3/97	0930	dry @	2.10				MS	
5/9/97	1618	gauge	4.40	"			WR	

Golder Associates

WELL or DATE _____

WATER LEVEL DATA

WELL LOCATION 56-9 Northern Staff Gauge

MEASURING POINT _____

ELEVATION: MEASURING POINT 5' marker 435.49

GROUND LEVEL _____

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS
Repaired and resurveyed.								
(B) To calculate w.l. elevation, use: 435.49 − (5.0 − S.G. reading)								
4/2/96	1503	gauge	3.48	see (B)		433.97	MRS	waves & wind
4/30/96	1216	"	2.49	"		"	WH	
5/1/96		"	2.56	"		"	WH	
5/2/96	1310	"	2.56	"		"	WH	
5/3/96	1230	"	2.53	"		"	WH	
6/13/96	0940	"	3.35	"			MS	
7/12/96	0905	"	3.37	"			MS	
8/8/96	0850	"	2.62	"			MS	
9/6/96	0649	"	dry @ ~1.8	"			MS	
3/31/97	0930	" dry @	2.08				MS	
5/9/97	1618	gauge	4.35	"			DR	

LOCATION _____

PROJECT _____

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Brian J. Power / Mike Spurgeon

Well ID	Date	Time	Top of Casing Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)	Total Depth	Notes
I68	5/20/02	1231	441.91	17.48	424.43	40.51	
PZ-114-AS	5/20/02	1236	451.31	17.55	433.76	26.37	
PZ-115-SS	5/20/02	1238	452.3	12.9	439.4	80.81	
PZ-208-SS	5/20/02	1244	474.25	23.18	451.07	100.31	
PZ-100-SS	5/20/02	1248	485.84	41.09	444.75	89.05	
PZ-100-SD	5/20/02	1251	485.82	41.76	444.06	96.2	
PZ-100-KS	5/20/02	1253	485.64	29.03	456.61	NA	
D-85	5/20/02	1306	457.13	24.49	432.64	81.11	
S-84	5/20/02	1309	456.23	24.25	431.98	35.65	
PZ-207-AS	5/20/02	1314	463.57	30.72	432.85	39.99	
PZ-113-SS	5/20/02	1320	461.77	29.5	432.27	160.39	
PZ-113-AD	5/20/02	1323	461.46	29.21	432.25	109.94	
PZ-113-AS	5/20/02	1325	461.42	29.29	432.13	38.84	
D-3	5/20/02	1331	470.32	37.45	432.87	109.05	
I-4	5/20/02	1333	468.57	35.81	432.76	79.91	
S-5	5/20/02	1335	468.65	35.41	433.24	44.79	
PZ-111-SD	5/20/02	1350	461.55	30.88	430.67	196.52	
PZ-111-KS	5/20/02	1352	460.87	6.75	454.12	NA	
DF-1	5/20/02	1400	NA	NA	NA	NA	Casing is bent
SF-1	5/20/02	1402	NA	29.49	NA	32.51	
PZ-110-SS	5/20/02	1408	458.91	28.05	430.86	107.05	
PZ-206-SS	5/20/02	1410	460.2	28.21	431.99	126.74	
PZ-305-AI	5/20/02	1416	459.28	27.29	431.99	64.82	
LR-104	5/20/02	1418	459.73	27.82	431.91	40.05	
PZ-108-SS	5/20/02	1430	456.2	NA	NA	NA	well surrounded by 3ft of mud
PZ-109-SS	5/20/02	1442	458.5	25.75	432.75	130.55	
I-73	5/20/02	1447	461.39	29.45	431.94	50.39	

Herst & Associates, Inc. 5988 Mid Rivers Mall Drive, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Brian J. Power / Mike Spurgeon

Well ID	Date	Time	Top of Casing Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)	Total Depth	Notes
PZ-205-AS	5/20/02	1456	460.99	28.56	432.43	50.16	
PZ-205-SS	5/20/02	1458	461.78	27.54	434.24	92.87	
PZ-107-SS	5/20/02	1503	464.66	32.35	432.31	103.92	
PZ-106-SD	5/20/02	1509	463.24	29.45	433.79	195.78	
PZ-106-KS	5/20/02	1511	464.26	7.11	457.15	NA	
PZ-106-SS	5/20/02	1514	462.7	28.64	434.06	160.98	
PZ-105-SS	5/20/02	1540	483.61	38.29	445.32	144.54	
PZ-203-SS	5/20/02	1546	486.59	40.41	446.18	111.2	
PZ-104-KS	5/20/02	1550	484.04	21.43	462.61	NA	
PZ-104-SD	5/20/02	1552	483.69	38.72	444.97	119.85	
PZ-104-SS	5/20/02	1553	483.63	39.89	443.74	139.98	
PZ-1201-SS	5/20/02	1557	NA	39.55	NA	149.98	
PZ-202-SS	5/20/02	1600	481.17	16.51	464.66	84.99	
PZ-116-SS	5/20/02	1624	484.87	44.39	440.48	149.59	
MW-1204	5/20/02	1626	485.63	47.55	438.08	173.06	
PZ-204-SS	5/20/02	1645	469.63	20.91	448.72	87.85	
PZ-204A-SS	5/20/02	1647	468.16	12.54	455.62	85.29	
S-88	5/20/02	1707	462.76	30.61	432.15	42.43	
LR-103	5/20/02	1715	461.28	29.1	432.18	40.61	
PZ-200-SS	5/20/02	1725	485.63	38.12	447.51	99.49	
PZ-102-SS	5/20/02	1735	483.85	40.83	443.02	91.42	
PZ-101-SS	5/20/02	1741	476.68	39.32	437.36	141.29	
PZ-103-SS	5/20/02	1756	480.17	42.89	437.28	146.25	
PZ-102R-SS	5/21/02	1004	485.58	37.23	448.35	92.18	
PZ-112-AS	5/21/02	1033	NA	27.14	NA	35.63	
PZ-201A-SS	5/21/02	1035	480.16	35.24	444.92	NA	

Herst & Associates, Inc. 5988 Mid Rivers Mall Drive, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton CF

Personnel: Brian J Power / Mike Spurgeon

Well ID	Date	Time	Top of Casing Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)	Notes
I68	5/20/02	1231		17.48	40.51	
PZ114 AS		1236		17.55	26.37	
PZ 115-55		1238		12.90	80.81	
PZ-208-55		1244		23.18	100.31	
PZ-100-SS		1248		41.09	89.05	
PZ-100-SD		1251		41.76	96.20	
PZ-100-KS		1253		29.03		
D-85		1306		24.49	81.11	
S-84		1309		24.25	32.65	
PZ-207-AS		1314		30.72	39.99	
PZ 113-SS		1320		29.50	160.39	
PZ-113-SD		1323		29.21	109.94	
PZ-113-AS		1325		29.29	38.84	
D-3		1331		37.45	109.05	
I-4		1333		35.81	79.91	
S-5		1335		35.41	44.79	
PZ112-AS		1347	—	—		could not get w/L due to strongly water
PZ-111 SD		1350	30.88	196.52		
PZ-111KS		1352	6.75	—		too deep for our probe to measure TD.
PF 1		1400	—	—		Casing u bent cannot get a w/L.
SF1		1402	29.49	32.51		
PZ-110-SS		1405	28.05	107.05		
PZ-206SS		1410	28.21	126.74		
PZ-305AL		1414	27.29	64.82		
LR-104		1418	27.82	~~39.87~~ 40.05		
PZ-108SS		1430	—	—		unable to collect w/l, surrounded by ~3 Ft of mud.
PZ-109SS		1442	25.75	130.55		
I-73		1447	29.45	50.39		

Herst & Associates, Inc. 5988 Mid Rivers Mall Drive, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site:

Personnel:

Well ID	Date	Time	Top of Casing Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)	Notes
PZ205AS	5-20-02	1456		28.56	50.16	
PZ105SS	"	1458		27.54	92.87	
PZ-107SJ	"	1503		32.35	103.92	
PZ-106SD		1509		29.45	195.78	
PZ-106KS		1511		7.11	—	too deep for our pump NO TD.
PZ-106SS		1514		28.64	160.98	
PZ-105SS		1540		38.29	144.54	
PZ-203SS		1542		40.41	111.20	
PZ-104KS		1550		21.43	—	too deep for T.D
PZ-104SD		1552		38.72	119.85	
PZ-104SS		1553		39.89	139.98	
PZ-120SS		1557		39.55	149.88	
PZ-202SS		1600		16.31	84.99	
PZ-116SJ		1624		44.39	149.59	
MW-1204		1626		47.55	173.06	
PZ204SS		1645		20.91	87.85	
PZ-204A-SS		1647.		12.54	85.29	
5-88		1707		30.61	42.43	
LL103		1715		29.10	40.61	
PZ-200SS		1725		38.12	99.49	
PZ-102SS		1735		40.83	91.42	
PZ-101S		1741		39.32	141.29	
PZ-103SS	5/20/02	1746		42.89	146.25	
PZ102RSS	5/21/02	1004		37.23	92.18	
PZ102-AS	5/21/02	1033		27.14	35.63	
PZ-201ASS		1035		35.24		
~~PZ-107SS~~		~~1040~~				

Herst & Associates, Inc. 5988 Mid Rivers Mall Drive, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski, Timothy Ewing

Well ID	Date	Time	Top of Casing Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)	Notes
PZ-114-AS	11/18/2002	1118	451.31	21.66	429.65	
PZ-115-SS	11/18/2002	1120	452.3	19.2	433.1	
I-68	11/18/2002	1135	441.98	21.05	420.93	
PZ-208-SS	11/18/2002	1146	474.25	26.89	447.36	
PZ-100-SD	11/18/2002	1153	485.82	50.68	435.14	
PZ-100-KS	11/18/2002	1155	485.64	30.34	455.3	
PZ-100-SS	11/18/2002	1158	485.84	51.61	434.23	
PZ-200-SS	11/18/2002	1204	485.63	44.57	441.06	
PZ-201A-SS	11/18/2002	1211	480.16	41.15	439.01	
PZ-102R-SS	11/18/2002	1222	485.58	37.46	448.12	
PZ-102-SS	11/18/2002	1250	483.85	49.77	434.08	
PZ-103-SS	11/18/2002	1256	480.17	52.51	427.66	
PZ-204A-SS	11/18/2002	1347	468.16	16.04	452.12	
PZ-204-SS	11/18/2002	1350	469.63	26.26	443.37	
PZ-106-KS	11/18/2002	1356	464.26	7.13	457.13	
PZ-106-SD	11/18/2002	1359	463.24	40.05	423.19	
PZ-106-SS	11/18/2002	1402	462.7	37.32	425.38	
PZ-116-SS	11/18/2002	1407	484.87	53.14	431.73	
MW-1204	11/18/2002	1409	485.63	92.94	392.69	
PZ-105-SS	11/18/2002	1417	483.61	45.84	437.77	
PZ-203-SS	11/18/2002	1424	486.59	48.09	438.5	
PZ-202-SS	11/18/2002	1431	481.17	19.51	461.66	
PZ-1201-SS	11/18/2002	1440	NA	50.79	NA	
PZ-104-SS	11/18/2002	1450	483.63	44.63	439	
PZ-104-SD	11/18/2002	1454	483.69	46.57	437.12	
PZ-104-KS	11/18/2002	1456	484.04	23.41	460.63	
PZ-107-SS	11/18/2002	1510	464.66	35.22	429.44	

Herst & Associates, Inc. 4630 S. Hwy 94-North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski, Timothy Ewing

Well ID	Date	Time	Top of Casing Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)	Notes
PZ-205-SS	11/18/2002	1517	461.78	32.53	429.25	
PZ-205-AS	11/18/2002	1519	460.99	31.24	429.75	
I-73	11/18/2002	1525	461.39	32.02	429.37	
PZ-108-SS	11/18/2002	1531	456.2	36.58	419.62	Well appears to have been raised
PZ-109-SS	11/18/2002	1535	458.5	36.06	422.44	
PZ-206-SS	11/18/2002	1542	460.2	31.59	428.61	
LR-104	11/18/2002	1545	459.73	30.31	429.42	
PZ-305-AI	11/18/2002	1548	459.28	29.86	429.42	
PZ-110-SS	11/18/2002	1602	458.91	30.91	428	
PZ-111-SD	11/18/2002	1610	461.55	32.05	429.5	
PZ-111-KS	11/18/2002	1613	460.87	6.27	454.6	
MW-FI-S	11/18/2002	1615	NA	32.18	NA	
MW-FI-D	11/18/2002	1617	NA	NA	NA	casing bent over
PZ-113-AD	11/18/2002	1630	461.46	32.33	429.13	
PZ-113-AS	11/18/2002	1632	461.42	32.26	429.16	
PZ-113-SS	11/18/2002	1635	461.77	32.45	429.32	
D-3	11/18/2002	1640	470.32	40.4	429.92	
I-4	11/18/2002	1642	468.57	38.49	430.08	
S-5	11/18/2002	1645	468.65	37.78	430.87	
PZ-207-AS	11/18/2002	1651	463.57	34.05	429.52	
D-85	11/18/2002	1657	457.13	27.83	429.3	
S-84	11/18/2002	1700	456.23	27.62	428.61	
PZ-112-AS	11/19/2002	928	NA	30.38	NA	New lock-well cut down 3.75" by Randy to close
S-88	11/19/2002		NA	NA	NA	casing bent over
LR-103	11/19/2002		461.28	32.27	429.01	
PZ-101-SS	11/19/2002		NA	NA	NA	has been raised ~10ft- unable to get W.L

Herst & Associates, Inc. 4630 S. Hwy 94-North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton

Personnel: Tim Ewing Mike Antes

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes TD
PZ104S	5-27-03	946	23.95		414.98
PZ104D	5-27-03	1003	59.28		
PZ104SS	5-27-03	1005	59.24		
~~DUP~~					
PZ1201SS	5-27-03	1013	67.86		149.98
PZ202-SS	5-27-03	1028	20.35		T.O.P.
PZ203SS	5-27-03	1035	60.82		111.33
PZ105SS	5-27-03	1045	59.91		T.O.P.
PZ116SS	5-27-03	1056	76.53		T.O.P.
~~MW~~ MW1204	5-27-03	1059	102.53		
~~PZ201SS~~					
~~PZ204ASS~~					
PZ106-SS	5-27-03	1200	51.03		T.O.P.
PZ106SD	5-27-03	1205	53.78		T.O.P.
PZ106KSS	5-27-03	1210	8.84		T.O.P.
PZ107SS	5-27-03	1213	36.94		103.91
PZ205-SS	5-27-03	1223	36.51		
PZ205AS	5-27-03	1225	33.09		50.11
PZ108SS	5-27-03	1233	53.26		148.02
PZ109SS	5-27-03	1240	60.08		T.O.P.
PZ206SS	5-27-03	1246	37.66		126.69
LR104	5-27-03	1256	32.30		40.10
I73	5-27-03	1304	12.16		50.46
LR103	5-27-03	1326	33.66		44.58
PZ110SS	5-27-03	1332	34.23		T.O.P

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton

Personnel: Tim Ewing Michael Antes

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	T.D. Notes ~~D.T.B~~
DF1	5/27/03				Damaged
SF1			DRY		Methane 32.55
P2111SS		1343	34.61		
P2112AS		1344	31.60		35.33
O-3		1358	42.03		109.29
I-4		1402	40.12		79.95
S-5		1408	38.95		45.25
P2113AS		1413	33.96		39.16
P2113AD		1415	34.03		110.00
P2113SS		1420	34.19		160.30
P2207AS		1435	35.72		40.03
S-84		1442	29.34		32.80
D-85		1445	29.85		81.19
I-68		1452	22.87		40.64
P2114AS		1455	23.67		T.O.P 500 ppm CH4
P2115SS		1500	22.24		T.O.P.
P2100KS		1510	32.86		~~34~~ 39.09
P2100SD		1518	65.31		T.O.B.
P2100SS		1520	61.92		T.O.P
P2101SS		1530	72.93		
~~P2200SS~~		~~1537~~			
P2102RSS		1542	24.09		91.08
P2102SS		1546	56.14		92.37
P2201ASS		1552	54.28		T.O.P.
P2103SS		1556	73.25		

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Tim Ewing Michael Antes

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	T.D. Notes
PZ208SS	5-27-03	1607	28.95		100.26
PZ204ASS	5-28-03		17.23		25.46
PZ204SS	5-28-03		41.63		87.91
PZ206SS	5-28-03		50.31		99.42
PZ104SS	5-28-03		58.12		T.O.P.

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Timothy Ewing Todd Loethler

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes
					TD
I-68	11-19-03	0923	22.59	~~40.70~~ 22.87	40.70
P2-115-SS		0932	16.35	~~81.05~~ 22.24	81.05
P2-114-AS		0934	23.01	~~26.02~~ 23.67	26.02
S-84		0946	29.01	29.34	32.82
D-85		0944	29.30	29.55	81.23
P2-207-AS		0954	35.40	35.72	40.05
P2-113-SS		1000	34.00	34.19	160.45
P2 113 AD		1003	33.75	34.03	109.99
P2-113-AS		1007	33.67	33.96	39.18
P2-112-AS		1009	31.38	31.60	35.34
D-3		1019	41.85	42.03	109.29
I-4		1040	39.87	40.12	79.98
S-5		1044	38.92	38.95	45.39
LR-103		1100	33.42	33.66	40.60
P2-111-SD		1105	33.36	34.61	196.66
P2-111-KS		1113	6.26	6.27	372.19
D-F1		1121			damaged
S-F1		1122	dry @ ~~32.58~~		32.58
P2 208-SS		1236	24.46	~~53.26~~ 28.93	100.29
P2 110-SS		1253	31.66	34.23	107.21
P2 109SS		1300	22.63	60.08	130.64
P2 108-SS		1310	22.04	53.26	148.04
P2-206-SS		1325	29.94	37.66	126.70
LR 104		1334	31.78	32.30	41.02
P2-105-AS		1337	31.23	29.86	64.95

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

V

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Timothy Ewing Todd Loeffler

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes
I-73	11/19/03	1345	14.81	5 12.16	~~50.42~~ 50.42
P2-205-SS		1355	31.44	36.51	92.80
P2-205-AS		1358	32.08	33.09	51.00
P2-107-SS		1403	36.30	36.94	103.93
P2-106-SS		1409	24.10	51.03	161
P2-106-SD		1415	25.10	53.73	126.03
P2-106-KS		1421	6.53	8.84	379.21
M 1204		1441	45.40	102.53	226.30
P2 116-SS		1446	38.38	76.53	150.00
RZ 105 SS		1457	34.78	59.91	144.65
P2-203-SS		1515	36.95	60.82	111.38
P2 104 KS		1522	21.42	23.95	414.74
P2 104 SD		1525	34.59	59.28	120.41
P2 104 SS		1529	34.10	59.24	140.28
P2 202-SS		1536	16.98	~~73.25~~	85.07
P2 103 SS		1545	37.06	73.25	146.33
P2-201A-SS		1600	31.70	54.28	86.30
P2-102-SS		1606	36.19	56.14	91.42
P2-102R-SS		1608	33.47	24.09	91.09
P2-101SS		1612	51.94	72.93	155.58
P2-100-SS		1626	38.73	61.42	89.30
P2-100-SD		1629	40.09	65.31	96.12
P2-100-KS		1631	28.18	32.86	389.25
P2-204A-SS		1700	11.76	17.23	85.49
P2-204-SS		1704	17.35	41.63	87.95

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Timothy Ewing Todd Loeffler

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes
P2-200-SS	11-19-03	well is now a GMP; can't take W.L.			
P2-1201-SS		could not remove well cap; no W/L taken			
S-88		destroyed by asphault operations			

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: West Lake OU2

Personnel: Shane Tamborski Tim Ewing

Well ID	Date	Time	Depth to Water (ft)	~~Depth to Water Previous Event~~ TOC. ~~(ft)~~	Notes
					TD
PZ 303AS	12-11-03	1015	25.75	453.71	29.16
PZ 303AS	12-11-03	1025	25.17	453.18	28.82 - oil sheen on probe w/odor
PZ 302AI	12-11-03	1036	23.10	451.15	44.16
PZ 302AS	12-11-03	1042	23.29	451.42	24.44
PZ 304AI	12-11-03	1110	26.09	454.02	52.08 lock cut-new lock added
MW-F2	12-11-03				Unable to locate well
					looked for on 12/11, 12/12, 12/15
TOC's were	taken from	Physical	Characterization	Technical	Memorandum
	West	Lake	OU-2		
	Volume	III	Appendicies		
		July	96'		

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Westlake OU1

Personnel: Timothy Ewing Joe Grib

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes Total Depth
S-1	3-23-04	1011	18.01	16.94	25.98
I-2		1014	17.95	16.90	53.00
S-82		1046	21.60	15.73	25.50
D-93		1048	21.52	15.63	114.49
I-9		1051	22.45	16.52	56.97
I-11		1116	51.85	45.53	~~58~~ 94.30
S-10		1119	51.81	45.57	56.73
D-12		1121	51.52	45.2	148.48
S-61		1153	21.40	15.14	26.13
D-13		1305	42.54	36.08	136.00
D-3		1318	41.09	35.60	109.17
I-4		1324	39.20	33.75	79.97
S-5		1326	37.98	33.56	45.38
D-85		1331	28.65	22.39	81.20
S-84		1336	28.40	22.15	32.83
I-68		1340	21.87	15.78	40.70
D-6	3/25/04	0945	19.24	13.04	108.16
MW-102	3/25/04	1135	19.79	13.58	26.38

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Tim Ewing Todd Loeffler

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes
P2-114-AS	5-10-04	927	21.76	23.01	26.29
P2-115-SS	5-10-04	930	19.90	16.35	80.76
P2-113-SS	5-10-04	937	32.30	34.00	160.30
P2-113-AS	5-10-04	940	32.04	~~35.40~~ 33.67	39.20
P2-113-AD	5-10-04	942	32.20	33.75	110.00
P2-112-AS	5-10-04	948	29.74	31.38	35.34
P2-111-KS	5-10-04	955	5.98	6.26	369.73
P2-111-SD	5-10-04	1001	32.38	33.36	196.60
P2-110-SS	5-10-04	1007	31.95	31.66	187.00
P2-109-SS	5-10-04	1013	45.95	22.63	130.97
P2-108-SS	5-10-04	1028	37.28	22.04	148.00
P2-206-SS	5-10-04	1034	31.50	29.94	126.63
~~P2-305-AS~~ LR-104	5-10-04	1038	30.33	31.78	40.12
~~LR-104~~ P2-305-BS	5-10-04	1039	29.80	31.23	64.93
T-73	5-10-04	1047	10.17	14.81	50.45
P2-205-SS	5-10-04	1053	31.70	31.44	92.87
P2-205-AS	5-10-04	1058	30.95	32.08	50.10
P2-107-SS	5-10-04	1110	34.77	36.30	103.90
P2-106-SS	5-10-04	1116	47.27	24.10	161.19
P2-106-SD	5-10-04	1118	28.35	25.10	196.00
P2-106-KS	5-10-04	1121	6.37	6.53	374.73
P2-204-SS	5-10-04	1313	21.10	17.35	79.91
P2-204A-SS	5-10-04	1318	13.33	11.76	85.45
MW-1204	5-10-04	1331	47.78	45.40	171.54
P2-116-SS	5-10-04	1341	43.50 ~~42.~~	~~43.50~~ 38.38	149.70

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Tim Ewing, Todd Loeffler

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes
PZ-105-S	5-10-04	1346	36.30	34.78	144.30
PZ104SD	5-10-04	1404	35.92	34.59	120.30
PZ-104-SS	5-10-04	1406	36.14	34.10	142.27
PZ-104-KS	5-10-04	1410	21.32	~~23.95~~ 21.42	409.00
PZ203SS	5-10-04	1423	37.85	36.95	111.30
PZ202SS	5-10-04	1430	16.93	16.98	85.04
PZ103SS	5-10-04	1448	54.45	37.06	146.29
PZ-201A-SS	5-10-04	1454	41.93	31.70	85.98
PZ-102R-SS	5-10-04	1458	40.27	33.47	91.07
PZ-102-SS	5-10-04	1501	48.30	38.19	91.40
PZ 101-SS	5-10-04	1505	69.90	51.94	155.45
PZ100-SS	5-10-04	1520	53.35	38.73	89.30
PZ-100-SD	5-10-04	1522	53.27	40.09	96.39
PZ-100-KS	5-10-04	1525	~~29~~.12	28.18	385.18
LR103	5-10-04	1552	31.63	33.42	40.60
S-88	5-10-04	~~1620~~	~~26.42~~	N/A	Damaged
PZ208SS	5-10-04	1620	26.42	24.46	102.49

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: West Lake OU-1 and OU-2 (Bridgeton, MO)

Personnel: Brett D. Shank / Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes
I-68	5-10-04	0952	21.04	21.91	TD = 40.80
S-84	5-10-04	1005	27.46	28.12	TD = 32.90
D-85	5-10-04	1008	27.74	28.37	TD = 81.19
D-3	5-10-04	1020	40.19	40.87	TD = 109.31
I-4	5-10-04	1029	38.24	38.93	TD = 79.96
S-5	5-10-04	1032	37.42	45.38	TD = 45.36
I-11	5-10-04	1055	50.91	51.84	TD = 94.33
S-10	5-10-04	1058	50.87	51.80	TD = 56.72
D-12	5-10-04	1102	50.48	51.46	TD = 148.47
S-61	5-10-04	1146	20.44	21.38	TD = 26.29
P2302AS	5-10-04	1208	21.56	~~24.46~~ 23.29 BOS	TD = 24.46
P2302AI	5-10-04	1211	21.39	23.06	TD = 44.16
P2303AS	5-10-04	1219	23.42	25.19	TD = 28.20
P2304AI	5-10-04	1226	24.33	26.09	TD = 52.11
P2304AS	5-10-04	1230	24.06	25.79	TD = 29.22
S-82	5-10-04	1250	20.65	25.50	TD = 25.51
D-93 ~~I-9~~	5-10-04	1253	20.52	21.22	TD = 114.45
I-9	5-10-04	1257	21.45	22.13	TD = 57.01
I-2	5-10-04	1320	16.98	17.91	TD = 52.99
S-1	5-10-04	1324	17.02	17.98	TD = 25.98
D-6	5-10-04	1342	18.31	19.24	TD = 108.23
MW102	5-10-04	1347	18.82	19.79	TD = 26.45
D-13	5-10-04	1411	41.54	42.50	TD = 136.04

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton L.F.

Personnel: Shane Tamborski / Joe Grib

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Notes TD
I-73	11/16/04	1025	13.55	10.17	55.00
P2205SS	11/16/04	1030	31.00	31.70	92.78
P2205AS	11/16/04	1035	30.82	30.95	51.50
P2107SS	11/16/04	1040	34.81	34.77	104.10
P2106SS	11/16/04	1050	23.42	47.27	161.31
P2106SD	11/16/04	1055	24.41	28.35	196.10
P2106KS	11/16/04	1100	6.75	6.37	>300ft last event-374.73
P2204SS	11/16/04	1107	17.30	21.10	88.01
P2204ASS	11/16/04	1110	7.80	13.33	83.70
MW1204	11/16/04	1118	44.18	47.73	171.50
P2116SS	11/16/04	1125	39.33	43.50	150.30
P2105SS	11/16/04	1132	34.00	36.30	145.00
P2120SS	11/16/04	1140			unable to open well
P2104SS	11/16/04	1145	33.12	36.14	145.80
P2104SD	11/16/04	1147	33.37	35.92	120.14
P2104KS	11/16/04	1150	21.44	21.32	>300ft last event - 409.00
P2203SS	11/16/04	1207	35.55	37.85	111.44
P2103SS	11/16/04	1200	47.11	54.45	146.48
P2202SS	11/16/04	1211	16.78	16.43	85.22
P2102SS	11/16/04	1217	46.00	48.30	91.45
P2102KSS	11/16/04	1220	36.38	40.27	91.18
P2101SS	11/16/04	1225	65.07	69.90	157.70
P2201ASS	11/16/04	1235	37.98	41.93	86.33
P2201SS	11/16/04	1242	42.80	N/A	99.60 labeled-GMW-7-not done 2 last event
P2100SS	11/16/04	1248	46.22	53.35	89.13

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton L.F.

Personnel: Shane Tamborski / Joe Grib

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	T.D.	Notes
PZ100SD	11/16/04	1250	48.50	53.27	96.87	
PZ100KS	11/16/04	1255	28.97	29.12	>300ft	lastevent - 385.18
PZ108SS	11/16/04	1300	25.82	26.42	103.33	
PZ114AS	11/16/04	1305	21.42	21.76	26.33	
PZ115SS	11/16/04	1310	19.17	19.30	~~82.7~~ 80.87	S.T.
I-68	11/16/04	1312	20.70	S.T. ~~N/A~~ 21.04	40.75	S.T. ~~not measured last event~~
S-84	11/16/04	1315	27.18	S.T. ~~N/A~~ 27.48	32.92	S.T. ~~not measured last event~~
D-85	11/16/04	1320	27.94	S.T. ~~N/A~~ 27.74	81.03	S.T. ~~not measured last event~~
PZ207AS	11/16/04	1325	33.63	N/A	40.08	~~not measured last event~~
PZ113SS	11/16/04	1410	32.19	32.30	160.48	
PZ113AD	11/16/04	1414	31.96	32.20	110.12	
PZ113AS	11/16/04	1420	31.90	32.04	39.22	
D-3	11/16/04	1425	40.08	40.19	109.42	
I-4	11/16/04	1435	38.08	38.24	80.02	
S-5	11/16/04	1440		37.42	unable to get locking cap open	
PZ112AS	11/16/04	1448	33.25	29.74	38.98	
PZ111SD	11/16/04	1455	36.63	32.38	191.22	
PZ111KS	11/16/04	1502	11.05	5.98	>300ft	lastevent - 389.73
PZ110SS	11/16/04	1507	31.28	31.95	107.35	
PZ109SS	11/16/04	1515	40.45	45.95	131.08	
PZ108SS	11/16/04	1520	31.25	37.28	148.13	
PZ305AD	11/16/04	1530	29.61	29.80	65.02	
LR104	11/16/04	1535	30.02	30.33	40.14	
PZ206SS	11/16/04	1540	30.62	31.50	126.83	
LR103	11/16/04	1550	31.74	31.63	40.68	

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC. ®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Ann Miller and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Top of Pump (ft)	Top of Pump Previous Event (ft)	Notes
D-3	5-23-05	1104	39.50	40.08	109.00	109.42	TD Double checked - soft
D-85	"	1736	27.26	27.44	81.00	81.03	TD
I-4	5-23-05	1108	37.42	38.08	79.55	80.02	TD
I-68	"	1745	20.52	20.70	40.79	40.75	TD
I-73	"	1252	9.50	13.55	50.40	55.00	TD
LR-103	"	1312	31.45	31.74	40.70	40.68	TD
LR-104	"	1239	29.92	30.02	40.40	40.14	TD
MW-F1S	NA	NA	NA	NA	NA	NA	Does not exist
MW-F1D	NA	NA	NA	NA	NA	NA	Does not exist
MW-1204	"	1442	45.90	44.18	171.60	171.50	Top of Pump
PZ-100-KS	"	1639	30.80	28.97	391.00	>300	TD
PZ-100-SD	"	1636	58.00	48.50	96.25	96.87	Top of Pump
PZ-100-SS	"	1634	56.39	46.22	89.30	89.13	Top of Pump
PZ-101-SS	"	1616	76.60	65.07	155.68	157.70	TD - Double checked
PZ-102-SS	"	1607	48.45	46.00	91.43	91.45	TD
PZ-102R-SS	"	1610	40.90	36.38	91.19	91.18	TD
PZ-103-SS	"	1539	54.95	47.11	146.40	146.48	TD
PZ-104-KS	"	1513	22.00	21.44	415.30	>300	TD
PZ-104-SD	"	1519	36.10	33.37	120.42	120.14	Top of Pump
PZ-104-SS	"	1521	35.15	33.12	142.00	145.80	Top of Pump Double checked
PZ-105-SS	"	1459	36.90	34.00	144.75	145.00	Top of Pump
PZ-106-KS	"	1427	7.00	6.75	378.80	>300	TD
PZ-106-SD	"	1423	32.48	24.41	195.90	196.10	Top of Pump
PZ-106-SS	"	1419	30.85	23.42	161.10	161.31	Top of Pump
PZ-107-SS	"	1400	34.81	34.81	103.99	104.10	TD
PZ-108-SS	"	1350	56.41 65.20	31.25	148.17	148.13	TD
PZ-109-SS	"	1150	~~48.20~~	40.45	130.90	131.08	Top of Pump

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC. ®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Ann Miller and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5-23-05	1157	31.71	31.28	107.30	107.35	Top of Pump
PZ-111-KS	"	1205	11.00	11.05	380.00	>300	TD
PZ-111-SD	"	1213	36.30	36.63	196.70	191.22	Top of Pump - Double checked
PZ-112-AS	"	1135	33.00	33.25	39.00	29.74	TD
PZ-113-AD	"	1051	31.71	31.96	110.02	110.12	TD
PZ-113-AS	"	1055	31.69	31.90	39.20	39.22	TD
PZ-113-SS	"	1046	31.91	32.19	160.35	160.48	TD
PZ-114-AS	"	1748	21.30	21.42	26.30	26.33	Top of Pump
PZ-115-SS	"	1750	22.90	19.17	80.99	80.87	Top of Pump
PZ-116-SS	"	1447	41.20	39.33	149.80	150.30	Top of Pump Double checked
PZ-200-SS (GMP-7)	"	1658	47.42	42.80	99.50	99.60	TD
PZ-201A-SS	"	1551	~~43.32~~ 43.32	37.98	86.05	86.33	Top of Pump
PZ-202-SS	"	1532	17.85	16.78	85.20	85.22	Top of Pump
PZ-203-SS	"	1506	38.50	35.55	111.40	111.44	TD
PZ-204-SS	"	17.25	18.60	17.30	87.95	88.01	TD
PZ-204A-SS	"	1721	7.86	7.80	83.40	83.70	TD
PZ-205-AS	"	1404	31.01	30.82	50.15	51.50	Double check
PZ-205-SS	"	1408	36.90	31.00	92.96	92.78	Top of Pump
PZ-206-SS	"	1228	38.31	30.62	126.82	126.83	TD
PZ-207-AS	"	1030	33.12	33.63	39.76	40.08	TD
PZ-208-SS	"	1648	26.80	25.82	100.30	103.33	TD Double checked
PZ-305-AI	"	~~1245~~ 1736	~~29.43~~ 29.92	29.61	64.97	65.02	TD
PZ-1201-SS	NA	NA	NA	NA	NA	NA	unable to open last event
S-5	5-23-05	1110	36.68	NA	44.84	NA	unable to open - Fused shut ~~TD unable to open last event~~
S-84	"	1739	27.05	27.18	32.90	32.92	TD

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

BRIDGETON SUMP
MEASUREMENTS

7/29/2005 8/31/05 from Randy M.

Sump Destination	Sump Depth	Pipe Depth	Length of pump	Pump Depth Measurement	Depth to Liquid	Depth of Liquid	Comments
LCS # 1A	275.5 feet						Being aborted, well is too bent to get a pump down any more
LCS # 1B	274.5 feet	264 feet	8 feet	268 feet is where bubbler line is set	241.4 feet	33.1 feet	New variable pump regulator on pump in enclosed electrical can with a depth transducer unit at bowl inlet to digitally read water depth in well.
LCS # 2B	305 feet						Being aborted, well has too much gas to bring water out of well.
LCS # 3B	295 feet	280 feet	6 feet	286 feet			Could not measure due to an internal air leak. Well is being aborted due to too high of temperature.
LCS # 4A	312 feet	285 feet	5 feet	306 feet	286.7 feet	25.3 feet	New variable pump regulator on pump in enclosed electrical can with a depth transducer unit at bowl inlet to digitally read water depth in well.
LCS # 128K	30.13 feet	20 feet	7 feet	27 feet	20.33	~~6.66 feet~~ 9.80	
							Questions ? Call Randy at 314 739 1919 ext ~~120~~ 112
							Depth of Liquid = (PSI x 2.31) + (Sump depth - pump depth)
							Depth to Liquid = Sump depth - depth of Liquid

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Brandon Killion & Dave Vasbinder

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/28/05	0941	41.12	39.50	108.95	109.00	DC
D-85		1528	28.91	27.26	80.91	81.00	DC
I-4		0950	39.05	37.42	79.58	79.55	
I-68		1510	22.15	20.52	40.74	40.79	
I-73		1101	14.76	9.50	50.40	50.40	
LR-103		1145	46.78	31.45	54.33	40.70	Outer Casing Extended ~9ft
LR-104		1041	31.23	29.92	40.12	40.40	DC
MW-F1S		NA	NA	NA	NA	NA	DOES NOT EXIST
MW-F1D		NA	NA	NA	NA	NA	DOES NOT EXIST
MW-1204		1303	37.59	45.90	171.57	171.60	TOP
PZ-100-KS		1454	27.58	30.80	391.00	391.00	
PZ-100-SD		1452	37.76	58.00	96.00	96.25	DC TOP
PZ-100-SS		1450	38.03	56.39	89.20	89.30	DC TOP
PZ-101-SS		1442	51.94	76.60	155.48	155.68	DC
PZ-102-SS		1430	36.29	48.45	91.45	91.43	
PZ-102R-SS		1432	34.58	40.90	91.10	91.91	DC
PZ-103-SS		1421	30.80	54.95	146.30	146.40	DC
PZ-104-KS		1357	~~1352~~ 20.92	22.00	415.32	415.30	
PZ-104-SD		1401	32.80	36.10	120.11	120.42	DC TOP
PZ-104-SS		1406	34.45	35.15	139.98	142.00	TOP
PZ-105-SS		1348	33.50	36.90	144.80	144.75	DC TOP
PZ-106-KS		1258	6.10	7.00	378.83	378.80	
PZ-106-SD		1256	21.29	32.48	195.89	195.90	TOP
PZ-106-SS		~~1254~~ 1254	20.54	30.85	161.25	161.10	TOP DC
PZ-107-SS		1114	35.99	34.81	103.95	103.99	
PZ-108-SS		1028	22.10	56.41	148.00	148.17	DC
PZ-109-SS		1020	22.78	65.20	130.75	130.90	DC TOP

DC = Double Checked

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

TOP = Top of Pump

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Brandon Killion & Dave Vasbinder

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	11/28/05	1014	30.94	31.71	107.20	107.30	DC
PZ-111-KS		1004	10.35	11.00	379.98	380.00	
PZ-111-SD		1005	37.47	36.30	196.71	196.70	TOP
PZ-112-AS		0957	34.61	33.00	38.98	39.00	
PZ-113-AD		0932	33.48	31.71	110.22	110.02	
PZ-113-AS		0935	33.29	31.69	39.18	39.20	
PZ-113-SS		0929	34.53	31.91	160.45	160.35	DC
PZ-114-AS		1517	22.70	21.30	26.00	26.30	TOP DC
PZ-115-SS		1515	17.06	22.90	80.74	80.99	TOP DC
PZ-116-SS		1259	37.79	41.20	149.80	149.80	TOP
GMP-7 PZ-200-SS		1680	41.38	47.42	99.47	99.50	
PZ-201A-SS		1331	26.85	43.32	86.05	86.05	
PZ-202-SS		M15	15.78	17.85	85.07	85.20	DC TOP
PZ-203-SS		1339	35.46	38.50	111.32	111.40	DC
PZ-204-SS		1316	15.91	18.60	88.03	87.95	DC
PZ-204A-SS		1313	9.27	7.86	83.26	83.40	DC
PZ-205-AS		1110	31.82	31.01	50.11	50.15	
PZ-205-SS		1107	31.40	36.90	92.85	92.96	TOP DC
PZ-206-SS		1035	29.60	38.31	126.70	126.82	DC
PZ-207-AS		0923	34.76	33.12	39.72	39.76	
PZ-208-SS		1505	25.42	26.80	100.28	100.30	
PZ-305-AI		1044	34.61	29.43	64.93	64.97	
PZ-1201-SS		NA	NA	NA	NA	NA	UNABLE TO OPEN
S-5		0946	37.75	36.68	44.90	44.84	DC
S-84	↓	1525	28.64	27.05	32.87	32.90	

DC = Double Checked

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

TOP = Top of Pump

HERST & ASSOCIATES, INC®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/22/06	1415	43.50	41.12	108.97	108.95	Double checked
D-85	5/22/06	1340	31.31	28.91	80.93	80.91	Double checked
I-4	5/22/06	1433	41.42	39.05	79.54	79.58	Double checked
I-68	5/22/06	1334	24.68	22.15	40.78	40.74	Double checked
I-73	5/22/06	1554	18.92	14.76	50.44	50.40	Double checked
LR-103	5/22/06	1620	49.08	46.78	54.31	54.33	Double checked
LR-104	5/22/06	1546	33.95	31.23	40.11	40.12	Double checked
MW-F1S	5/22/06	NA	NA	NA	NA	NA	No longer present
MW-F1D	5/22/06	NA	NA	NA	NA	NA	No longer present
MW-1204	5/22/06	1027	68.44	37.59	172.21	171.57	Top of pump Double checked
PZ-100-KS	5/22/06	1253	32.58	27.58	391.30	391.00	Double checked
PZ-100-SD	5/22/06	1300	56.65	37.76	96.11	96.00	Top of pump Double checked
PZ-100-SS	5/22/06	1302	52.89	38.03	89.25	89.20	Top of pump Double checked
PZ-101-SS	5/22/06	1222	82.15	51.94	156.79	155.48	Double checked
PZ-102-SS	5/22/06	1211	53.42	36.29	91.39	91.45	Double checked
PZ-102R-SS	5/22/06	1214	43.66	34.58	91.09	91.10	Double checked
PZ-103-SS	5/22/06	1159	56.80	30.80	147.70	146.30	Double checked - soft bottom
PZ-104-KS	5/22/06	1114	25.83	20.92	414.91	415.32	Double checked
PZ-104-SD	5/22/06	1122	64.63	32.80	120.10	120.11	Top of pump Double checked
PZ-104-SS	5/22/06	1124	69.66	34.45	140.12	139.98	Top of pump Double checked
PZ-105-SS	5/22/06	1048	49.74	33.50	144.70	144.80	Top of pump Double checked
PZ-106-KS	5/22/06	0943	9.81	6.10	378.55	378.83	Double checked
PZ-106-SD	5/22/06	0952	43.61	21.29	198.01	195.89	Top of pump water level and Top of pump Double check
PZ-106-SS	5/22/06	0957	41.47	20.54	162.69	161.25	Top of pump water level and Top of pump Double check
PZ-107-SS	5/22/06	1606	38.70	35.99	103.90	103.95	Double checked
PZ-108-SS	5/22/06	1530	64.08	22.10	149.80	148.00	Double checked
PZ-109-SS	5/22/06	1524	71.49	22.78	131.98	130.75	Top of pump Double checked

Double Checked = Water Level and Total Depth or Top of Pump

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5/22/06	1517	36.22	30.94	107.05	107.20	Top of Pump Double checked
PZ-111-KS	5/22/06	1500	13.20	10.35	379.40	379.98	Double checked
PZ-111-SD	5/22/06	1509	40.80	37.47	198.60	196.71	Top of Pump
PZ-112-AS	5/22/06	1443	36.98	34.61	38.98	38.98	Double checked
PZ-113-AD	5/22/06	1400	35.69	33.48	110.00	110.22	Double checked
PZ-113-AS	5/22/06	1358	35.55	33.29	39.19	39.18	Double checked
PZ-113-SS	5/22/06	1402	35.84	34.53	160.34	160.45	Double checked
PZ-114-AS	5/22/06	1326	25.48	22.70	26.29	26.00	Top of Pump Double checked
PZ-115-SS	5/22/06	1323	33.20	17.06	80.97	80.74	Top of Pump Double checked
PZ-116-SS	5/22/06	1032	59.00	37.79	150.10	149.80	Top of Pump Double checked
PZ-200-SS	5/22/06	1244	48.55	41.38	99.45	99.47	Labeled GWP-7 - Double checked
PZ-201A-SS	5/22/06	1235	45.32	26.85	86.01	86.05	Top of Pump Double checked
PZ-202-SS	5/22/06	1146	22.98	15.78	85.04	85.07	Top of Pump Double checked
PZ-203-SS	5/22/06	1042	53.70	35.46	111.32	111.32	Double checked
PZ-204-SS	5/22/06	1018	33.51	15.91	87.91	88.03	Double checked
PZ-204A-SS	5/22/06	1015	15.41	9.27	83.33	83.26	Double checked
PZ-205-AS	5/22/06	1602	35.00	31.82	50.10	50.11	Double checked
PZ-205-SS	5/22/06	1600	41.41	31.40	92.87	92.85	Top of Pump Double checked
PZ-206-SS	5/22/06	1537	42.42	29.60	127.90	126.70	Double checked
PZ-207-AS	5/22/06	1350	37.09	34.76	39.72	39.72	Double checked
PZ-208-SS	5/22/06	1316	28.35	25.42	100.28	100.28	Double checked
PZ-305-AI	5/22/06	1548	33.46	34.61	64.94	64.93	Double checked
PZ-1201-SS	5/22/06	1135	NA	NA	NA	NA	Unable to open
S-5	5/22/06	1427	41.50	37.75	44.92	44.90	Double checked
S-84	5/22/06	1343	31.08	28.64	32.88	32.87	Double checked

Double Checked = Water Level and Total Depth a Top of Pump

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Rachael Collins & Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/6/06	0821	43.94	43.50	108.99	108.97	
D-85		1242	31.80	31.31	80.92	80.93	
I-4		0831	41.90	41.42	79.55	79.54	
I-68		1235	23.20	24.68	40.60	40.78	double checked total Depth
I-73		0947	21.55	18.92	50.43	50.44	
LR-103		0957	49.53	49.08	54.30	54.31	
LR-104		0940	34.20	33.95	40.10	40.11	
MW-F1S		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204		1047	49.40	68.44	172.20	172.21	TOP OF PUMP
PZ-100-KS		1207	32.74	32.58	391.05	391.30	
PZ-100-SD		1205	45.23	56.65	96.10	96.11	TOP OF PUMP
PZ-100-SS		1203	43.50	52.89	89.33	89.25	TOP OF PUMP
PZ-101-SS		1312	65.42	82.15	155.58	156.79	double checked total Depth
PZ-102-SS		1303	43.70	53.42	91.41	91.39	
PZ-102R-SS		1309	47.66	43.66	91.09	91.09	
PZ-103-SS		1257	43.54	56.80	146.40	147.70	double checked total depth
PZ-104-KS		1112	26.68	25.83	414.70	414.90	
PZ-104-SD		1110	42.98	64.63	120.40	120.10	TOP OF PUMP double checked total depth
PZ-104-SS		1108	48.62	69.66	140.10	140.12	TOP OF PUMP
PZ-105-SS		1059	46.70	49.74	144.50	144.70	TOP OF PUMP double checked Total Depth
PZ-106-KS		1037	10.39	9.81	378.05	378.55	
PZ-106-SD		1035	31.41	43.61	198.00	198.01	TOP OF PUMP
PZ-106-SS		1030	34.90	41.47	161.30	162.69	TOP OF PUMP double checked for Depth
PZ-107-SS		1005	36.91	38.70	103.93	103.90	
PZ-108-SS		0905	37.11	64.08	149.81	149.80	
PZ-109-SS	11/6/06	0920	40.00	71.49	130.90	131.98	TOP OF PUMP Water level double checked

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Rachael Collins & Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	11/6/06	0912	34.84	36.22	107.00	107.05	top of pump
PZ-111-KS		0903	14.64	13.20	379.35	379.40	
PZ-111-SD		0857	40.78	40.80	198.50	198.60	top of Pump double checked
PZ-112-AS		0855	37.40	36.98	38.97	38.98	
PZ-113-AD		0815	36.24	35.69	110.01	110.00	
PZ-113-AS		0818	36.15	35.55	39.18	39.19	
PZ-113-SS		0811	36.32	35.84	160.34	160.34	
PZ-114-AS		1236	25.95	25.48	26.00	26.29	double checked water level and total Depth
PZ-115-SS		1238	23.52	33.20	80.90	80.97	
PZ-116-SS		1050	57.20	59.00	149.95	150.10	double checked total Depth
PZ-200-SS		1345	43.42	48.55	99.44	99.45	~~Also~~ labeled as Comp 78
PZ-201A-SS		1220	37.00	45.32	86.00	86.01	
PZ-202-SS		1125	23.53	22.98	84.90	86.04	double checked total Depth
PZ-203-SS		1120	43.85	53.70	111.35	111.32	
PZ-204-SS		1025	24.00	33.51	87.90	87.91	
PZ-204A-SS		1021	9.05	15.41	83.35	83.33	
PZ-205-AS		1015	35.00	35.00	50.10	50.10	
PZ-205-SS		1017	40.70	41.41	92.90	92.87	
PZ-206-SS		0931	35.43	42.42	126.70	127.90	double checked Water level total Depth
PZ-207-AS	~~11/3/06~~	0803	37.60	37.09	39.72	39.72	
PZ-208-SS		1230	26.29	28.35	100.28	100.28	
PZ-305-AI		0945	33.75	33.46	64.95	64.94	
PZ-1201-SS		1253	NA	NA	NA	NA	UNABLE TO OPEN
S-5		0940	41.80	41.50	44.95	44.92	
S-84	11/6/06	1240	31.50	31.08	32.80	32.88	

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC. ®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Rachael Collins and Josh Gray

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/17/07	0840	39.50	43.94	107.89	108.99	double checked total depth
D-85		0827	28.69	31.80	80.93	80.92	
I-4		0849	37.73	41.90	78.70	79.55	double checked total depth
I-68		0838	22.24	25.20	40.59	40.60	
I-73		0953	23.92	21.55	50.45	50.43	
LR-103		1247	45.91	49.53	54.23	54.30	
LR-104		1617	30.54	34.20	64.95	40.10	Triple checked Total Depth Had Error
MW-F1S		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204		1214	~~70.25~~ 71.26	49.40	171.36	172.20	TOP OF PUMP double checked
PZ-100-KS		1050	33.68	32.99	387.65	391.05	Triple checked Total Depth
PZ-100-SD		1058	55.70	45.23	96.10	96.10	TOP OF PUMP
PZ-100-SS		1059	54.88	43.80	89.26	89.33	TOP OF PUMP
PZ-101-SS		1047	87.79	65.35	~~157.05~~ Rec.	155.58	155.55 total Depth
PZ-102-SS		1035	52.30	43.70	91.37	91.41	
PZ-102R-SS		1041	46.47	47.00	91.10	91.09	
PZ-103-SS		1123	56.55	43.54	146.37	146.40	
PZ-104-KS		1144	25.35	26.68	412.56	414.70	
PZ-104-SD		1150	62.65	42.98	120.16	120.40	TOP OF PUMP
PZ-104-SS		1153	66.56	48.62	140.07	140.10	TOP OF PUMP
PZ-105-SS		1205	47.31	46.70	144.70	144.50	TOP OF PUMP
PZ-106-KS		1227	99.99	10.89	379.38	378.05	double checked
PZ-106-SD		1221	41.98	31.41	197.95	198.00	TOP OF PUMP
PZ-106-SS	1225	~~0958~~	~~41.90~~ 40.42	34.90	161.02	161.30	TOP OF PUMP
PZ-107-SS		1235	35.25	38.91	103.91	103.93	
PZ-108-SS		0947	59.38	37.11	148.05	149.81	Double checked total depth
PZ-109-SS	↓	0940	67.37	40.00	130.58	130.90	TOP OF PUMP

double checked water level

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC. ®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Rachael Collins and Josh Gray

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5/17/07	0938	33.06	34.84	107.20	107.00	Top of Pump
PZ-111-KS	↓	0920	~~14~~ 13.72	14.64	374.45	379.35	Triple checked total Depth
PZ-111-SD		0918	38.92	40.78	196.10	198.50	Triple checked total Depth
PZ-112-AS		0907	34.05	37.40	38.97	38.97	
PZ-113-AD		0856	32.85	36.24	110.04	110.01	
PZ-113-AS		0902	32.80	36.15	39.18	39.18	
PZ-113-SS		0859	32.89	36.32	160.32	160.34	
PZ-114-AS		0834	23.25	25.95	25.99	26.00	
PZ-115-SS		0832	37.44	23.82	81.05	80.90	top of pump
PZ-116-SS		12.11	62.20	57.20	150.07	172.20	Triple checked [illegible] caught in pump cannot be measured due to damage
PZ-200-SS		1110	59.30	43.42	99.44	99.44	Labeled as GMP-7
PZ-201A-SS		1117	21.70	31.00	89.90	86.00	Double checked Total Depth
PZ-202-SS		1137	22.32	23.83	85.10	84.90	Top of pump
PZ-203-SS		1157	56.40 ~~37.67~~ RC	43.15	111.35	111.35	
PZ-204-SS		1323	32.65	24.60	87.90	87.90	
PZ-204A-SS		1321	8.79	9.05	83.30	83.35	
PZ-205-AS		1001 ~~0958~~ RC	31.98 ~~37.55~~ RC	35.00	50.11	50.10	
PZ-205-SS		0958	37.55	40.70	92.89	92.90	Top of pump
PZ-206-SS		1013	38.83	35.43	126.69	126.70	
PZ-207-AS		1254	34.29	37.60	39.72	39.72	
PZ-208-SS		1330	26.42	26.29	100.26	100.28	
* PZ-305-AI		1019	31.19	33.75	40.12	64.95	
PZ-1201-SS		1113	NA	NA	NA	NA	UNABLE TO ~~OPEN~~ find Abandoned/destroyed?
S-5		0845	37.09	41.80	44.30	44.85	
S-84	↓	0824	28.44	31.56	33.22	32.86	Double checked hard Bottom
LR104AI (PZ-305 AI)		1019	31.19		40.12		

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC. ®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Rachael Haynes Nick Bauer

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/6/07	0907	39.20	39.50	~~108.79~~ 107.79 DH	107.89	double checked
D-85		0834	28.19	28.69	80.94	80.93	
I-4		0905	37.43	37.73	78.63	78.70	
I-68		0845	21.52	22.24	40.63	40.59	
I-73		0941	25.03	23.92	50.45	50.45	
LR-103		1334	45.99	45.91	54.25	54.23	
LR-104		1320	30.33	30.54	64.95	64.95	Also labeled PZ-35
MW-F1S		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204		1024	76.13	71.25	171.59	171.36	TOP OF PUMP
PZ-100-KS		1227	37.22	33.65	388.10	387.65	
PZ-100-SD		1232	71.42	55.70	96.36	96.10	TOP OF PUMP double checked water
PZ-100-SS		1234	61.71	54.88	89.31	89.26	TOP OF PUMP
PZ-101-SS		1115	101.22	87.79	155.55	155.55	double checked water level
PZ-102-SS		1107	58.45	52.30	91.38	91.37	
PZ-102R-SS		1111	47.73	46.47	91.04	91.10	
PZ-103-SS		1100	70.82	56.55	146.31	146.37	double checked water level
PZ-104-KS		1048	27.81	25.35	413.00	412.56	
PZ-104-SD		1045	61.55	62.65	120.35	120.16	TOP OF PUMP
PZ-104-SS		1042	68.59	68.56	140.38	140.07	TOP OF PUMP
PZ-105-SS		1037	53.52	47.31	144.80	144.70	TOP OF PUMP
PZ-106-KS		1011	11.81	99.99	379.40	379.38	double checked water level
PZ-106-SD	11/8	~~1013~~	~~46.11~~	41.90	~~198.10~~ 197.10 DH	197.95	TOP OF PUMP double checked top & bottom
PZ-106-SS		1021	45.50	40.42	161.38	161.02	TOP OF PUMP
PZ-107-SS		1000	35.79	35.25	103.92	103.91	
PZ-108-SS		0937	80.35	59.38	148.00	148.05	double checked water level
PZ-109-SS	11/6/07	0931	97.90	67.37	131.05	130.88	TOP OF PUMP double checked water level

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC. ®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Rachael Haynes and Nick Bauer

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	11/6/07	0926	35.66	33.06	107.23	107.20	top of pump
PZ-111-KS		0921	15.38	13.72	375.00	374.45	
PZ-111-SD		0916	37.51	38.92	196.77	196.10	top of Pump
PZ-112-AS		0911	33.86	34.05	38.96	38.97	
PZ-113-AD		0858	32.57	32.85	110.03	110.04	
PZ-113-AS		0900	32.54	32.80	39.17	39.18	
PZ-113-SS		0855	32.79	32.89	160.33	160.32	
PZ-114-AS		0841	22.31	23.25	25.99	25.99	top of Pump
PZ-115-SS		0843	61.63	37.44	81.09	81.05	top of pump : double checked water level
PZ-116-SS		1030	69.41	62.20	150.08	150.07	top of pump
PZ-200-SS		1240	63.62	59.30	99.45	99.44	also labeled GMP-7
PZ-201A-SS		1245	53.53	21.70	86.28	89.90	double checked water level and top of pump
PZ-202-SS		1255	24.94	22.32	85.15	85.10	top of pump
PZ-203-SS		1053	57.08	51.40	111.29	111.35	
PZ-204-SS		1221	38.10	32.65	87.90	87.90	
PZ-204A-SS		1219	9.71	8.79	83.23	83.30	
PZ-205-AS		0950	32.16	31.98	50.05	50.11	
PZ-205-SS		0952	40.13	37.55	92.69	92.89	top of pump
PZ-206-SS		~~1350~~ 1340	~~50.80~~ 44.58	38.83	126.70	126.69	
PZ-207-AS		1311	33.97	34.29	39.71	39.72	
PZ-208-SS		1305	33.54	28.42	100.28	100.26	
PZ-305-AI		1325	30.80	31.19	40.11	40.12	
PZ-1201-SS		1053	NA	NA	NA	NA	UNABLE TO ~~OPEN~~ Locate
S-5		0903	36.80	37.09	44.31	44.30	
S-84		0837	27.90	28.44	33.20	33.22	
LR-104-AI	↓	1325	30.80	31.19	40.11	40.12	Also labled PZ-305AI

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Nicholas Bauer & Bryan Sehie

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/6/2008	1130	~~23.89~~ 34.89	39.20	107.73	107.79	
D-85	5/6/2008	0829	23.81	28.19	80.96	80.94	
I-4	5/6/2008	0944	33.14	37.43	78.85	78.63	
I-68	5/6/2008	15.37	17.12	21.52	48.63	40.63	
I-73	5/6/2008	1123	26.19	25.03	50.53	50.45	
LR-103	5/6/2008	1110	41.79	45.99	54.28	54.25	
LR-104	5/6/2008	1055	28.12	30.33	64.93	64.95	
MW-F1S	5/6/2008	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	5/6/2008	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	5/6/2008	1253	74.55	76.13	171.40	171.59	TOP OF PUMP
PZ-100-KS	5/6/2008	1516	31.14	37.22	388.02	388.10	
PZ-100-SD	5/6/2008	1512	48.90	71.42	96.28	96.36	TOP OF PUMP
PZ-100-SS	5/6/2008	1510	42.70	61.71	89.30	89.31	TOP OF PUMP
PZ-101-SS	5/6/2008	1436	81.85	101.22	155.56	155.55	
PZ-102-SS	5/6/2008	~~1422~~ 1422	47.37	58.45	91.91	91.38	double checked
PZ-102R-SS	5/6/2008	1427	40.09	47.73	91.06	91.09	
PZ-103-SS	5/6/2008	1414	49.34	70.82	146.30	146.31	
PZ-104-KS	5/6/2008	1320	24.30	27.81	413.96	413.00	double checked
PZ-104-SD	5/6/2008	1330	58.56	61.55	120.35	120.35	TOP OF PUMP
PZ-104-SS	5/6/2008	1339	103.22	68.59	140.13	140.38	TOP OF PUMP double checked
PZ-105-SS	5/6/2008	1309	44.32	53.52	144.74	144.80	TOP OF PUMP
PZ-106-KS	5/6/2008	1240	8.85	11.81	379.30	379.40	
PZ-106-SD	5/6/2008	1232	38.48	47.11	196.05	196.10	TOP OF PUMP
PZ-106-SS	5/6/2008	1225	36.55	45.50	162.71	161.38	TOP OF PUMP double checked
PZ-107-SS	5/6/2008	1150	31.46	35.79	103.95	103.92	
PZ-108-SS	5/6/2008	1034	59.55	88.35	147.61	148.00	double checked
PZ-109-SS	5/6/2008	1025	59.30	97.90	131.02	131.05	TOP OF PUMP

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Nicholas Bauer & Bryan Sehie

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5/6/2008	1014	29.34	33.06	106.97	107.20	Top of pump / double checked
PZ-111-KS	5/6/2008	0955	12.73	13.72	374.38	374.45	
PZ-111-SD	5/6/2008	1006	134.40	38.92	196.39	196.10	double checked Top of pump
PZ-112-AS	5/6/2008	0925	29.51	34.05	38.96	38.97	
PZ-113-AD	5/6/2008	0906	28.31	32.85	110.10	110.04	
PZ-113-AS	5/6/2008	0910	28.26	32.80	39.19	39.18	
PZ-113-SS	5/6/2008	0901	28.45	32.89	160.28	160.32	
PZ-114-AS	5/6/2008	1541	17.85	23.25	26.16	25.99	double checked
PZ-115-SS	5/6/2008	1544	20.61	37.44	81.00	81.05	
PZ-116-SS	5/6/2008	1259	58.68	62.20	150.15	150.07	
PZ-200-SS	5/6/2008	1442	42.95	59.30	99.44	99.44	
PZ-201A-SS	5/6/2008	1449	39.27	21.70	87.29	89.90	double checked top of pump
PZ-202-SS	5/6/2008	1500	20.92	22.32	85.13	85.10	
PZ-203-SS	5/6/2008	1405	48.23	51.40	111.33	111.35	
PZ-204-SS	5/6/2008	1559	29.75	32.65	87.95	87.90	
PZ-204A-SS	5/6/2008	1555	8.38	8.79	83.29	83.30	
PZ-205-AS	5/6/2008	1143	~~3[illegible]~~ 28.13	31.98	50.10	50.11	
PZ-205-SS	5/6/2008	1135	33.68	37.55	92.68	92.89	
PZ-206-SS	5/6/2008	1044	37.19	38.83	126.70	126.69	
PZ-207-AS	5/6/2008	0851	29.66	34.29	39.75	39.72	
PZ-208-SS	5/6/2008	~~0935~~	25.03	28.42	100.25	100.26	time = 1530
~~PZ-305-AI~~	~~5/6/2008~~	~~1055~~	~~26.12~~	~~31.19~~	~~64.93~~	~~40.12~~	~~double checked well may be mislabeled~~ W/S also labeled R104
PZ-1201-SS	5/6/2008	—	NA	NA	NA	NA	UNABLE TO OPEN
S-5	5/6/2008	0940	32.10	37.09	44.36	44.30	
S-84	5/6/2008	0837	23.62	28.44	33.20	33.22	
Z-305AI- LR-104-AI	5/6/2008	1100	26.59	31.19	40.12	40.12	also labeled PZ305AI

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Rachael Haynes and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/3/2008	1321	35.00	34.89	107.73	107.73	
D-85	11/3/2008	0856	23.81	23.81	80.96	80.96	
I-4	11/3/2008	1323	33.22	33.14	78.70	78.85	
I-68	11/3/2008	0907	17.24	17.12	40.65	40.63	
I-73	11/3/2008	1047	26.45	26.19	50.51	50.53	
LR-103	11/3/2008	1353	42.19	41.79	54.30	54.28	
PZ305 / LR-104	11/3/2008	1050	26.60	26.12	64.95	64.93	Also labled PZ-305
MW-F1S	11/3/2008	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	11/3/2008	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	11/3/2008	1017	61.90	74.55	171.38	171.40	TOP OF PUMP
PZ-100-KS	11/3/2008	0929	31.29	31.14	388.50	388.02	
PZ-100-SD	11/3/2008	0927	59.95	48.90	96.35	96.28	TOP OF PUMP
PZ-100-SS	11/3/2008	0925	52.49	42.70	89.30	89.30	TOP OF PUMP
PZ-101-SS	11/3/2008	0929 0932	87.51	81.85	155.70	155.56	
PZ-102-SS	11/3/2008	0945	51.46	47.37	91.41	91.91	
PZ-102R-SS	11/3/2008	0947	38.52	40.09	91.10	91.06	
PZ-103-SS	11/3/2008	0950	59.50	49.34	149.99	146.30	*well has been extended
PZ-104-KS	11/3/2008	1009	22.74	24.30	413.15	413.90	
PZ-104-SD	11/3/2008	1000	54.34	58.56	120.20	120.35	TOP OF PUMP
PZ-104-SS	11/3/2008	1004	56.23	63.22	140.12	140.13	TOP OF PUMP
PZ-105-SS	11/3/2008	1012	41.09	44.32	144.74	144.74	TOP OF PUMP
PZ-106-KS	11/3/2008	1023	7.72	8.85	379.03	379.30	
PZ-106-SD	11/3/2008	1025	36.54	38.48	196.00	196.05	TOP OF PUMP
PZ-106-SS	11/3/2008	1028	34.60	36.55	162.71	162.71	TOP OF PUMP
PZ-107-SS	11/3/2008	1036	32.13	31.46	103.95	103.95	
PZ-108-SS	11/3/2008	1102	68.48	59.55	149.00	147.61	
PZ-109-SS	11/3/2008	1104	81.60	59.30	131.02	131.02	TOP OF PUMP

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Rachael Haynes and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	11/3/2008	1111	30.30	29.34	107.22	107.20	Top of Pump
PZ-111-KS	11/3/2008	1402	11.84	12.73	374.86	374.38	
PZ-111-SD	11/3/2008	1400	33.21	134.40	196.75	196.39	Top of pump
PZ-112-AS	11/3/2008	1348	29.78	29.51	38.96	38.96	
PZ-113-AD	11/3/2008	1333	28.45	28.31	110.09	110.10	
PZ-113-AS	11/3/2008	1337	28.42	28.26	39.18	39.19	
PZ-113-SS	11/3/2008	1331	28.69	28.45	160.35	160.28	
PZ-114-AS	11/3/2008	0910	18.04	17.85	26.20	26.16	Top of Pump
PZ-115-SS	11/3/2008	0912	42.00	20.61	81.00	81.00	Top of Pump
PZ-116-SS	11/3/2008	1015	50.30	58.68	150.19	150.15	Top of Pump
PZ-200-SS	11/3/2008	0931	51.93	42.95	99.50	99.44	
PZ-201A-SS	11/3/2008	0935	43.95	38.27	86.35	87.29	Top of Pump / double checked
PZ-202-SS	11/3/2008	1309	19.00	20.92	85.10	85.13	Top of Pump
PZ-203-SS	11/3/2008	0958	44.83	48.23	111.35	111.33	
~~PZ-204-SS~~	11/3/2008	1300	27.21	29.75	87.91	87.95	
~~PZ-204A-SS~~	11/3/2008	1257	9.42	8.38	83.25	83.29	
PZ-205-AS	11/3/2008	1041	28.48	28.13	50.09	50.10	
PZ-205-SS	11/3/2008	1043	34.30	33.68	92.82	92.68	
PZ-206-SS	11/3/2008	1059	38.30	37.19	126.71	126.70	
PZ-207-AS	11/3/2008	0846	29.79	29.66	39.71	39.75	
PZ-208-SS	11/3/2008	0920	26.97	25.03	100.30	100.25	
PZ-305-AI/LR-104-AI	11/3/2008	1054	26.68	26.59	44.95	40.12	
PZ-1201-SS	11/3/2008	—	NA	NA	NA 40.10	NA	UNABLE TO OPEN well locked
S-5	11/3/2008	1327	33.21	33.10	44.31	44.30	
S-84	11/3/2008	0952	23.68	23.62	33.20	33.22	

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Bryan Sehie and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/6/2009	0900	35.96	35.00	107.90	107.73	
D-85	5/6/2009	1412	25.00	23.89	81.00	80.96	
I-4	5/6/2009	0902	34.13	33.22	78.73	~~18.70~~ 78.70	
I-68	5/6/2009	1428	18.39	17.24	40.73	40.65	
I-73	5/6/2009	0955	27.20	26.45	50.45	50.51	
LR-103	5/6/2009	0945	42.62	42.19	54.26	54.30	
LR-104	5/6/2009	0942	27.10	26.60	65.05	64.95	Also Labeled PZ-305
MW-F1S	5/6/2009	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	5/6/2009	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	5/6/2009	1027	78.43	61.90	171.40	171.38	TOP OF PUMP
PZ-100-KS	5/6/2009	1338	33.09	31.29	388.48	388.50	
PZ-100-SD	5/6/2009	1340	69.00	59.95	96.41	96.35	TOP OF PUMP
PZ-100-SS	5/6/2009	1342	61.40	52.49	89.30	89.30	TOP OF PUMP
PZ-101-SS	5/6/2009	1323	87.44	87.59	155.75	155.70	
PZ-102-SS	5/6/2009	1313	59.63	51.46	91.50	91.41	
PZ-102R-SS	5/6/2009	1315	44.73	38.52	91.15	91.10	
PZ-103-SS	5/6/2009	1307	68.19	59.50	149.82	149.84	
PZ-104-KS	5/6/2009	1038	22.79	22.74	413.20	413.15	
PZ-104-SD	5/6/2009	1040	58.18	54.34	120.17	120.20	TOP OF PUMP
PZ-104-SS	5/6/2009	1042	64.04	56.23	140.18	140.12	TOP OF PUMP
PZ-105-SS	5/6/2009	1033	44.35	41.09	144.80	144.74	TOP OF PUMP
PZ-106-KS	5/6/2009	1014	7.93	7.72	379.12	379.03	
PZ-106-SD	5/6/2009	1016	42.43	36.54	196.10	196.00	TOP OF PUMP
PZ-106-SS	5/6/2009	1018	40.49	34.60	162.68	162.71	TOP OF PUMP
PZ-107-SS	5/6/2009	1012	32.38	32.13	104.00	103.95	
PZ-108-SS	5/6/2009	0931	74.29	68.48	147.94	148.00	
PZ-109-SS	5/6/2009	0924	88.76	81.60	131.14	131.02	TOP OF PUMP

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Bryan Sehie and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5/6/2009	0919	31.12	30.30	107.02	107.22	Top of Pump
PZ-111-KS	5/6/2009	0915	12.17	11.84	374.85	374.86	
PZ-111-SD	5/6/2009	0916	34.24	33.21	196.75	196.75	Top of Pump
PZ-112-AS	5/6/2009	0908	30.61	29.78	38.96	38.94	
PZ-113-AD	5/6/2009	0851	29.41	28.45	110.18	110.09	
PZ-113-AS	5/6/2009	0853	29.30	28.42	39.23	39.18	
PZ-113-SS	5/6/2009	0854	29.50	28.69	160.36	160.35	
PZ-114-AS	5/6/2009	1433 1453 (BK)	19.09	18.04	26.20	26.20	Top of Pump
PZ-115-SS	5/6/2009	1436	36.55	42.00	81.12	81.00	Top of Pump
PZ-116-SS	5/6/2009	1030	64.30	50.30	150.21	150.19	Top of Pump
PZ-200-SS	5/6/2009	1335	67.05	51.93	99.52	99.50	Labeled as GMP-7
PZ-201A-SS	5/6/2009	1330	49.68	43.95	86.40	86.35	Top of Pump
PZ-202-SS	5/6/2009	1303	18.92	19.00	85.20	85.10	~~Top of Pump~~ (BK)
PZ-203-SS	5/6/2009	1047	48.58	44.83	111.43	111.35	
PZ-204-SS	5/6/2009	1445	31.81	27.21	88.02	87.91	
PZ-204A-SS	5/6/2009	1447	9.87	9.42	83.35	83.25	
PZ-205-AS	5/6/2009	1004	28.85	28.48	50.10	50.09	
PZ-205-SS	5/6/2009	1002	35.57	34.30	92.91	92.82	Top of Pump
PZ-206-SS	5/6/2009	0936	39.41	38.30	126.80	126.71	
PZ-207-AS	5/6/2009	0842	30.48	29.79	39.44	39.71	
PZ-208-SS	5/6/2009	1351	27.01	26.97	100.37	100.30	
PZ-305-AI/LR-104-AI	5/6/2009	0941	27.55	27.00	40.18	40.10	
PZ-1201-SS	5/6/2009	1308	NA	NA	NA	NA	UNABLE TO OPEN
S-5	5/6/2009	0904	34.10	33.21	44.41	44.31	
S-84	5/6/2009	1414	24.74	23.68	33.23	33.20	

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Neil Kostelecky and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/2/2009	0952	33.95	35.96	107.90	107.90	
D-85	11/2/2009	1341	22.04	25.00	81.01	81.00	
I-4	11/2/2009	0958	31.95	34.13	78.73	78.73	
I-68	11/2/2009	1345	15.08	18.39	40.70	40.73	
I-73	11/2/2009	1049	27.38	27.20	50.43	50.45	
LR-103	11/2/2009	1036	39.99	42.62	54.26	54.26	
LR-104	11/2/2009	1033	25.48	27.10	65.05	65.05	Also Labeled PZ-305
MW-F1S	11/2/2009	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	11/2/2009	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	11/2/2009	1110	76.05	78.43	171.41	171.40	TOP OF PUMP
PZ-100-KS	11/2/2009	1330	34.75	33.09	388.48	388.48	
PZ-100-SD	11/2/2009	1331	79.89	69.00	96.41	96.41	TOP OF PUMP
PZ-100-SS	11/2/2009	1332	61.68	61.40	89.30	89.30	TOP OF PUMP
PZ-101-SS	11/2/2009	1315	81.28	87.44	155.75	155.75	
PZ-102-SS	11/2/2009	1306	74.25	59.63	91.50	91.50	
PZ-102R-SS	11/2/2009	1307	43.34	44.73	91.17	91.15	
PZ-103-SS	11/2/2009	1303	77.99	68.19	149.80	149.82	
PZ-104-KS	11/2/2009	1119	22.75	22.79	413.20	413.20	
PZ-104-SD	11/2/2009	1120	52.88	58.18	120.20	120.17	TOP OF PUMP
PZ-104-SS	11/2/2009	1121	58.23	64.04	140.18	140.18	TOP OF PUMP
PZ-105-SS	11/2/2009	1116	41.92	44.35	144.81	144.80	TOP OF PUMP
PZ-106-KS	11/2/2009	1104	7.93	7.93	379.10	379.12	
PZ-106-SD	11/2/2009	1105	41.09	42.43	196.11	196.10	TOP OF PUMP
PZ-106-SS	11/2/2009	1106	39.18	40.49	162.69	162.68	TOP OF PUMP
PZ-107-SS	11/2/2009	1100	30.91	32.38	104.00	104.00	
PZ-108-SS	11/2/2009	1023	73.42	74.29	147.92	147.94	
PZ-109-SS	11/2/2009	1020	90.63	88.76	131.15	131.14	TOP OF PUMP

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Neil Kostelecky and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	11/2/2009	1014	30.68	31.12	107.02	107.02	Top of Pump
PZ-111-KS	11/2/2009	1007	12.01	12.17	374.85	374.85	
PZ-111-SD	11/2/2009	1008	33.69	34.24	197.11	196.75	Top of Pump
PZ-112-AS	11/2/2009	1003	28.55	30.61	38.98	38.96	
PZ-113-AD	11/2/2009	0947	27.15	29.41	110.13	110.18	
PZ-113-AS	11/2/2009	0945	27.12	29.30	39.25	39.23	
PZ-113-SS	11/2/2009	0946	27.59	29.50	160.48	160.36	
PZ-114-AS	11/2/2009	1347	15.78	19.09	26.20	26.20	Top of Pump
PZ-115-SS	11/2/2009	1348	19.35	36.55	81.12	81.12	Top of Pump
PZ-116-SS	11/2/2009	1111	62.90	64.30	150.20	150.21	Top of Pump
PZ-200-SS	11/2/2009	1325	42.88	67.05	99.54	99.52	Labled as GMP-7
PZ-201A-SS	11/2/2009	1320	50.73	49.68	86.40	86.40	Top of Pump
PZ-202-SS	11/2/2009	1300	19.09	18.92	85.21	85.20	Top of Pump
PZ-203-SS	11/2/2009	1128	44.06	48.58	111.45	111.43	
PZ-204-SS	11/2/2009	1405	30.68	31.81	88.00	88.02	
PZ-204A-SS	11/2/2009	1406	67.20	9.87	83.35	83.35	
PZ-205-AS	11/2/2009	1056	27.38	28.85	50.10	50.10	
PZ-205-SS	11/2/2009	1055	34.75	35.57	92.90	92.91	
PZ-206-SS	11/2/2009	1026	39.42	39.41	126.78	126.80	
PZ-207-AS	11/2/2009	0936	27.79	30.48	39.44	39.44	
PZ-208-SS	11/2/2009	1335	25.95	27.01	100.36	100.37	
PZ-305-AI/LR-104-AI	11/2/2009	1030	25.88	27.55	40.19	40.18	
PZ-1201-SS	11/2/2009	1305	NA	NA	NA	NA	UNABLE TO OPEN
S-5	11/2/2009	0955	31.91	34.10	44.39	44.41	
S-84	11/2/2009	1340	21.87	24.74	33.25	33.23	

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Bryan Sehie and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/18/2010	0950	33.54	33.75	107.87	107.90	
D-85	5/18/2010	1500	21.97	22.04	81.04	81.01	
I-4	5/18/2010	0953	31.69	31.95	78.71	78.73	
I-68	5/18/2010	1425	15.04	15.08	40.78	40.70	
I-73	5/18/2010	1056	27.64	27.38	50.38	50.43	
LR-103	5/18/2010	1045	36.34	39.99	49.90	54.26	Well was cut shorter.
LR-104	5/18/2010	1040	25.21	25.48	65.09	65.05	Also Labeled PZ-305
MW-F1S	5/18/2010	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	5/18/2010	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	5/18/2010	1126	78.79	76.05	171.41	171.41	TOP OF PUMP
PZ-100-KS	5/18/2010	1405	36.67	34.75	388.48	388.48	
PZ-100-SD	5/18/2010	1408	84.85	79.89	96.38	96.41	TOP OF PUMP
PZ-100-SS	5/18/2010	1410	66.26	61.68	89.33	89.30	TOP OF PUMP
PZ-101-SS	5/18/2010	1343	98.09	81.28	155.75	155.75	
PZ-102-SS	5/18/2010	1336	73.14	74.25	91.50	91.50	
PZ-102R-SS	5/18/2010	1338	45.53	43.34	91.17	91.17	
PZ-103-SS	5/18/2010	1325	78.36	77.99	149.80	149.80	
PZ-104-KS	5/18/2010	1141	23.46	22.75	413.20	413.20	
PZ-104-SD	5/18/2010	1143	53.19	52.88	120.41	120.20	TOP OF PUMP
PZ-104-SS	5/18/2010	1145	59.50	58.23	140.18	140.18	TOP OF PUMP
PZ-105-SS	5/18/2010	1133	43.31	41.92	144.81	144.81	TOP OF PUMP
PZ-106-KS	5/18/2010	1113	8.22	7.93	379.10	379.10	
PZ-106-SD	5/18/2010	1115	44.58	41.09	196.11	196.11	TOP OF PUMP
PZ-106-SS	5/18/2010	1117	42.59	39.18	162.69	162.69	TOP OF PUMP
PZ-107-SS	5/18/2010	1108	30.75	30.91	104.02	104.00	
PZ-108-SS	5/18/2010	1032	77.80	73.42	148.10	147.92	
PZ-109-SS	5/18/2010	1020	98.95	90.63	130.99	131.15	TOP OF PUMP

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Bryan Sehie and Brandon Killion

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5/18/2010	1015	30.39	30.68	107.04	107.02	Top of Pump
PZ-111-KS	5/18/2010	1008	12.14	12.01	374.85	374.85	
PZ-111-SD	5/18/2010	1012	32.93	33.69	197.11	197.11	Top of Pump
PZ-112-AS	5/18/2010	1000	28.28	28.55	38.95	38.98	
PZ-113-AD	5/18/2010	0941	26.90	27.15	110.14	110.13	
PZ-113-AS	5/18/2010	0943	26.90	27.12	39.22	39.25	
PZ-113-SS	5/18/2010	0940	27.14	27.39	160.48	160.48	
PZ-114-AS	5/18/2010	1430	15.91	15.78	26.04	26.20	Top of Pump
PZ-115-SS	5/18/2010	1428	38.38	19.35	81.13	81.12	Top of Pump
PZ-116-SS	5/18/2010	1122	64.40	62.90	149.95	150.20	Top of Pump
PZ-200-SS	5/18/2010	1358	61.44	42.88	99.54	99.54	Labeled as GMP-7
PZ-201A-SS	5/18/2010	1352	51.24	50.73	86.17	86.40	Top of Pump
PZ-202-SS	5/18/2010	1308	20.22	19.09	85.15	85.21	Top of Pump
PZ-203-SS	5/18/2010	1303	45.22	44.06	111.43	111.45	
PZ-204-SS	5/18/2010	1445	33.04	30.68	88.01	88.00	
PZ-204A-SS	5/18/2010	1447	8.75	7.20	83.35	83.35	
PZ-205-AS	5/18/2010	1102	27.18	27.38	50.11	50.10	
PZ-205-SS	5/18/2010	1059	35.34	34.75	92.98	92.90	Top of Pump
PZ-206-SS	5/18/2010	1027	39.52	39.42	126.76	126.78	
PZ-207-AS	5/18/2010	0830	27.61	27.79	39.44	39.44	
PZ-208-SS	5/18/2010	1420	28.06	25.95	100.38	100.36	
PZ-305-AI/LR-104-AI	5/18/2010	1038	25.61	25.88	40.20	40.19	
PZ-1201-SS	5/18/2010	1310	NA	NA	NA	NA	UNABLE TO OPEN
S-5	5/18/2010	0956	31.18	31.91	44.36	44.39	
S-84	5/18/2010	1505	21.75	21.87	33.27	33.25	

Herst & Associates, Inc. 4630 South Highway 94 - North Outer Road, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski and Neil Kostelecky

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/9/2010	1415	35.33	33.54	107.91	107.87	
D-85	11/9/2010	0843	24.33	21.97	81.04	81.04	
I-4	11/9/2010	1418	33.51	31.69	78.68	78.71	
I-68	11/9/2010	0852	17.71	15.04	40.75	40.78	
I-73	11/9/2010	1208	27.73	27.64	50.40	50.38	
LR-103	11/9/2010	1401	37.83	36.34	49.90	49.90	
LR-104	11/9/2010	1405	26.68	25.21	65.09	65.09	Also Labeled PZ-305
MW-F1S	11/9/2010	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	11/9/2010	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	11/9/2010	0959	73.78	78.79	171.43	171.41	TOP OF PUMP
PZ-100-KS	11/9/2010	0918	37.70	36.67	388.55	388.48	
PZ-100-SD	11/9/2010	0915	84.28	84.85	96.30	96.38	TOP OF PUMP
PZ-100-SS	11/9/2010	0912	69.91	66.26	89.41	89.33	TOP OF PUMP
PZ-101-SS	11/9/2010	1035	101.38	98.09	155.65	155.75	
PZ-102-SS	11/9/2010	1043	69.82	73.14	91.51	91.50	
PZ-102R-SS	11/9/2010	1041	47.21	45.53	91.15	91.17	
PZ-103-SS	11/9/2010	1051	78.38	78.36	149.81	149.80	
PZ-104-KS	11/9/2010	1111	25.35	23.46	411.12	413.20	
PZ-104-SD	11/9/2010	1108	48.98	53.19	120.19	120.41	TOP OF PUMP
PZ-104-SS	11/9/2010	1105	54.34	59.50	140.46	140.18	TOP OF PUMP
PZ-105-SS	11/9/2010	1126	45.99	43.31	144.59	144.81	TOP OF PUMP
PZ-106-KS	11/9/2010	1142	9.31	8.22	375.21	379.10	
PZ-106-SD	11/9/2010	1139	42.68	44.58	196.25	196.11	TOP OF PUMP
PZ-106-SS	11/9/2010	1136	40.99	42.59	161.44	162.69	TOP OF PUMP
PZ-107-SS	11/9/2010	1154	32.16	30.75	104.03	104.02	
PZ-108-SS	11/9/2010	1312	74.74	77.80	148.16	148.10	
PZ-109-SS	11/9/2010	1319	94.54	98.95	131.21	130.99	TOP OF PUMP

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski and Neil Kostelecky

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	11/9/2010	1326	31.82	30.39	107.10	107.04	Top of Pump
PZ-111-KS	11/9/2010	1331	12.89	12.14	374.55	374.85	
PZ-111-SD	11/9/2010	1334	33.79	32.93	196.84	197.11	Top of Pump
PZ-112-AS	11/9/2010	1410	29.98	28.28	38.95	38.95	
PZ-113-AD	11/9/2010	1430	28.82	26.90	110.12	110.14	
PZ-113-AS	11/9/2010	1433	28.72	26.90	39.28	39.22	
PZ-113-SS	11/9/2010	1436	28.95	27.14	160.44	160.48	
PZ-114-AS	11/9/2010	0855	18.52	15.91	26.38	26.04	Top of Pump
PZ-115-SS	11/9/2010	0858	56.40	38.38	80.90	81.13	Top of Pump
PZ-116-SS	11/9/2010	0956	63.59	64.40	149.95	149.95	Top of Pump
PZ-200-SS	11/9/2010	0927	69.98	61.44	99.54	99.54	Labeled as GMP-7
PZ-201A-SS	11/9/2010	0934	53.31	51.24	86.20	86.17	Top of Pump
PZ-202-SS	11/9/2010	0939	22.31	20.22	85.19	85.15	Top of Pump
PZ-203-SS	11/9/2010	0946	46.28	45.22	111.38	111.43	
PZ-204-SS	11/9/2010	1013	32.87	33.04	88.02	88.01	
PZ-204A-SS	11/9/2010	1011	12.19	8.75	83.28	83.35	
PZ-205-AS	11/9/2010	1203	28.48	27.18	50.16	50.11	
PZ-205-SS	11/9/2010	1200	36.17	35.34	92.78	92.98	
PZ-206-SS	11/9/2010	1345	40.31	39.52	126.78	126.76	
PZ-207-AS	11/9/2010	1440	29.72	27.61	39.45	39.44	
PZ-208-SS	11/9/2010	0906	31.49	28.06	100.38	100.38	
PZ-305-AI/LR-104-AI	11/9/2010	1350	27.11	25.61	40.23	40.20	
PZ-1201-SS	11/9/2010	1100	NA	NA	NA	NA	UNABLE TO ~~OPEN~~ FIND well is covered by st rock
S-5	11/9/2010	1421	33.58	31.18	44.32	44.36	
S-84	11/9/2010	0840	24.10	21.75	33.30	33.27	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Brandon Killion & Bryan Sehie

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/9/2011	0855	33.55	35.33	107.84	107.91	
D-85	5/9/2011	1335	20.30	24.33	81.04	81.04	
I-4	5/9/2011	0857	31.73	33.51	78.66	78.68	
I-68	5/9/2011	1318	15.30	17.71	40.76	40.75	
I-73	5/9/2011	0940	27.89	27.73	50.38	50.40	
LR-103	5/9/2011	0934	36.41	37.83	49.89	49.90	
LR-104	5/9/2011	0929	25.21	26.68	65.01	65.09	Also Labeled PZ-305
MW-F1S	5/9/2011	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	5/9/2011	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	5/9/2011	1006	46.61	73.78	171.40	171.43	TOP OF PUMP
PZ-100-KS	5/9/2011	1130	32.35	37.70	388.56	388.55	
PZ-100-SD	5/9/2011	1132	64.70	84.28	96.31	96.30	TOP OF PUMP
PZ-100-SS	5/9/2011	1134	58.55	69.91	89.39	89.41	TOP OF PUMP
PZ-101-SS	5/9/2011	1100	85.15	101.38	155.67	155.65	
PZ-102-SS	5/9/2011	1050	51.75	69.82	91.46	91.51	
PZ-102R-SS	5/9/2011	1052	41.95	47.21	91.13	91.15	
PZ-103-SS	5/9/2011	1047	63.38	78.38	149.80	149.81	
PZ-104-KS	5/9/2011	1030	22.11	25.35	411.12	411.12	
PZ-104-SD	5/9/2011	1032	36.42	48.98	120.15	120.19	TOP OF PUMP
PZ-104-SS	5/9/2011	1034	35.66	54.34	140.10	140.46	TOP OF PUMP
PZ-105-SS	5/9/2011	1014	33.94	45.99	144.57	144.59	TOP OF PUMP
PZ-106-KS	5/9/2011	0958	6.75	9.31	375.23	375.21	
PZ-106-SD	5/9/2011	0959	28.98	42.68	196.25	196.25	TOP OF PUMP
PZ-106-SS	5/9/2011	1001	27.36	40.99	161.45	161.44	TOP OF PUMP
PZ-107-SS	5/9/2011	0954	30.73	32.16	103.97	104.03	
PZ-108-SS	5/9/2011	0921	51.69	74.74	148.15	148.16	
PZ-109-SS	5/9/2011	0914	67.00	94.54	131.13	131.21	TOP OF PUMP

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Brandon Killion & Bryan Sehie

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5/9/2011	0910	29.83	31.82	109.04	107.10	Top of Pump
PZ-111-KS	5/9/2011	0907	10.84	12.89	374.51	374.55	
PZ-111-SD	5/9/2011	0908	32.67	33.79	196.83	196.84	Top of Pump
PZ-112-AS	5/9/2011	0901	28.27	29.98	38.89	38.95	
PZ-113-AD	5/9/2011	0847	27.00	28.82	110.10	110.12	
PZ-113-AS	5/9/2011	0848	27.02	28.72	39.23	39.28	
PZ-113-SS	5/9/2011	0850	27.24	28.95	160.45	160.44	
PZ-114-AS	5/9/2011	1330	15.90	18.52	26.37	26.38	Top of Pump
PZ-115-SS	5/9/2011	1332	17.90	56.40	80.90	80.90	Top of Pump
PZ-116-SS	5/9/2011	1009	43.40	63.59	149.96	149.95	Top of Pump
PZ-200-SS	5/9/2011	1124	58.74	69.98	99.50	99.54	Labeled as GMP-7
PZ-201A-SS	5/9/2011	1117	45.66	53.31	86.30	86.20	Top of Pump
PZ-202-SS	5/9/2011	1043	18.69	22.31	85.13	85.19	Top of Pump
PZ-203-SS	5/9/2011	1342	58.19	46.28	111.39	111.38	
PZ-204-SS	5/9/2011	1352	45.19	32.87	88.00	88.02	
PZ-204A-SS	5/9/2011	1355	20.18	12.19	83.29	83.28	
PZ-205-AS	5/9/2011	0945	26.89	28.48	50.14	50.16	
PZ-205-SS	5/9/2011	0947	31.16	36.17	92.93	92.78	Double Checked Top of Pump
PZ-206-SS	5/9/2011	0922	34.51	40.31	126.78	126.78	
PZ-207-AS	5/9/2011	0844	27.84	29.72	39.43	39.45	
PZ-208-SS	5/9/2011	1307	25.00	31.49	100.35	100.38	
PZ-305-AI/LR-104-AI	5/9/2011	0929	25.62	27.11	40.17	40.23	
PZ-1201-SS	5/9/2011	NA	NA	NA	NA	NA	UNABLE TO FIND, WELL IS BURIED
S-5	5/9/2011	0858	31.24	33.58	44.33	44.32	
S-84	5/9/2011	1338	21.76	24.10	33.32	33.30	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Bryan Sehie & Kate Whitener

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/16/2011	1316	35.75	35.55	107.88	107.84	
D-85	11/16/2011	1252	21.09	20.30	81.04	81.04	
I-4	11/16/2011	1322	34.01	31.73	78.70	78.66	
I-68	11/16/2011	1602	18.07	15.30	40.85	40.76	
I-73	11/16/2011	1403	27.92	27.89	50.37	50.38	
LR-103	11/16/2011	1332	38.38	36.41	49.92	49.89	
LR-104	11/16/2011	1553	27.14	25.21	65.04	65.01	Also Labeled PZ-305
MW-F1S	11/16/2011	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	11/16/2011	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	11/16/2011	1444	42.15	46.61	171.70	171.40	TOP OF PUMP double checked
PZ-100-KS	11/16/2011	1634	35.79	32.35	388.57	388.56	
PZ-100-SD	11/16/2011	1632	75.19	64.70	96.32	96.31	TOP OF PUMP
PZ-100-SS	11/16/2011	1629	67.53	58.55	89.31	89.39	TOP OF PUMP
PZ-101-SS	11/16/2011	1543	90.10	85.15	155.55	155.67	double checked
PZ-102-SS	11/16/2011	1535	65.29	51.75	91.50	91.46	
PZ-102R-SS	11/16/2011	1537	45.91	41.95	91.15	91.13	
PZ-103-SS	11/16/2011	1530	64.90	63.38	149.73	149.80	
PZ-104-KS	11/16/2011	1512	24.00	22.11	411.11	411.12	
PZ-104-SD	11/16/2011	1509	29.40	36.42	120.19	120.15	TOP OF PUMP
PZ-104-SS	11/16/2011	1506	32.80	35.66	140.13	140.10	TOP OF PUMP
PZ-105-SS	11/16/2011	1454	32.82	33.94	144.57	144.57	TOP OF PUMP
PZ-106-KS	11/16/2011	1439	8.49	6.75	375.24	375.23	
PZ-106-SD	11/16/2011	1433	28.63	28.98	196.22	196.25	TOP OF PUMP
PZ-106-SS	11/16/2011	1436	26.97	27.36	161.20	161.45	TOP OF PUMP
PZ-107-SS	11/16/2011	1427	32.48	30.73	104.00	103.97	
PZ-108-SS	11/16/2011	1359	57.02	51.69	148.09	148.15	
PZ-109-SS	11/16/2011	1345	82.97	67.00	131.10	131.13	TOP OF PUMP

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Bryan Sehie & Kate Whitener

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	11/16/2011	1353	31.87	29.83	107.10	107.04	Top of Pump
PZ-111-KS	11/16/2011	1338	12.16	10.84	374.50	374.51	
PZ-111-SD	11/16/2011	1339	34.16	32.67	196.88	196.83	Top of Pump
PZ-112-AS	11/16/2011	1314	30.23	28.27	38.90	28.89	
PZ-113-AD	11/16/2011	1309	29.26	27.00	110.15	110.10	
PZ-113-AS	11/16/2011	1311	29.18	27.02	39.25	39.23	
PZ-113-SS	11/16/2011	1307	29.48	27.24	160.42	160.45	
PZ-114-AS	11/16/2011	1406	18.94	15.90	26.33	26.37	Top of Pump
PZ-115-SS	11/16/2011	1608	46.90	17.40	81.08	80.90	Top of Pump
PZ-116-SS	11/16/2011	1447	39.21	43.40	150.00	149.96	Top of Pump
PZ-200-SS	11/16/2011	1625	~~47.97~~ 46.82	58.74	99.53	99.50	Labeled as GMP-7
PZ-201A-SS	11/16/2011	1619	47.97	45.66	86.21	86.30	Top of Pump
PZ-202-SS	11/16/2011	1519	20.52	18.69	85.17	85.13	Top of Pump
PZ-203-SS	11/16/2011	1458	32.46	58.19	111.39	111.39	
PZ-204-SS	11/16/2011	1646	19.29	45.19	88.02	88.00	labed as PZ-204DSS
PZ-204A-SS	11/16/2011	1643	8.75	20.18	83.10	83.29	doubled checked
PZ-205-AS	11/16/2011	1411	28.75	26.89	50.11	50.14	
PZ-205-SS	11/16/2011	1409	33.50	31.16	92.96	92.93	
PZ-206-SS	11/16/2011	1557	37.75	34.51	126.74	126.78	
PZ-207-AS	11/16/2011	~~1610~~ 1301	30.21	27.84	39.43	39.43	
PZ-208-SS	11/16/2011	1612	29.06	25.00	100.35	100.35	
PZ-305-AI/LR-104-AI	11/16/2011	1552	27.61	25.62	40.18	40.17	
PZ-1201-SS	11/16/2011		NA	NA	NA	NA	UNABLE TO FIND, WELL IS BURIED
S-5	11/16/2011	1321	33.84	31.24	44.39	44.33	
S-84	11/16/2011	1257	24.38	21.76	33.28	33.32	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Matt Stewart and Shane Tamborski

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/9/2012	1626	~~70~~ 34.88	35.75	107.91	107.88	
D-85	5/9/2012	1349	23.68	21.09	81.07	81.04	
I-4	5/9/2012	1634	33.12	34.01	78.70	78.70	
I-68	5/9/2012	1353	16.92	18.07	40.86	40.85	
I-73	5/9/2012	1514	28.16	27.92	50.38	50.37	
LR-103	5/9/2012	1557	37.52	38.38	49.93	49.92	
LR-104	5/9/2012	1549	26.23	27.14	65.04	65.04	Also Labeled PZ-305
MW-F1S	5/9/2012	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	5/9/2012	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	5/9/2012	1411	32.34	42.15	171.72	171.70	TOP OF PUMP Double Checked
PZ-100-KS	5/9/2012	1257	27.44	35.79	388.47	388.57	
PZ-100-SD	5/9/2012	1251	40.19	75.19	96.51	96.32	TOP OF PUMP Double Checked
PZ-100-SS	5/9/2012	1253	39.14	67.53	89.41	89.31	TOP OF PUMP Double Checked
PZ-101-SS	5/9/2012	1234	61.01	90.10	155.72	155.55	Double Checked
PZ-102-SS	5/9/2012	1145	37.48	65.29	91.52	91.50	Double Checked
PZ-102R-SS	5/9/2012	1151	35.90	45.91	91.19	91.15	Double checked
PZ-103-SS	5/9/2012	1132	29.94	64.90	149.86	149.73	Double Checked
PZ-104-KS	5/9/2012	1107	19.88	24.00	411.18	411.11	
PZ-104-SD	5/9/2012	1100	24.97	29.40	120.36	120.19	TOP OF PUMP
PZ-104-SS	5/9/2012	1057	24.70	32.80	140.37	140.13	TOP OF PUMP
PZ-105-SS	5/9/2012	1043	27.10	32.82	144.65	144.57	TOP OF PUMP
PZ-106-KS	5/9/2012	1446	5.41	8.49	375.06	375.24	
PZ-106-SD	5/9/2012	1433	16.94	28.63	196.25	196.22	TOP OF PUMP
PZ-106-SS	5/9/2012	1438	15.86	26.97	161.23	161.20	TOP OF PUMP
PZ-107-SS	5/9/2012	1457	31.46	32.48	104.03	104.00	
PZ-108-SS	5/9/2012	1521	19.17	57.02	148.11	148.09	Double Checked
PZ-109-SS	5/9/2012	1530	27.18	82.97	131.12	131.10	TOP OF PUMP Double Checked

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Matt Stewart and Shane Tamborski

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5/9/2012	1535	28.24	31.87	107.19	107.10	Top of Pump
PZ-111-KS	5/9/2012	1605	9.65	12.16	374.58	374.50	
PZ-111-SD	5/9/2012	1602	33.68	34.16	196.86	196.88	Top of Pump
PZ-112-AS	5/9/2012	1612	29.53	30.23	38.91	38.90	
PZ-113-AD	5/9/2012	1620	28.37	29.26	110.23	110.15	
PZ-113-AS	5/9/2012	1623	28.31	29.18	39.28	39.25	
PZ-113-SS	5/9/2012	1618	28.61	29.48	160.47	160.42	
PZ-114-AS	5/9/2012	1356	17.45	18.94	26.11	26.33	Top of Pump
PZ-115-SS	5/9/2012	1358	15.43	46.90	81.18	81.08	Top of Pump
PZ-116-SS	5/9/2012	1407	31.39	39.21	150.00	150.00	Top of Pump
PZ-200-SS	5/9/2012	1246	40.07	65.82	94.59	99.53	Double checked Labeled as GMP-7
PZ-201A-SS	5/9/2012	1241	23.97	47.97	86.22	86.21	Double checked Top of Pump
PZ-202-SS	5/9/2012	1123	14.79	20.52	85.29	85.17	Top of Pump
PZ-203-SS	5/9/2012	1049	27.60	32.46	111.41	111.39	
PZ-204-SS	5/9/2012	1421	10.79	19.29	88.05	88.02	
PZ-204A-SS	5/9/2012	1419	6.62	8.75	~~78.88~~	83.10	78.81 Double checked
PZ-205-AS	5/9/2012	1508	~~27.42~~ MD	28.75	50.15	50.11	WL= 27.47
PZ-205-SS	5/9/2012	1503	27.42	33.50	93.00	92.96	
PZ-206-SS	5/9/2012	1541	26.62	37.75	126.78	126.74	
PZ-207-AS	5/9/2012	1641	29.32	30.21	39.50	39.43	
PZ-208-SS	5/9/2012	1305	23.19	29.06	100.42	100.35	
PZ-305-AI/LR-104-AI	5/9/2012	1551	26.71	27.61	40.24	40.18	
PZ-1201-SS	5/9/2012	N/A	NA	NA	NA	NA	UNABLE TO FIND, WELL IS BURIED
S-5	5/9/2012	~~1347~~ MD	31.21	33.84	44.37	44.39	Time = 1630
S-84	5/9/2012	1345	23.47	24.38	33.33	33.28	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill OU-1

Personnel: John D Regan and Ward Herst

Well ID	Date	Time	Depth to Water (ft)	Total Depth (ft)	Notes
D-12	5/15/2012	0940	46.98	150.13	
D-13	5/15/2012	0957	37.48	137.48	
D-6	5/15/2012	1322	14.64	108.95	Severely overgrown
D-81	5/15/2012	1136	Presumed Destroyed: no well at GPS location or vicinity		
D-83	5/15/2012	1436	Presumed Present: Inaccessible, location severely overgrown		
D-85	5/15/2012	23.83	For correlation with water levels measured on 5/9/12		
D-87	5/15/2012	1016	Damaged: obstructed at 3.93, obstruction is soft		
D-89	5/15/2012	1124	Presumed Destroyed: no well at GPS location or vicinity		
D-92	5/15/2012	0949	Presumed Destroyed: location under 20' tall pile of concrete debris		
D-93	5/15/2012	1224	18.08	57.09	Due to TD, suspect mis-labeled, most likely I-9
D-94	5/15/2012	1421	Presumed Present: Inaccessible, location severely overgrown		
I-11	5/15/2012	0926	47.31	94.49	
I-2	5/15/2012	1230	Presumed Present: Inaccessible, location severely overgrown		
I-55	5/15/2012	1245	Presumed Present: Inaccessible, location severely overgrown		
I-56	5/15/2012	1202	Presumed Destroyed: no well at GPS location or vicinity		
I-58	5/15/2012	1213	Presumed Destroyed: no well at GPS location or vicinity		
I-59	5/15/2012	1215	Presumed Destroyed: no well at GPS location or vicinity		
I-62	5/15/2012	1435	Presumed Present: Inaccessible, location severely overgrown		
I-65	5/15/2012	1420	Unable to locate: Inaccessible, location severely overgrown		
I-66	5/15/2012	1416	8.68	41.35	
I-67	5/15/2012	1409	Damaged: unable to measure, PVC broken below ground surface		
I-7	5/15/2012	1335	Presumed Present: Inaccessible, location severely overgrown		
I-9	5/15/2012	1221	17.13	114.60	Due to TD, suspect mis-labeled, most likely D-93
LR-100	5/15/2012	1110	Presumed Destroyed: no well at GPS location or vicinity		
LR-101	5/15/2012	1040	Presumed Destroyed: no well at GPS location or vicinity		
LR-102	5/15/2012	1032	Presumed Destroyed: location under soil stockpile		
LR-105	5/15/2012	1057	31.49	38.43	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill OU-1

Personnel: John D Regan and Ward Herst

Well ID	Date	Time	Depth to Water (ft)	Total Depth (ft)	Notes
MW-101	5/15/2012	1337	Presumed Present: Inaccessible, location severely overgrown		
MW-102	5/15/2012	1332	15.23	20.50	Severely overgrown
MW-103	5/15/2012	1212	Damaged: casing bent at 45° angle, unable to measure		
MW-104	5/15/2012	1144	8.11	18.98	
MW-F2	5/15/2012	1146	Presumed Destroyed: no well at GPS location or vicinity		
MW-F3	5/15/2012	0959	Presumed Destroyed: location under toe of C&D landfill		
PZ-302-AI	5/15/2012	1132	18.21	44.28	
PZ-302-AS	5/15/2012	1129	18.27	24.58	
PZ-303-AS	5/15/2012	1155	20.3	28.32	
PZ-304-AI	5/15/2012	1201	21.12	52.25	
PZ-304-AS	5/15/2012	1205	20.83	29.35	
S-1	5/15/2012	1231	Presumed Present: Inaccessible, location severely overgrown		
S-10	5/15/2012	0930	47.26	56.83	
S-54	5/15/2012	1145	Presumed Destroyed: no well at GPS location or vicinity		
S-60	5/15/2012	1240	Presumed Present: Inaccessible, location severely overgrown		
S-61	5/15/2012	1312	16.82	26.49	Severely overgrown
S-75	5/15/2012	1103	Damaged: casing bent at 45° angle, unable to measure		
S-76	5/15/2012	1135	Presumed Destroyed: no well at GPS location or vicinity		
S-8	5/15/2012	1437	Presumed Present: Inaccessible, location severely overgrown		
S-82	5/15/2012	1217	17.24	25.32	
S-84	5/15/2012	1429	23.61	For correlation with water levels measured on 5/9/12	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski, Jon Wilkinson, Bill Abernathy and Rachael Haynes

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-12	7/30/2012	1103	50.26	46.98	148.60	150.13	
D-13	7/30/2012	1054	40.90	37.48	136.02	137.48	
D-6	7/30/2012	1303	18.01	14.64	108.28	108.95	Severely overgrown
D-81	7/30/2012	1444	21.02	NA	62.75	NA	Presumed Destroyed: no well at GPS location or vicinity
D-83	7/30/2012	1000	18.99	NA	98.41	NA	Presumed Destroyed: no well at GPS location or vicinity
D-85	7/30/2012	1026	27.29	NA	81.07	NA	For correlation with water levels measured on 5/9/12
D-87	7/30/2012	1116	34.72	NA	112.75	NA	Damaged: obstructed at 3.93, obstruction is soft
D-89	7/30/2012			NA		NA	Presumed Destroyed: no well at GPS location or vicinity
D-92	7/30/2012			NA		NA	Presumed Destroyed: location under 20' tall pile of concrete debris
D-93	7/30/2012	1543	21.34	18.08	57.10	57.09	Due to TD, suspect mis-labeled, most likely I-9
D-94	7/30/2012	Damaged		NA		NA	Presumed Present: Inaccessible, location severely overgrown
I-11	7/30/2012	1106	50.57	47.31	94.40	94.49	
I-2	7/30/2012			NA		NA	Presumed Present: Inaccessible, location severely overgrown
I-55	7/30/2012			NA		NA	Presumed Present: Inaccessible, location severely overgrown
I-56	7/30/2012			NA		NA	Presumed Destroyed: no well at GPS location or vicinity
I-58	7/30/2012			NA		NA	Presumed Destroyed: no well at GPS location or vicinity
I-59	7/30/2012			NA		NA	Presumed Destroyed: no well at GPS location or vicinity
I-62	7/30/2012	1003	16.70	NA	44.95	NA	Presumed Present: Inaccessible, location severely overgrown
I-65	7/30/2012	1635	12.25	NA	38.90	NA	Unable to locate: Inaccessible, location severely overgrown
I-66	7/30/2012	1045	12.20	8.68	41.29	41.35	
I-67	7/30/2012	1040	12.18	NA	40.59	NA	Damaged: unable to measure, PVC broken below ground surface
I-7	7/30/2012			NA		NA	Presumed Present: Inaccessible, location severely overgrown
I-9	7/30/2012	1539	20.35	17.13	114.50	114.60	Due to TD, suspect mis-labeled, most likely D-93
LR-100	7/30/2012	1204	17.40	NA	27.21	NA	Presumed Destroyed: no well at GPS location or vicinity
LR-101	7/30/2012			NA		NA	Presumed Destroyed: no well at GPS location or vicinity
LR-102	7/30/2012			NA		NA	Presumed Destroyed: location under soil stockpile
LR-105	7/30/2012	1156	31.38	31.49	37.96	38.43	

D-93 as I-9 & I-9 as D-93 possibly mislabled

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski, Jon Wilkinson, Bill Abernathy and Rachael Haynes

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
MW-101	7/30/2012			NA		NA	Presumed Present: Inaccessible, location severely
MW-102	7/30/2012	1312	18.53	15.23	22.80	20.5	Severely overgrown
MW-103	7/30/2012	1522	9.50	NA	14.45	NA	Damaged: casing bent at 45° angle, unable to measure
MW-104	7/30/2012	1456	11.09	8.11	19.00	18.95	
MW-F2	7/30/2012			NA		NA	Presumed Destroyed: no well at GPS location or vicinity
MW-F3	7/30/2012			NA		NA	Presumed Destroyed: location under toe of C&D landfill
PZ-302-AI	7/30/2012	1436	21.22	18.21	44.25	44.28	
PZ-302-AS	7/30/2012	1439	21.28	18.27	24.54	24.58	
PZ-303-AS	7/30/2012	1502	23.42	20.3	28.29	28.32	
PZ-304-AI	7/30/2012	1510	24.19	21.12	52.20	52.25	
PZ-304-AS	7/30/2012	1513	23.90	20.83	29.32	29.35	
S-1	7/30/2012			NA		NA	Presumed Present: Inaccessible, location severely
S-10	7/30/2012	1108	50.54	47.26	56.81	56.83	
S-54	7/30/2012			NA		NA	Presumed Destroyed: no well at GPS location or vicinity
S-60	7/30/2012			NA		NA	Presumed Present: Inaccessible, location severely
S-61	7/30/2012	1315	20.17	16.82	26.48	26.49	Severely overgrown
S-75	7/30/2012	Blockage at		NA	17.45	NA	Damaged: casing bent at 45° angle, unable to measure
S-76	7/30/2012			NA		NA	Presumed Destroyed: no well at GPS location or vicinity
S-8	7/30/2012	1233	14.49	NA	31.20	NA	Presumed Present: Inaccessible, location severely
S-82	7/30/2012	1535	20.48	17.24	25.49	25.32	
S-84	7/30/2012	1028	26.98	23.61	33.30	NA	For correlation with water levels measured on 5/9/12
S-53	7/30/2012	1426	14.27	NA	17.00	NA	
LR-103	8/6/2012	1235	40.79		49.89		

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski, Jon Wilkinson, Bill Abernathy and Rachael Haynes

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	7/30/2012	1356	38.11	34.88	107.86	107.91	
✓ D-85	7/30/2012			23.68		81.09	
I-4	7/30/2012	1407	36.00	33.12	78.66	78.70	
I-68	7/30/2012	1239	20.63	16.92	40.77	40.86	
I-73	7/30/2012	1524	28.25	28.16	50.38	50.38	
LR-103	7/30/2012	1653	40.70	37.52	49.90	49.93	
LR-104	7/30/2012	1652	29.11	26.23	65.00	65.04	Also Labeled PZ-305
MW-F1S	7/30/2012	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D	7/30/2012	NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204	7/30/2012	1630	33.20	32.34	171.72	171.72	TOP OF PUMP
PZ-100-KS	7/30/2012	1213	30.41	27.44	388.15	388.47	
PZ-100-SD	7/30/2012	1210	52.93	40.19	96.48	96.51	TOP OF PUMP
PZ-100-SS	7/30/2012	1206	47.50	39.14	89.25	89.41	TOP OF PUMP
PZ-101-SS	7/30/2012	1139	72.73	61.01	155.61	155.72	
PZ-102-SS	7/30/2012	1124	44.80	37.48	91.48	91.52	
PZ-102R-SS	7/30/2012	1131	37.78	35.90	91.04	91.19	
PZ-103-SS	7/30/2012	1114	42.74	29.94	149.79	149.86	
PZ-104-KS	7/30/2012	1030	22.40	19.88	409.26	411.18	Double checked total Depth
PZ-104-SD	7/30/2012	1043	23.80	24.97	120.50	120.36	TOP OF PUMP
PZ-104-SS	7/30/2012	1045	23.48	24.70	140.22	140.37	TOP OF PUMP
PZ-105-SS	7/30/2012	1013	27.74	27.10	144.81	144.65	TOP OF PUMP
PZ-106-KS	7/30/2012	1559	6.82	5.41	374.97	375.06	
PZ-106-SD	7/30/2012	1557	18.26	16.74	196.15	196.25	TOP OF PUMP
PZ-106-SS	7/30/2012	1551	16.92	15.86	161.20	161.23	TOP OF PUMP
PZ-107-SS	7/30/2012	1537	34.46	31.46	103.99	104.03	
PZ-108-SS	7/30/2012			19.17		148.11	
PZ-109-SS	7/30/2012	1511	59.91	27.18	131.18	131.12	TOP OF PUMP

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

MOS per Dave Vasbinder

PZ-108-SS - Inaccessible due to current liner work - actionable I.A.
D.N. to utalize PID, Respirator ~~and possibly~~ methane meter to monitor headspace

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Shane Tamborski, Jon Wilkinson, Bill Abernathy and Rachael Haynes

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	7/30/2012	1459	33.21	28.24	107.11	107.19	Top of Pump
PZ-111-KS	7/30/2012	1450	10.71	9.65	374.59	374.58	
PZ-111-SD	7/30/2012	1444	35.93	33.68	196.81	196.86	Top of Pump
PZ-112-AS	7/30/2012	1429	32.78	29.53	38.83	38.91	
PZ-113-AD	7/30/2012	1420	31.68	28.37	110.12	110.23	
PZ-113-AS	7/30/2012	1418	31.55	28.31	39.22	39.28	
PZ-113-SS	7/30/2012	1424	31.85	28.61	160.43	160.47	
PZ-114-AS	7/30/2012	1232	21.35	17.45	26.35	26.11	Top of Pump
PZ-115-SS	7/30/2012	1235	36.93	15.43	80.92	81.18	Top of Pump double checked water level
PZ-116-SS	7/30/2012	1626	31.80	31.39	149.98	150.00	Top of Pump
PZ-200-SS	7/30/2012	1146	45.58	40.07	99.51	99.59	Labeled as GMP-7
PZ-201A-SS	7/30/2012	1156	33.55	23.97	86.11	86.22	Top of Pump
PZ-202-SS	7/30/2012	1109	17.78	14.79	85.24	85.29	Top of Pump
PZ-203-SS	7/30/2012	1101	27.80	27.60	111.38	111.41	
PZ-204-SS	7/30/2012	1611	12.85	10.79	88.01	88.05	Labeled MW-3040-55 Double gauged Total depth Labeled 204A-55
PZ-204A-SS	7/30/2012	1615	7.31	6.62	83.34	78.81	
PZ-205-AS	7/30/2012	1534	30.28	27.47	50.15	50.15	
PZ-205-SS	7/30/2012	1531	31.51	27.42	92.95	93.00	
PZ-206-SS	7/30/2012	1520	34.70	26.62	126.80	126.78	
PZ-207-AS	7/30/2012	1437	32.75	29.32	39.45	39.50	
PZ-208-SS	7/30/2012	1224	26.01	23.19	100.36	100.42	
PZ-305-AI	7/30/2012	1650	29.60	26.71	40.18	40.24	Also Labeled LR-104-AI
PZ-1201-SS	7/30/2012	NA	NA	NA	NA	NA	Unable to Find, Well is Buried
S-5	7/30/2012	1403	36.01	31.21	44.34	44.37	
✓ S-84	7/30/2012			23.47		33.33	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Shane Tamborski & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/26/12	0956	40.31	34.88	107.75	107.91	
D-85	11/26/12	1007	29.37	23.68	80.65	81.09	
I-4	11/26/12	0958	38.54	33.12	78.65	78.70	
I-68	11/26/12	1016	22.73	16.92	40.75	40.86	
I-73	11/26/12	1405	33.38	28.16	50.03	50.38	
LR-103	11/26/12	1441	42.79	37.52	49.80	49.93	
LR-104	11/26/12	1417	31.42	26.23	64.99	65.04	Also labeled PZ-305.
MW-1204	11/26/12	1316	33.51	32.34	171.70	171.72	TD is top of pump.
PZ-100-KS	11/26/12	1040	29.56	27.44	387.45	388.47	TD - Double checked
PZ-100-SD	11/26/12	1037	46.18	40.19	96.55	96.51	TD is top of pump.
PZ-100-SS	11/26/12	1035	40.20	39.14	89.28	89.41	TD is top of pump.
PZ-101-SS	11/26/12	1107	69.81	61.01	156.00	155.72	
PZ-102-SS	11/26/12	1114	36.28	37.48	91.44	91.52	
PZ-102R-SS	11/26/12	1116	34.47	35.90	91.10	91.19	
PZ-103-SS	11/26/12	1123	27.30	29.94	149.62	149.86	
PZ-104-KS	11/26/12	1143	21.89	19.88	411.25	411.18	
PZ-104-SD	11/26/12	1138	25.04	24.97	120.51	120.36	TD is top of pump.
PZ-104-SS	11/26/12	1140	23.05	24.70	140.24	140.37	TD is top of pump.
PZ-105-SS	11/26/12	1157	27.52	27.10	144.82	144.65	TD is top of pump.
PZ-106-KS	11/26/12	1335	6.59	5.41	374.90	375.06	
PZ-106-SD	11/26/12	1332	17.93	16.74	196.20	196.25	TD is top of pump.
PZ-106-SS	11/26/12	1330	16.72	15.86	181.26	161.23	TD is top of pump.
PZ-107-SS	11/26/12	1351	36.45	31.46	104.00	104.03	
PZ-108-SS	11/26/12	1427	NA	19.17	NA	148.11	no longer present
PZ-109-SS	11/26/12	1429	54.65	27.18	131.04	131.12	n.l. - Double checked TD is top of pump.
PZ-110-SS	11/26/12	1435	34.95	28.24	107.23	107.19	TD is top of pump.
PZ-111-KS	11/26/12	1450	10.66	9.65	374.20	374.58	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Shane Tamborski & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-111-SD	11/26/12	1448	38.32	33.68	196.01	196.86	TD- Double checked TD is top of pump.
PZ-112-AS	11/26/12	0948	34.86	29.53	38.70	38.91	
PZ-113-AD	11/26/12	1506	33.83	28.37	110.13	110.23	
PZ-113-AS	11/26/12	1503	33.80	28.31	39.18	39.28	
PZ-113-SS	11/26/12	1501	33.98	28.61	160.30	160.47	
PZ-114-AS	11/26/12	1020	23.40	17.45	26.35	26.11	TD is top of pump.
PZ-115-SS	11/26/12	1023	31.49	15.43	81.16	81.18	TD is top of pump.
PZ-116-SS	11/26/12	1321	31.73	31.39	149.90	150.00	TD is top of pump.
PZ-200-SS	11/26/12	1053	38.95	40.07	99.51	99.59	Labeled as GMP-7.
PZ-201A-SS	11/26/12	1100	23.32	23.97	86.07	86.22	TD is top of pump.
PZ-202-SS	11/26/12	1128	17.50	14.79	85.20	85.29	TD is top of pump.
PZ-203-SS	11/26/12	1154	27.95	27.60	111.38	111.41	
PZ-204-SS	11/26/12	1300	11.30	10.79	88.02	88.05	
PZ-204A-SS	11/26/12	1303	6.91	6.62	85.16	78.81	TD-Double checked
PZ-205-AS	11/26/12	1359	31.45	27.47	49.20	50.15	TD-Double checked
PZ-205-SS	11/26/12	1402	32.64	27.42	92.83	93.00	
PZ-206-SS	11/26/12	1421	35.67	26.62	126.38	126.78	
PZ-207-AS	11/26/12	1510	34.93	29.32	39.54	39.50	
PZ-208-SS	11/26/12	1030	25.33	23.19	100.40	100.42	
PZ-305-AI	11/26/12	1414	31.90	26.71	40.10	40.24	Also labeled as LR-104-AI.
S-5	11/26/12	0954	37.99	31.21	44.16	44.37	
S-84	11/26/12	1009	29.15	23.47	33.21	33.33	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: West Lake OU-1

Personnel: Jon Wilkinson, John Regan,

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-12	4/2/13	1314	52.33	50.26		148.60	
D-13		1321	43.24	40.90		136.02	
D-6		1058	20.12	18.01		108.28	
D-81		1155	22.82	21.02		62.75	
D-83		1120	21.15	18.99		98.41	
D-87		1304	37.02	34.72		112.75	Damaged: obstructed at 3.93, obstruction is soft
D-93		1143	23.28	21.34		114.50	
I-11		1310	52.77	50.57		94.40	
I-62		1118	18.90	16.70		44.95	
I-65		1342	14.43	12.25		38.90	
I-66		1333	14.57	12.20		41.29	
I-67		1328	14.51	12.18		40.59	
I-9		1145	22.30	20.35		57.10	
LR-100		1222	15.28	17.40		27.21	
LR-105		1237	32.53	31.38		37.96	
MW-102		1101	20.19	18.53		22.80	
MW-103		1133	11.44	9.50		14.45	Damaged: casing bent at 45° angle, unable to measure
MW-104		1150	12.81	11.09		19.00	
PZ-302-AI		1201	23.11	21.22		44.25	
PZ-302-AS		0925	23.40	21.28		24.54	
PZ-303-AS		1206	25.21	23.42		28.29	
PZ-304-AI		1217	26.05	24.19		52.20	
PZ-304-AS		1210	25.80	23.90		29.32	
S-10		1312	52.75	50.54		56.81	
S-53		0905	16.35	14.27		17.00	
S-61		1054	22.33	20.17		26.48	
S-75		1226	N/A	NA		17.45	Damaged: casing bent at 45° angle, unable to measure, bent @ 17.15
S-8		1112	16.73	14.49		31.20	
S-82	4/2/13	1142	22.44	20.48		25.49	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Jon Wilkinson, John Regan,

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	4/2/13	1319	40.55	38.11		107.86	
D-85		1257	29.65	27.46		81.07	
I-4		1326	38.77	36.00		78.66	
I-68		1253	22.91	20.63		40.77	
I-73		1416	33.43	28.25		50.38	
LR-103		1417	42.85	40.70		49.90	
LR-104		1410	31.62	29.11		65.00	Also Labeled PZ-305
MW-F1S		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204		1100	37.84	33.20		171.72	TOP OF PUMP
PZ-100-KS		1213	26.32	30.41		388.15	
PZ-100-SD		1215	35.87	52.93		96.48	TOP OF PUMP
PZ-100-SS		1217	34.57	47.50		89.25	TOP OF PUMP
PZ-101-SS		1151	53.15	72.73		155.61	
PZ-102-SS		1143	37.67	44.80		91.48	
PZ-102R-SS		1140	28.79	37.78		91.04	
PZ-103-SS		1136	9.58	42.74		149.79	
PZ-104-KS		1119	18.71	22.40		409.26	
PZ-104-SD		1121	22.01	23.80		120.50	TOP OF PUMP
PZ-104-SS		1123	21.25	23.48		140.22	TOP OF PUMP
PZ-105-SS		1108	24.19	27.74		144.81	TOP OF PUMP
PZ-106-KS		1053	4.59	6.82		374.97	
PZ-106-SD		1051	14.69	18.20		196.15	TOP OF PUMP
PZ-106-SS		1049	13.57	16.92		161.20	TOP OF PUMP
PZ-107-SS		1258	36.30	34.40		103.99	
PZ-108-SS		NA	NA	NA	NA	NA	NO LONGER PRESENT
PZ-109-SS	4/2/13	1339	27.53	59.91		131.18	TOP OF PUMP

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Jon Wilkinson, John Regan,

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	4/2/13	1351	33.06	33.21		107.11	Top of Pump
PZ-111-KS		1343	9.20	10.71		374.59	
PZ-111-SD		1346	38.86	35.93		196.81	Top of Pump
PZ-112-AS		1331	35.09	32.78		38.83	
PZ-113-AD		1313	34.06	31.68		110.12	
PZ-113-AS		1311	33.98	31.55		39.22	
PZ-113-SS		1315	34.20	31.85		160.43	
PZ-114-AS		1250	23.37	21.35		26.35	Top of Pump
PZ-115-SS		1248	15.88	36.93		80.92	Top of Pump
PZ-116-SS		1103	27.25	31.80		149.98	Top of Pump
PZ-200-SS		1207	30.58	45.58		99.51	Labeled as GMP-7
PZ-201A-SS		1159	12.39	33.55		86.11	Top of Pump
PZ-202-SS		1129	14.08	17.78		85.24	Top of Pump
PZ-203-SS		1112	24.84	27.80		111.38	
PZ-204-SS		1249	8.76	12.85		88.01	
PZ-204A-SS		1247	4.85	7.31		83.34	
PZ-205-AS		1409	30.87	30.28		50.15	
PZ-205-SS		1412	31.02	31.51		92.95	
PZ-206-SS		1403	29.33	34.70		126.80	
PZ-207-AS		1304	35.11	32.75		39.45	
PZ-208-SS		1223	22.04	26.01		100.36	
PZ-305-AI		1407	32.14	29.60		40.18	Also Labeled LR-104-AI
PZ-1201-SS		NA	NA	NA	NA	NA	NO LONGER PRESENT
S-5		1322	37.63	36.01		44.34	
S-84	4/2/13	1259	29.43	26.98		33.30	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Jon Wilkinson, Matt Stewart

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	7/8/2013	1047	28.81	33.06	107.11	107.11	Top of Pump
PZ-111-KS	"	1042	8.51	9.20	374.59	374.59	
PZ-111-SD		1040	33.16	38.96	196.81	196.81	Top of Pump
PZ-112-AS		1034	29.09	35.09	38.83	38.83	
PZ-113-AD		1033	28.10	34.06	110.12	110.12	
PZ-113-AS		1034	28.05	33.98	39.22	39.22	
PZ-113-SS		1031	28.34	34.20	160.43	160.43	
PZ-114-AS		1359	17.39	23.37	26.35	26.35	~~Top of Pump~~ Top of Pump
PZ-115-SS		1357	14.94	15.88	80.92	80.92	Top of Pump
PZ-116-SS		1522	25.68	27.25	149.98	149.98	Top of Pump
PZ-200-SS		1423	26.66	30.58	99.51	99.51	Labeled as GMP-7
PZ-201A-SS		1432	10.60	12.39	86.11	86.11	Top of Pump
PZ-202-SS		1318	15.24	14.08	85.24	85.24	Top of Pump
PZ-203-SS		1240	24.84	24.94	111.38	111.38	
PZ-204-SS		1350	7.96	6.76	88.01	88.01	
PZ-204A-SS		1349	5.49	4.95	83.34	83.34	
PZ-205-AS		1120	25.46	30.97	50.15	50.15	
PZ-205-SS		1118	25.75	31.02	92.95	92.95	Top of Pump
PZ-206-SS		1519	26.14	29.33	126.80	126.80	
PZ-207-AS		1024	28.76	35.11	39.45	39.45	
PZ-208-SS		1438	21.57	22.04	100.36	100.36	
PZ-305-AI		1535	26.38	32.14	40.18	40.18	Also Labeled LR-104-AI
PZ-1201-SS		NA	NA	NA	NA	NA	NO LONGER PRESENT
S-5	"	1024	32.82	37.63	44.34	44.34	
S-84	7/8/13	0946	23.34	29.43	33.30	33.30	
D-14	7/10/2013	1629	28.97	—	33.32	—	Obstructed at 33.32

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: West Lake OU-1

Personnel: Jon Wilkinson, Matt Stewart

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-12	7/8/2013	0959	46.62	52.33	148.60	148.60	
D-13		1013	36.89	43.24	136.02	136.02	
D-6		1313	14.28	20.12	109.28	108.28	
D-81		1200	17.75	22.82	62.75	62.75	
D-83		1330	15.10	21.15	98.41	98.41	
D-87		1040	31.20	37.02	112.75	112.75	~~Damaged: obstructed at 3.93, obstruction in well~~
D-93		1247	16.85	23.28	114.50	114.50	
I-11		0956	46.90	52.77	94.40	94.40	
I-62		1332	12.80	18.90	44.95	44.95	
I-65		1501	8.08	14.43	38.90	38.90	
I-66		1446	8.29	14.57	41.29	41.29	
I-67		1443	8.23	14.51	40.59	40.59	
I-9		1247	17.82	22.30	57.10	57.10	
LR-100		1608	15.16	15.28	27.21	27.21	
LR-105		1425	30.49	32.53	37.96	37.96	
MW-102		1302	14.88	20.19	22.80	22.80	
MW-103		1238	6.40	11.44	14.45	14.45	~~Damaged: casing bent at 45° angle, unable to measure~~
MW-104		1208	7.83	12.81	19.00	19.00	
PZ-302-AI		1146	17.96	23.11	44.25	44.25	
PZ-302-AS		1148	17.57	23.40	24.54	24.54	
PZ-303-AS		1220	20.11	25.21	28.29	28.29	
PZ-304-AI		1231	20.88	26.05	52.20	52.20	
PZ-304-AS		1229	20.59	25.80	29.32	29.32	
S-10		0957	46.95	52.75	56.81	56.81	
S-53		1112	11.12	16.35	18.45	17.00	
S-61		1311	16.43	22.33	26.48	26.48	
S-75		N/A	N/A	NA	N/A	17.45	Damaged: casing bent at 45° angle, unable to measure
S-8		1337	10.54	16.73	31.20	31.20	
S-82	7/8/2013	1249	16.95	22.44	25.49	25.49	

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill

Personnel: Jon Wilkinson, Matt Stewart

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	7/8/2013	1020	34.65	40.55	107.86	107.86	
D-85		0950	23.60	29.65	81.07	81.07	
I-4		1022	32.60	38.77	78.66	78.66	
I-68		1350	16.88	22.91	40.77	40.77	
I-73		1112	28.07	33.43	50.38	50.38	
LR-103		1051	37.29	42.85	49.90	49.90	
LR-104		1621	25.98	31.62	65.00	65.00	Also Labeled PZ-305
MW-F1S		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-F1D		NA	NA	NA	NA	NA	NO LONGER PRESENT
MW-1204		1524 (MP) 1504	27.47	27.84	171.72	171.72	TOP OF PUMP
PZ-100-KS		1415	26.14	26.32	388.15	388.15	
PZ-100-SD		1413	36.75	35.87	96.48	96.48	TOP OF PUMP
PZ-100-SS		1411	34.18	34.57	89.25	89.25	TOP OF PUMP
PZ-101-SS		1339	58.19	53.15	155.61	155.61	
PZ-102-SS		1501	25.63	27.67	91.48	91.48	
PZ-102R-SS		1503	25.14	28.79	91.04	91.04	
PZ-103-SS		1325	6.72	9.58	149.79	149.79	
PZ-104-KS		1249	19.11	18.71	409.26	409.26	
PZ-104-SD		1251	22.17	22.01	120.50	120.50	TOP OF PUMP
PZ-104-SS		1253	20.11	21.25	140.22	140.22	TOP OF PUMP
PZ-105-SS		1226	24.24	24.19	144.81	144.81	TOP OF PUMP
PZ-106-KS		1211	4.34	4.59	374.97	374.97	
PZ-106-SD		1213	13.52	14.69	196.15	196.15	TOP OF PUMP
PZ-106-SS		1215	12.47	13.57	161.20	161.20	TOP OF PUMP
PZ-107-SS		1140	31.12	36.30	103.99	103.99	
PZ-108-SS		NA	NA	NA	NA	NA	NO LONGER PRESENT
PZ-109-SS	7/8/2013	1053	35.86	27.53	131.18	131.18	TOP OF PUMP

Herst & Associates, Inc. 4631 North St. Peters Parkway, St. Charles, MO 63304 (636) 939-9111 (636) 939-9757 fax

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: West Lake OU-1

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	9/30/2013	0911	37.50	34.65	N/A*	107.86	
D-6	"	1128	17.36	14.28	N/A*	108.28	
D-12		0909	49.61	46.62	N/A*	148.60	
D-13		1343	40.05	36.89	N/A*	136.02	
D-14		1432	30.17	28.97	N/A*	33.32	
D-81		0955	20.34	17.75	N/A*	62.75	
D-83		1152	18.37	15.10	N/A*	98.41	
D-85		0853	26.63	23.60	N/A*	81.07	
D-87		1502	44.05	31.20	N/A*	112.75	Double checked w
D-93		1059	19.75	16.85	N/A*	114.50	
I-4		0913	35.39	32.60	N/A*	78.66	
I-9		1100	20.68	17.82	N/A*	57.10	
I-11		0905	49.89	46.90	N/A*	94.40	
I-62		1153	16.00	12.80	N/A*	44.95	
I-65		1400	11.49	8.08	N/A*	38.90	
I-66		1356	11.54	8.29	N/A*	41.29	
I-67		1351	11.45	8.23	N/A*	40.59	
I-68		1326	19.92	16.88	N/A*	40.77	
I-73		0952	30.73	28.07	N/A*	50.38	
S-5		0915	35.76	32.82	N/A*	44.34	
S-8		1143	13.81	10.54	N/A*	31.20	
S-10		0907	49.94	46.95	N/A*	56.81	
S-53		0928	13.70	11.12	N/A*	17.00	
S-61		1129	19.53	16.43	N/A*	26.48	
S-75		N/A	N/A	NA	N/A*	N/A	Damaged: casing bent at 45° angle, unable to measure
S-82	↓	1057	19.79	16.95	N/A*	25.49	
S-84	9/30/2013	0851	26.84	23.34	N/A*	33.30	

* N/A = Total Depths from July 2012 event utilized for this event.

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

GROUNDWATER ELEVATION MEASUREMENTS

Site: West Lake OU-1

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
LR-100	9/30/2013	1225	16.58	15.16	N/A*	27.21	
LR-103	"	1458	39.95	37.29	N/A*	49.90	
LR-104		1441	28.55	25.98	N/A*	65.00	Also Labeled as PZ-305.
LR-105		1235	31.39	30.49	N/A*	37.96	
MW-102		1131	17.93	14.88	N/A*	22.80	
MW-103		1032	8.85	6.40	N/A*	14.45	
MW-104		1002	10.39	7.83	N/A*	19.00	
MW-1204		1048	25.38	27.47	N/A*	171.72	TD is Top of pump.
PZ-100-KS		1348	26.09	26.14	N/A*	388.15	
PZ-100-SD		1346	34.99	36.75	N/A*	96.48	TD is Top of pump.
PZ-100-SS		1344	33.72	34.18	N/A*	89.25	TD is Top of pump.
PZ-101-SS		1210	54.49	58.19	N/A*	155.61	
PZ-102-SS		1158	24.77	25.63	N/A*	91.48	
PZ-102R-SS		1200	25.49	25.14	N/A*	91.04	
PZ-103-SS		1148	8.64	6.72	N/A*	149.79	
PZ-104-KS		1121	20.05	19.11	N/A*	409.26	
PZ-104-SD		1123	21.99	22.17	N/A*	120.50	TD is Top of pump.
PZ-104-SS		1125	19.56	20.11	N/A*	140.22	TD is Top of pump.
PZ-105-SS		1059	24.69	24.24	N/A*	144.81	TD is Top of pump.
PZ-106-KS		1029	5.05	4.34	N/A*	374.97	
PZ-106-SD		1031	12.38	13.52	N/A*	196.15	TD is Top of pump.
PZ-106-SS		1033	11.39	12.47	N/A*	161.20	TD is Top of pump.
PZ-107-SS		1017	33.62	31.12	N/A*	103.99	
PZ-109-SS		0943	27.81	35.86	N/A*	131.18	TD is Top of pump.
PZ-110-SS		0934	30.65	28.81	N/A*	107.11	TD is Top of pump.
PZ-111-KS		1222	9.11	8.51	N/A*	374.59	
PZ-111-SD	9/30/2013	1220	35.11	33.16	N/A*	196.81	TD is Top of pump.

* N/A = Total Depths from July 2012 event utilized for this event.

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: West Lake OU-1

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-112-AS	9/30/2013	0927	31.87	29.09	N/A*	38.83	
PZ-113-AD	"	1427	30.98	28.10	N/A*	110.12	
PZ-113-AS		1429	30.90	28.05	N/A*	39.22	
PZ-113-SS		1426	31.17	28.34	N/A*	160.43	
PZ-114-AS		1332	20.54	17.39	N/A*	26.35	TD is Top of pump.
PZ-115-SS		1334	17.11	14.94	N/A*	80.92	TD is Top of pump.
PZ-116-SS		1050	24.21	25.68	N/A*	149.98	TD is Top of pump.
PZ-200-SS		1358	26.27	26.66	N/A*	99.51	Labeled as GMP-7.
PZ-201A-SS		1405	11.95	10.60	N/A*	86.11	TD is Top of pump.
PZ-202-SS		1139	15.49	15.24	N/A*	85.24	TD is Top of pump.
PZ-203-SS		1113	25.23	24.84	N/A*	111.38	
PZ-204-SS		1209	7.52	7.90	N/A*	88.01	
PZ-204A-SS		1210	5.63	5.49	N/A*	83.34	
PZ-205-AS		1008	27.31	25.46	N/A*	50.15	
PZ-205-SS		1001	26.83	25.75	N/A*	92.95	TD is Top of pump.
PZ-206-SS		1451	26.80	26.14	N/A*	126.80	
PZ-207-AS		1332	31.77	28.76	N/A*	39.45	
PZ-208-SS		1415	21.40	21.57	N/A*	100.36	
PZ-302-AI		0945	20.52	17.96	N/A*	44.25	
PZ-302-AS		0947	20.56	17.57	N/A*	24.54	
PZ-303-AS		1011	23.08	20.11	N/A*	28.29	
PZ-304-AI		1025	23.48	20.88	N/A*	52.20	
PZ-304-AS		1027	23.26	20.59	N/A*	29.32	
PZ-305-AI	9/30/2013	1442	29.01	26.38	N/A*	40.18	Also labeled as LR-104-AI.

* N/A = Total Depths from July 2012 event utilized for this event.

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
	5/27/14						
D-3	~~5/27/14~~	1143	79.84	37.50	107.68	107.86	
D-85		1043	29.01	26.63	77.28	81.07	Double Checked TD
I-4		1146	37.79	35.39	56.67	78.66	Double Checked TD
I-68		1003	22.26	19.92	40.45	40.77	
I-73		1521	32.93	30.73	49.90	50.38	
LR-103		1620	41.18	39.95	49.75	49.90	
LR-104		1516	30.79	28.55	64.83	65.00	Also labeled PZ-305.
MW-1204		1402	23.69	25.38	171.43	171.72	TD is top of pump.
PZ-100-KS		1014	24.52	26.07	381.31	388.15	Double Checked TD
PZ-100-SD		1020	35.54	34.99	96.25	96.48	TD is top of pump.
PZ-100-SS		~~1028~~ 1026	32.29	33.72	89.36	89.25	TD is top of pump.
PZ-101-SS		1024	54.26	54.49	155.69	155.61	
PZ-102-SS		1122	23.49	24.77	91.30	91.48	
PZ-102R-SS		1119	23.38	25.48	90.91	91.04	
PZ-103-SS		1129	6.07	8.64	149.63	149.79	
PZ-104-KS		1201	18.09	20.05	409.26	409.26	
PZ-104-SD		1158	21.85	21.99	120.50	120.50	TD is top of pump.
PZ-104-SS		1155	9.52	19.56	140.53	140.22	TD is top of pump.
PZ-105-SS		1356	24.91	24.69	144.82	144.81	TD is top of pump.
PZ-106-KS		1551	3.71	5.05	374.98	374.97	
PZ-106-SD		1559	11.40	12.38	196.11	196.15	TD is top of pump.
PZ-106-SS		1603	10.58	11.39	161.15	161.20	TD is top of pump.
PZ-107-SS		1540	35.67	33.62	103.80	103.99	
PZ-109-SS		1428	34.14	27.81	130.88	131.18	TD is top of pump.
PZ-110-SS		1226	33.11	30.65	106.90	107.11	TD is top of pump.
PZ-111-KS		1214	8.29	9.11	374.57	374.59	
PZ-111-SD		1216	38.42	35.11	196.48	196.81	TD is top of pump.
PZ-112-AS		1206	34.15	31.87	38.59	38.83	
PZ-113-AD	~~5/28/14~~ 5/27/14	1126	33.38	30.98	109.92	110.12	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-113-AS	5/27/14	1128	33.30	30.90	39.28	39.22	
PZ-113-SS	5/27/14	1123	33.56	31.17	160.21	160.43	
PZ-114-AS	5/28/14	0824	22.83	20.54	26.20	26.35	TD is top of pump.
PZ-115-SS	5/28/14	0825	17.33	17.11	81.02	80.92	TD is top of pump.
PZ-116-SS	5/27/14	1405	23.24	24.21	149.60	149.98	TD is top of pump.
PZ-200-SS	↑	1042	25.15	26.27	99.28	99.51	Labeled as GMP-7.
PZ-201A-SS		1052	9.02	11.95	86.08	86.11	TD is top of pump.
PZ-202-SS		1348	12.84	15.49	85.12	85.24	TD is top of pump.
PZ-203-SS		1226	25.57	25.23	111.10	111.38	
PZ-204-SS		1615	9.44	7.52	88.00	88.01	
PZ-204A-SS		1618	4.90	5.63	84.40	83.34	
PZ-205-AS		1533	28.81	27.31	49.05	50.15	
PZ-205-SS		1530	27.15	26.83	93.01	92.95	
PZ-206-SS		1433	29.19	26.80	126.67	126.80	
PZ-207-AS		1114	34.19	31.77	39.14	39.45	
PZ-208-SS		1032	21.18	21.40	100.35	100.36	
PZ-209-SD		1332	24.73	26.71	253.05	252.98	
PZ-209-SS		1330	23.15	25.48	152.70	152.74	
PZ-210-SD		1218	27.16	28.61	250.13	250.72	
PZ-210-SS		1215	26.20	27.11	150.39	150.38	
PZ-211-SD		1141	23.26	24.55	249.82	249.88	
PZ-211-SS		1138	21.55	23.49	149.99	149.99	
PZ-212-SD		1339	15.51	17.48	239.60	239.95	
PZ-212-SS		1342	14.55	17.96	144.75	144.60	
PZ-305-AI		1513	31.29	29.07	39.98	40.18	Also labeled as LR-104-AI.
S-5	↓	1149	37.48	35.76	44.32	44.34	
S-84	5/27/14	1041	28.78	26.34	32.96	33.30	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Matt Stewart & Ward Herst

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	9/22/14	0922	37.37	39.84	107.71	107.86	
D-85		0906	26.57	29.01	77.26	77.28	
I-4		0925	35.28	37.79	78.27	56.62	Double Checked
I-68		1319	19.92	22.26	40.44	40.45	
I-73		1017	31.52	32.93	51.08	49.90	well has been extended
LR-103		1125	39.70	41.18	49.87	49.75	
LR-104		1012	28.45	30.79	65.00	64.83	Also labeled PZ-305.
MW-1204		1251	23.35	23.69	222.66	171.43 (Top of Pump)	No pump
PZ-100-KS		1401	24.21	24.52	381.31	381.31	
PZ-100-SD		1358	34.48	35.54	96.48 (Top of Pump)	96.25 (Top of Pump)	
PZ-100-SS		1359	31.34	32.29	89.31 (Top of Pump)	89.36 (Top of Pump)	
PZ-101-SS		1142	50.26	54.26	155.64	155.69	
PZ-102-SS		1147	21.88	23.49	91.25	91.30	
PZ-102R-SS		1149	21.79	23.38	90.91	90.91	
PZ-103-SS		1153	9.38	6.07	149.62	149.63	
PZ-104-KS		1229	17.67	18.09	409.27	409.26	
PZ-104-SD		1225	22.90	21.85	120.59 (Top of Pump)	120.50 (Top of Pump)	
PZ-104-SS		1226	20.32	9.52	140.29 (Top of Pump)	140.53 (Top of Pump)	
PZ-105-SS		1246	25.96	24.91	144.81 (Top of Pump)	144.82 (Top of Pump)	
PZ-106-KS		1302	3.60	3.71	374.95	374.98	
PZ-106-SD		1308	12.74	11.40	196.08 (Top of Pump)	196.11 (Top of Pump)	
PZ-106-SS		1310	12.17	10.58	161.38 (Top of Pump)	161.15 (Top of Pump)	
PZ-107-SS		1132	33.16	35.67	103.79	103.80	
PZ-109-SS		0958	30.50	34.14	137.53 ~~(Top of Pump)~~	130.88 (Top of Pump)	
PZ-110-SS		0954	30.82	33.11	106.98	106.90 (Top of Pump)	
PZ-111-KS		0947	8.12	8.29	374.58	374.57	
PZ-111-SD		0944	35.66	38.42	196.70 (Top of Pump)	196.48 (Top of Pump)	
PZ-112-AS		0941	31.70	34.15	38.40	38.59	
PZ-113-AD	9/22/14	0917	30.91	33.38	110.04	109.92	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Matt Stewart & Ward Herst

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-113-AS	9/22/14	0919	30.80	33.30	34.25	39.28	
PZ-113-SS		0915	31.02	33.56	160.21	160.21	
PZ-114-AS		1325	20.51	22.83	26.31 (Top of Pump)	26.20 (Top of Pump)	
PZ-115-SS		1324	16.91	17.33	81.06 (Top of Pump)	81.02 (Top of Pump)	
PZ-116-SS		1254	22.84	23.24	149.58 (Top of Pump)	149.60 (Top of Pump)	
PZ-200-SS		1347	23.99	25.15	99.51	99.28	Labeled as GMP-7.
PZ-201A-SS		1351	9.66	9.02	86.20 (Top of Pump)	86.08 (Top of Pump)	
PZ-202-SS		1204	12.77	12.84	85.13 (Top of Pump)	85.12 (Top of Pump)	
PZ-203-SS		1243	26.71	25.57	111.35	111.10	
PZ-204-SS		1415	9.08	9.44	88.00	88.00	
PZ-204A-SS		1414	5.67	4.90	84.38	84.40	
PZ-205-AS		1022	45.06	28.81	54.29	49.05	Gas pressure blew J-plug off. strong gas odor. Extended
PZ-205-SS		1024	30.10	27.15	105.18	93.01	Extended
PZ-206-SS		1004	32.11	29.19	131.70	126.63	Extended
PZ-207-AS		0910	31.73	34.19	38.98	39.14	
PZ-208-SS		1110	21.88	21.18	100.36	100.35	
PZ-209-SD		1157	24.77	24.73	252.99 (Top of Pump)	253.05	
PZ-209-SS		1200	22.56	23.15	152.64 (Top of Pump)	152.70	
PZ-210-SD		1235	28.31	27.16	249.06 (Top of Pump)	250.13	soft bottom
PZ-210-SS		1239	27.10	26.20	150.38 (Top of Pump)	150.39	
PZ-211-SD		1217	23.55	23.26	249.79 (Top of Pump)	249.82	soft bottom
PZ-211-SS		1220	21.03	21.55	150.00 (Top of Pump)	149.99	
PZ-212-SD		1209	15.68	15.51	238.87	239.60	
PZ-212-SS		1212	14.31	14.55	144.30	144.75	
PZ-305-AI		1010	obstructed	31.29	obstructed	39.98	obstructed @ 50'ftb Also labeled as LR-104-AI.
S-5		0927	35.52	37.48	44.23	44.32	
S-84	9/22/14	0905	26.35	28.78	32.91	32.96	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/18/2014	0947	36.92	37.37	107.74	107.71	
D-85		1307	26.09	26.57	77.19	77.26	
I-4		0949	34.86	35.28	78.29	78.27	
I-68		1429	19.39	19.92	40.43	40.44	
I-73		1349	30.79	31.52	50.78	51.08	
LR-103		1419	39.33	39.70	49.73	49.87	
LR-104		1413	32.32	28.45	69.34	65.00	Also labeled PZ-305.
MW-1204		1159	21.85	23.35	222.62	222.66	
PZ-100-KS		1249	24.11	24.21	381.32	381.31	
PZ-100-SD		1254	33.93	34.48	96.48 (Top of Pump)	96.48 (Top of Pump)	
PZ-100-SS		1256	30.97	31.34	89.30 (Top of Pump)	89.31 (Top of Pump)	
PZ-101-SS		1002	49.48	50.26	155.65	155.64	
PZ-102-SS		1009	21.57	21.88	91.26	91.25	
PZ-102R-SS		1011	21.45	21.79	90.94	90.91	
PZ-103-SS		1016	10.59	9.38	149.65	149.62	
PZ-104-KS		1129	17.62	17.67	93.01 (Top of Pump)	93.21 (Top of Pump)	
PZ-104-SD		1131	22.58	22.90	120.32 (Top of Pump)	120.59 (Top of Pump)	
PZ-104-SS		1133	20.44	20.32	140.29 (Top of Pump)	140.29 (Top of Pump)	
PZ-105-SS		1151	25.67	25.96	144.80 (Top of Pump)	144.81 (Top of Pump)	
PZ-106-KS		1207	3.40	3.60	374.96	374.95	
PZ-106-SD		1212	12.85	12.74	196.12 (Top of Pump)	196.08 (Top of Pump)	
PZ-106-SS		1214	12.22	12.17	161.45 (Top of Pump)	161.38 (Top of Pump)	
PZ-107-SS		1406	32.86	33.16	103.76	103.79	
PZ-109-SS		1334	32.01	30.50	139.19	137.53	
PZ-110-SS		1330	30.33	30.82	106.97 (Top of Pump)	106.98 (Top of Pump)	
PZ-111-KS		1318	7.85	8.12	374.59	374.58	ID: 374.59
PZ-111-SD		1324	34.89	35.66	196.54 (Top of Pump)	196.70 (Top of Pump)	
PZ-112-AS		0957	31.32	31.70	39.40	38.40	
PZ-113-AD	11/18/2014	0939	30.50	30.91	109.92	110.04	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-113-AS	11/18/2014	0935	30.40	30.80	39.25	39.25	
PZ-113-SS		0941	30.65	31.02	160.21	160.21	
PZ-114-AS		1441	19.97	20.51	26.29 (Top of Pump)	26.31 (Top of Pump)	
PZ-115-SS		1440	16.59	16.91	81.06 (Top of Pump)	81.06 (Top of Pump)	
PZ-116-SS		1156	22.17	22.84	149.59 (Top of Pump)	149.58 (Top of Pump)	
PZ-200-SS		1243	23.35	23.99	99.51	99.51	Labeled as GMP-7.
PZ-201A-SS		1238	10.50	9.66	86.11 (Top of Pump)	86.20 (Top of Pump)	
PZ-202-SS		1104	12.76	12.77	85.21 (Top of Pump)	85.13 (Top of Pump)	
PZ-203-SS		1143	26.39	26.71	111.36	111.35	
PZ-204-SS		1224	9.57	9.08	88.00	88.00	
PZ-204A-SS		1222	5.53	5.67	84.24	84.38	
PZ-205-AS		1356	32.39	45.06	54.04	54.29	
PZ-205-SS		1354	29.41	30.10	104.37	105.18	
PZ-206-SS		1343	29.89	32.11	129.95	131.70	
PZ-207-AS		1312	31.25	31.73	38.99	38.98	
PZ-208-SS		1303	20.71	21.88	100.36	100.36	
PZ-209-SD		1021	24.68	24.77	101.42 (Top of Pump)	101.44 (Top of Pump)	
PZ-209-SS		1023	22.56	22.56	99.89 (Top of Pump)	99.91 (Top of Pump)	
PZ-210-SD		1130	28.02	28.31	101.81 (Top of Pump)	101.82 (Top of Pump)	
PZ-210-SS		1139	27.02	27.10	101.46 (Top of Pump)	101.50 (Top of Pump)	
PZ-211-SD		1110	23.32	23.55	99.40 (Top of Pump)	99.40 (Top of Pump)	
PZ-211-SS		1111	21.05	21.03	98.14 (Top of Pump)	98.16 (Top of Pump)	
PZ-212-SD		1028	15.63	15.68	238.80	238.87	
PZ-212-SS		1031	14.43	14.31	144.14	144.30	
PZ-305-AI		1412	31.98	Obstructed	43.70	Obstructed	Also labeled as LR-104-AI.
S-5		0951	34.91	35.52	44.22	44.23	
S-84	11/18/2014	1308	25.80	26.35	32.97	32.91	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: John Regan & Matt Stewart

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	2/2/15	0956	36.32	36.92	107.75	107.74	
D-85		1226	27.36	26.09	77.15	77.19	
I-4		0958	36.28	34.86	78.35	78.29	
I-68		1230	20.59	19.39	40.44	40.43	
I-73		1351	32.26	30.79	50.77	50.78	
LR-103		1403	40.87	39.33	49.83	49.73	
LR-104		1358	33.90	32.32	69.36	69.34	~~Also labeled PZ-305~~
MW-1204		1313	21.00	21.85	222.60	222.62	
PZ-100-KS		1208	23.91	24.11	381.33	381.32	
PZ-100-SD		1213	33.70	33.93	96.43 (Top of Pump)	96.48 (Top of Pump)	
PZ-100-SS		1215	30.54	30.97	89.36 (Top of Pump)	89.30 (Top of Pump)	
PZ-101-SS		1016	46.50	49.48	155.23	155.65	
PZ-102-SS		1083	21.27	21.57	91.27	91.26	
PZ-102R-SS		1081	20.72	21.45	90.91	90.94	
PZ-103-SS		1251	10.63	10.59	149.65	149.63	
PZ-104-KS		1059	17.51	17.62	93.00 (Top of Pump)	93.01 (Top of Pump)	
PZ-104-SD		1100	22.08	22.56	120.53 (Top of Pump)	120.32 (Top of Pump)	
PZ-104-SS		1102	20.01	20.44	140.51 (Top of Pump)	140.29 (Top of Pump)	
PZ-105-SS		1303	24.70	25.67	144.84 (Top of Pump)	144.80 (Top of Pump)	
PZ-106-KS		1329	3.19	3.40	374.97	374.96	
PZ-106-SD		1324	11.53	12.85	202.70 (Top of Pump)	196.12 (Top of Pump)	
PZ-106-SS		1322	10.83	12.22	166.65 (Top of Pump)	161.45 (Top of Pump)	
PZ-107-SS		1339	34.45	32.86	103.86	103.76	
PZ-109-SS		1419	32.40	32.01	130.78	139.19	top of pump
PZ-110-SS		1414	31.76	30.33	106.96 (Top of Pump)	106.97 (Top of Pump)	
PZ-111-KS		1434	7.67	7.85	374.59	374.59	
PZ-111-SD		1430	35.97	34.89	196.64 (Top of Pump)	196.54 (Top of Pump)	
PZ-112-AS		1011	32.72	31.32	38.38	38.40	
PZ-113-AD	2/2/15	0949	31.91	30.50	109.90	109.92	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: John Regan & Matt Stewart

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-113-AS	2/2/15	0950	31.84	30.40	39.26	39.25	
PZ-113-SS	↑	0947	32.15	30.65	160.22	160.21	
PZ-114-AS		1235	21.10	19.97	28.20 (Top of Pump)	26.29 (Top of Pump)	
PZ-115-SS		1234	16.68	16.59	81.08 (Top of Pump)	81.06 (Top of Pump)	
PZ-116-SS		1310	20.72	22.17	149.87 (Top of Pump)	149.59 (Top of Pump)	
PZ-200-SS		1201	22.85	23.35	99.51	99.51	Labeled as GMP-7.
PZ-201A-SS		1155	10.42	10.50	86.37 (Top of Pump)	86.11 (Top of Pump)	
PZ-202-SS		1039	12.50	12.76	84.97 (Top of Pump)	85.21 (Top of Pump)	
PZ-203-SS		1257	23.58	26.39	111.35	111.36	
PZ-204-SS		1458	7.19	9.57	88.01	88.00	
PZ-204A-SS		1456	5.08	5.53	84.87	84.24	
PZ-205-AS		1345	33.25	32.39	54.08	54.04	
PZ-205-SS		1346	30.72	29.41	92.96	104.37	top of pump
PZ-206-SS		1425	30.93	29.89	129.83	129.85	
PZ-207-AS		1244	32.61	31.25	39.04	38.99	
PZ-208-SS		1220	20.53	20.71	100.36	100.36	
PZ-209-SD		1045	24.30	24.68	101.35 (Top of Pump)	101.42 (Top of Pump)	
PZ-209-SS		1047	22.42	22.56	99.88 (Top of Pump)	99.89 (Top of Pump)	
PZ-210-SD		1110	27.16	28.02	101.70 (Top of Pump)	101.81 (Top of Pump)	
PZ-210-SS		1108	26.40	27.02	101.45 (Top of Pump)	101.46 (Top of Pump)	
PZ-211-SD		1052	22.09	23.32	99.40 (Top of Pump)	99.40 (Top of Pump)	
PZ-211-SS		1034	20.85	21.05	98.11 (Top of Pump)	98.14 (Top of Pump)	
PZ-212-SD		1031	15.39	15.63	92.83 (Top of Pump)	92.76 (Top of Pump)	
PZ-212-SS		1033	11.38	14.43	93.96 (Top of Pump)	93.79 (Top of Pump)	Double Checked
PZ-305-AI		1357	33.57	31.98	43.70	43.70	~~Also labeled as LR-104-AI.~~
S-5	↓	1001	36.12	34.91	44.25	44.22	
S-84	2/2/15	1225	27.13	25.86	32.90	32.87	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/12/2015	1015	38.06	38.32	107.74	107.75	
D-85		1025	27.14	27.36	77.15	77.15	
I-4		1017	35.96	36.28	78.31	78.35	
I-68		1029	20.36	20.59	40.45	40.44	
I-73		~~1426~~ 1425	31.85	32.26	50.78	50.77	
LR-103		1419	40.50	40.87	49.86	49.83	
LR-104		1425	33.55	33.90	69.53	69.36	
MW-1204		1225	19.94	21.00	222.51	222.60	
PZ-100-KS		1053	23.44	23.91	381.33	381.33	
PZ-100-SD		1049	32.18	33.70	96.19 (Top of Pump)	96.43 (Top of Pump)	
PZ-100-SS		1051	29.55	30.54	89.28 (Top of Pump)	89.36 (Top of Pump)	
PZ-101-SS		1123	41.91	46.50	155.21	155.23	
PZ-102-SS		1115	20.64	21.22	91.27	91.27	
PZ-102R-SS		1117	20.90	20.72	90.93	90.91	
PZ-103-SS		1127	10.80	10.63	149.61	149.65	
PZ-104-KS		1202	16.87	17.51	93.24 (Top of Pump)	93.00 (Top of Pump)	
PZ-104-SD		1204	21.19	22.02	120.57 (Top of Pump)	120.53 (Top of Pump)	
PZ-104-SS		1205	19.58	20.01	140.26 (Top of Pump)	140.51 (Top of Pump)	
PZ-105-SS		1219	23.84	24.70	144.79 (Top of Pump)	144.84 (Top of Pump)	
PZ-106-KS		1241	2.74	3.19	374.94	374.97	
PZ-106-SD		1238	12.90	11.53	196.48 (Top of Pump)	196.12 (Top of Pump)	
PZ-106-SS		1235	12.28	10.83	161.61 (Top of Pump)	161.45 (Top of Pump)	
PZ-107-SS		1436	34.09	34.45	103.85	103.86	
PZ-109-SS		1355	28.69	32.40	131.00	130.78 (Top of Pump)	TD is top of pump
PZ-110-SS		1352	31.38	31.76	106.98 (Top of Pump)	106.96 (Top of Pump)	
PZ-111-KS		1341	7.28	7.67	374.60	374.59	
PZ-111-SD		1333	36.12	35.97	196.64 (Top of Pump)	196.64 (Top of Pump)	
PZ-112-AS		1002	32.43	32.72	38.36	38.38	
PZ-113-AD	5/12/2015	1000	31.63	31.91	110.11	109.90	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Matt Stewart & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-113-AS	5/12/2015	1009	31.55	31.84	39.25	39.26	
PZ-113-SS		1006	31.80	32.15	160.21	160.22	
PZ-114-AS		1035	20.77	21.10	26.28 (Top of Pump)	26.20 (Top of Pump)	
PZ-115-SS		1034	14.60	16.68	81.03 (Top of Pump)	81.08 (Top of Pump)	
PZ-116-SS		1228	19.26	20.72	149.84 (Top of Pump)	149.87 (Top of Pump)	
PZ-200-SS		1040	21.99	22.85	99.51	99.51	Labeled as GMP-7.
PZ-201A-SS		1044	10.12	10.42	86.18 (Top of Pump)	86.37 (Top of Pump)	
PZ-202-SS		1150	12.00	12.50	85.19 (Top of Pump)	84.97 (Top of Pump)	
PZ-203-SS		1215	25.01	25.58	111.33	111.35	
PZ-204-SS		1444	6.00	7.19	87.98	88.01	
PZ-204A-SS		1443	5.09	5.08	84.28	84.27	
PZ-205-AS		1432	33.19	33.25	54.03	54.08	
PZ-205-SS		1431	31.20	30.72	92.93	92.96 (Top of Pump)	TD is top of pump
PZ-206-SS		1400	30.48	30.93	129.77	129.83	
PZ-207-AS		1108	32.37	32.61	39.13	39.04	
PZ-208-SS		1102	20.17	20.53	100.35	100.36	
PZ-209-SD		1132	23.70	24.30	101.41 (Top of Pump)	101.35 (Top of Pump)	
PZ-209-SS		1133	21.96	22.42	99.91 (Top of Pump)	99.88 (Top of Pump)	
PZ-210-SD		1210	26.32	27.16	101.71 (Top of Pump)	101.70 (Top of Pump)	
PZ-210-SS		1217	25.67	26.40	101.45 (Top of Pump)	101.45 (Top of Pump)	
PZ-211-SD		1157	22.20	22.79	99.40 (Top of Pump)	99.40 (Top of Pump)	
PZ-211-SS		1158	20.35	20.85	98.13 (Top of Pump)	98.11 (Top of Pump)	
PZ-212-SD		1141	14.63	15.39	92.83 (Top of Pump)	92.83 (Top of Pump)	
PZ-212-SS		1143	13.38	11.38	93.88 (Top of Pump)	93.76 (Top of Pump)	
PZ-305-AI		1424	35.26	33.57	43.70	43.70	
S-5		1020	35.55	36.12	44.24	44.25	
S-84	5/12/2015	1026	26.92	27.13	32.90	32.90	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Ward Herst & John Regan

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	8/18/15	1052	32.79	38.06	107.88	107.74	
D-85	8/18/15	1022	21.22	27.14	77.19	77.15	
I-4	8/18/15	1048	30.61	35.96	36.46	78.31	Hard to Hear
I-68	8/18/15	1018	14.29	20.36	40.47	40.45	
I-73	8/18/15	1134	27.45	31.85	50.82	50.78	
LR-103	8/18/15	1119	35.90	40.50	49.90	49.86	
LR-104	8/18/15	1128	28.95	33.55	69.33	69.33	
MW-1204	8/17/15	1138	16.48	19.94	223.98	222.51	
PZ-100-KS	8/18/15	0957	22.22	23.44	381.34	381.33	381.34
PZ-100-SD	8/18/15	0948	28.90	32.18	96.19 (Top of Pump)	96.19 (Top of Pump)	
PZ-100-SS	8/18/15	0946	27.70	29.53	89.40 (Top of Pump)	89.28 (Top of Pump)	89.40
PZ-101-SS	8/18/15	1219	36.64	41.91	155.65	155.21	
PZ-102-SS	8/18/15	1211	18.43	20.64	91.25	91.27	
PZ-102R-SS	8/18/15	1214	18.20	20.90	91.02	90.93	
PZ-103-SS	8/17/15	1220	9.48	10.80	149.88	149.61	
PZ-104-KS	8/18/15	1156	15.72	16.87	93.29 (Top of Pump)	93.24 (Top of Pump)	
PZ-104-SD	8/17/15	1104	21.27	21.19	120.58 (Top of Pump)	120.57 (Top of Pump)	
PZ-104-SS	8/17/15	1102	18.51	19.58	140.61 (Top of Pump)	140.26 (Top of Pump)	
PZ-105-SS	8/17/15	1130	25.44	23.84	144.92 (Top of Pump)	144.79 (Top of Pump)	
PZ-106-KS	8/18/15	1146	1.58	2.74	374.97	374.94	
PZ-106-SD	8/17/15	1146	11.63	12.90	196.24 (Top of Pump)	196.48 (Top of Pump)	
PZ-106-SS	8/17/15	1144	10.85	12.28	161.53 (Top of Pump)	161.61 (Top of Pump)	
PZ-107-SS	8/17/15	1156	29.98	34.09	104.00	103.85	
PZ-109-SS	8/17/15	1208	20.64	28.69	129.81 (Top of Pump)	131.00 (Top of Pump)	
PZ-110-SS	8/17/15	1213	26.24	31.38	107.02 (Top of Pump)	106.98 (Top of Pump)	
PZ-111-KS	8/18/15	1110	6.14	7.28	374.59	374.60	
PZ-111-SD	8/18/15	1106	31.19	36.12	196.89 (Top of Pump)	196.64 (Top of Pump)	
PZ-112-AS	8/18/15	1059	27.29	32.43	38.34	38.36	
PZ-113-AD	8/18/15	1038	26.29	31.63	110.12	110.11	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Ward Herst & John Regan

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-113-AS	8/18/15	1037	26.24	31.55	39.25	39.25	
PZ-113-SS	8/18/15	1040	26.60	31.80	160.24	160.21	
PZ-114-AS	8/18/15	1011	14.52	20.77	26.29 (Top of Pump)	26.28 (Top of Pump)	
PZ-115-SS	8/18/15	1014	10.67	14.60	81.07 (Top of Pump)	81.03 (Top of Pump)	
PZ-116-SS	8/17/15	1135	17.65	19.26	149.89 (Top of Pump)	149.84 (Top of Pump)	
PZ-200-SS	8/18/15	0940	19.84	21.99	99.57	99.51	Labeled as GMP-7.
PZ-201A-SS	8/17/15	1245	7.89	10.12	86.22 (Top of Pump)	86.18 (Top of Pump)	
PZ-202-SS	8/17/15	1226	11.22	12.00	85.23 (Top of Pump)	85.19 (Top of Pump)	
PZ-203-SS	8/17/15	1123	25.99	25.01	111.36	111.33	
PZ-204-SS	8/17/15	1256	10.27	6.00	88.03	87.98	
PZ-204A-SS	8/18/15	0931	5.18	5.09	84.27	84.28	
PZ-205-AS	8/18/15	1141	29.33	33.19	54.05	54.03	
PZ-205-SS	8/18/15	1138	27.71	31.20	93.00 (Top of Pump)	92.93 (Top of Pump)	
PZ-206-SS	8/17/15	1203	25.85	30.48	130.01	129.77	
PZ-207-AS	8/18/15	1029	26.63	32.37	39.00	39.13	
PZ-208-SS	8/18/15	1001	18.93	20.17	100.36	100.35	
PZ-209-SD	8/17/15	1049	23.45	23.70	101.42 (Top of Pump)	101.41 (Top of Pump)	
PZ-209-SS	8/17/15	1046	21.16	21.96	100.00 (Top of Pump)	99.91 (Top of Pump)	
PZ-210-SD	8/17/15	1114	27.25	26.32	101.81 (Top of Pump)	101.71 (Top of Pump)	
PZ-210-SS	8/17/15	1110	25.97	25.67	101.53 (Top of Pump)	101.45 (Top of Pump)	
PZ-211-SD	8/17/15	1057	22.16	22.20	99.41 (Top of Pump)	99.40 (Top of Pump)	
PZ-211-SS	8/17/15	1055	19.60	20.35	98.18 (Top of Pump)	98.13 (Top of Pump)	
PZ-212-SD	8/18/15	1203	13.26	14.63	92.81 (Top of Pump)	92.83 (Top of Pump)	
PZ-212-SS	8/17/15	1038	11.22	13.38	94.00 (Top of Pump)	93.88 (Top of Pump)	
PZ-305-AI	8/18/15	1126	28.57	33.26	43.67	43.70	
S-5	8/18/15	1046	30.32	35.55	44.24	44.24	
S-84	8/18/15	1024	21.02	26.92	32.91	32.90	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Ward Herst & John Regan

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	8/18/15	1052	32.79	38.06	107.88	107.74	
D-85	8/18/15	1022	21.22	27.14	77.19	77.15	
I-4	8/18/15	1048	30.61	35.96	36.46	78.31	Hard to Hear
I-68	8/18/15	1018	14.29	20.36	40.47	40.45	
I-73	8/18/15	1134	27.45	31.85	50.82	50.78	
LR-103	8/18/15	1119	35.90	40.50	49.90	49.86	
LR-104	8/18/15	1128	28.95	33.55	69.33	69.33	
MW-1204	8/17/15	1138	16.48	19.94	223.98	222.51	
PZ-100-KS	8/18/15	0957	22.22	23.44	381.34	381.33	381.34
PZ-100-SD	8/18/15	0948	28.90	32.18	96.19 (Top of Pump)	96.19 (Top of Pump)	
PZ-100-SS	8/18/15	0946	27.70	29.53	89.40 (Top of Pump)	89.28 (Top of Pump)	89.40
PZ-101-SS	8/18/15	1219	36.64	41.91	155.65	155.21	
PZ-102-SS	8/18/15	1211	18.43	20.64	91.25	91.27	
PZ-102R-SS	8/18/15	1214	18.20	20.90	91.02	90.93	
PZ-103-SS	8/17/15	1220	9.48	10.80	149.88	149.61	
PZ-104-KS	8/18/15	1156	15.72	16.87	93.27 (Top of Pump)	93.24 (Top of Pump)	
PZ-104-SD	8/17/15	1104	21.27	21.19	120.58 (Top of Pump)	120.57 (Top of Pump)	
PZ-104-SS	8/17/15	1102	18.51	19.58	140.61 (Top of Pump)	140.26 (Top of Pump)	
PZ-105-SS	8/17/15	1130	25.44	23.84	144.92 (Top of Pump)	144.79 (Top of Pump)	
PZ-106-KS	8/18/15	1146	1.58	2.74	374.97	374.94	
PZ-106-SD	8/17/15	1146	11.63	12.90	196.24 (Top of Pump)	196.48 (Top of Pump)	
PZ-106-SS	8/17/15	1144	10.85	12.28	161.53 (Top of Pump)	161.61 (Top of Pump)	
PZ-107-SS	8/17/15	1156	29.98	34.09	104.00	103.85	
PZ-109-SS	8/17/15	1208	20.64	28.69	129.81 (Top of Pump)	131.00 (Top of Pump)	
PZ-110-SS	8/17/15	1213	26.24	31.38	107.02 (Top of Pump)	106.98 (Top of Pump)	
PZ-111-KS	8/18/15	1110	6.14	7.28	374.59	374.60	
PZ-111-SD	8/18/15	1106	31.19	36.12	196.89 (Top of Pump)	196.64 (Top of Pump)	
PZ-112-AS	8/18/15	1059	27.29	32.43	38.34	38.36	
PZ-113-AD	8/18/15	1038	26.29	31.63	110.12	110.11	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Ward Herst & John Regan

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-113-AS	8/18/15	1037	26.24	31.55	39.25	39.25	
PZ-113-SS	8/18/15	1040	26.60	31.80	160.24	160.21	
PZ-114-AS	8/18/15	1011	14.52	20.77	26.29 (Top of Pump)	26.28 (Top of Pump)	
PZ-115-SS	8/18/15	1014	10.67	14.60	81.07 (Top of Pump)	81.03 (Top of Pump)	
PZ-116-SS	8/17/15	1135	17.65	19.26	149.89 (Top of Pump)	149.84 (Top of Pump)	
PZ-200-SS	8/18/15	0940	19.84	21.99	99.57	99.51	Labeled as GMP-7.
PZ-201A-SS	8/17/15	1245	7.89	10.12	86.22 (Top of Pump)	86.18 (Top of Pump)	
PZ-202-SS	8/17/15	1226	11.22	12.00	85.23 (Top of Pump)	85.19 (Top of Pump)	
PZ-203-SS	8/17/15	1123	25.99	25.01	111.36	111.33	
PZ-204-SS	8/17/15	1256	10.27	6.00	88.03	87.98	
PZ-204A-SS	8/18/15	0931	5.18	5.09	84.27	84.28	
PZ-205-AS	8/18/15	1141	29.33	33.19	54.05	54.03	
PZ-205-SS	8/18/15	1138	27.71	31.20	93.00 (Top of Pump)	92.93 (Top of Pump)	
PZ-206-SS	8/17/15	1203	25.85	30.48	130.01	129.77	
PZ-207-AS	8/18/15	1029	26.63	32.37	39.00	39.13	
PZ-208-SS	8/18/15	1001	18.93	20.17	100.36	100.35	
PZ-209-SD	8/17/15	1049	23.45	23.70	101.42 (Top of Pump)	101.41 (Top of Pump)	
PZ-209-SS	8/17/15	1046	21.16	21.96	100.00 (Top of Pump)	99.91 (Top of Pump)	
PZ-210-SD	8/17/15	1114	27.25	26.32	101.81 (Top of Pump)	101.71 (Top of Pump)	
PZ-210-SS	8/17/15	1110	25.97	25.67	101.53 (Top of Pump)	101.45 (Top of Pump)	
PZ-211-SD	8/17/15	1057	22.16	22.20	99.41 (Top of Pump)	99.40 (Top of Pump)	
PZ-211-SS	8/17/15	1055	19.60	20.35	98.18 (Top of Pump)	98.13 (Top of Pump)	
PZ-212-SD	8/18/15	1203	13.26	14.63	92.81 (Top of Pump)	92.83 (Top of Pump)	
PZ-212-SS	8/17/15	1038	11.22	13.38	94.00 (Top of Pump)	93.88 (Top of Pump)	
PZ-305-AI	8/18/15	1126	28.57	33.26	43.67	43.70	
S-5	8/18/15	1046	30.32	35.55	44.24	44.24	
S-84	8/18/15	1024	21.02	26.92	32.91	32.90	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: W. Herst J. Wilkinson-Feezor

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-85	11/16/15	1056	25.83	21.22	77.17	77.19	
I-68		0920	19.03	14.29	40.47	40.47	
I-73		1444	30.76	27.45	50.54	50.82	
LR-103		1436	39.29	35.90	49.80	49.90	
LR-104		1430	32.35	28.95	69.33	69.33	
MW-1204		1536	16.39	16.48	222.52	223.98	
PZ-100-KS		0946	23.77	22.22	381.32	381.34	
PZ-100-SD		0957	30.59	28.90	96.21 (Top of Pump)	96.19 (Top of Pump)	
PZ-100-SS		0959	28.56	27.70	89.37 (Top of Pump)	89.40 (Top of Pump)	
PZ-101-SS		1137	37.88	36.64	155.63	155.65	
PZ-102-SS		1149	19.88	18.43	91.25	91.25	
PZ-102R-SS		1145	19.80	18.20	91.15	91.02	
PZ-103-SS		1157	11.57	9.48	149.62	149.88	
PZ-104-KS		1617	17.24	15.72	93.30 (Top of Pump)	93.27 (Top of Pump)	
PZ-104-SD		1612	21.62	21.27	120.63 (Top of Pump)	120.52 (Top of Pump)	
PZ-104-SS		1608	20.33	18.51	140.25 (Top of Pump)	140.61 (Top of Pump)	
PZ-105-SS		1544	25.15	25.44	144.85 (Top of Pump)	144.92 (Top of Pump)	
PZ-106-KS		1520	3.02	1.58	375.00	374.97	
PZ-106-SD		1508	13.21	11.63	196.23 (Top of Pump)	196.24 (Top of Pump)	
PZ-106-SS		1515	12.49	10.85	161.39 (Top of Pump)	161.53 (Top of Pump)	
PZ-107-SS		1500	32.98	29.98	103.78	104.00	
PZ-109-SS		1413	25.43	20.64	131.00 (Top of Pump)	129.81 (Top of Pump)	
PZ-110-SS		1406	29.93	26.24	107.21 (Top of Pump)	107.02 (Top of Pump)	
PZ-111-KS		1341	7.45	6.14	374.60	374.59	
PZ-111-SD		1358	34.51	31.19	197.08 (Top of Pump)	196.89 (Top of Pump)	
PZ-112-AS		1128	31.22	27.29	38.37	38.34	
PZ-113-AD		1115	30.33	26.29	110.11	110.12	
PZ-113-AS		1112	30.25	26.24	39.01	39.25	
PZ-113-SS		1118	30.56	26.60	160.21	160.24	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

HERST & ASSOCIATES, INC.®

Global Presence
Personal Attention

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: W. Herst J. Wilkinson - Feezor

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-114-AS	11/16/15	0913	19.52	14.52	26.11 (Top of Pump)	26.29 (Top of Pump)	
PZ-115-SS		0910	15.28	10.67	81.03 (Top of Pump)	81.07 (Top of Pump)	
PZ-116-SS		1529	17.69	17.65	149.65 (Top of Pump)	149.89 (Top of Pump)	
PZ-200-SS		0938	20.41	19.84	99.49	99.57	Labeled as GMP-7.
PZ-201A-SS		0925	10.14	7.89	86.20 (Top of Pump)	86.22 (Top of Pump)	
PZ-202-SS		1209	12.55	11.22	85.24 (Top of Pump)	85.23 (Top of Pump)	
PZ-203-SS		1552	25.61	25.99	111.37	111.36	
PZ-204-SS		1031	7.15	10.27	88.00	88.03	
PZ-204A-SS		1027	5.12	5.18	84.38	84.27	
PZ-205-AS		1454	29.22	29.33	54.07	54.05	
PZ-205-SS		1449	30.90	27.71	92.94 (Top of Pump)	93.00 (Top of Pump)	
PZ-206-SS		1420	29.18	25.85	129.80	130.01	
PZ-207-AS		1103	31.05	26.63	38.95	39.00	
PZ-208-SS		1045	19.72	18.93	100.36	100.36	
PZ-209-SD		1213	24.35	23.45	101.40 (Top of Pump)	101.42 (Top of Pump)	
PZ-209-SS		1219	22.56	21.16	99.90 (Top of Pump)	100.00 (Top of Pump)	
PZ-210-SD		1558	27.16	27.25	101.79 (Top of Pump)	101.81 (Top of Pump)	
PZ-210-SS		1602	26.45	25.97	101.44 (Top of Pump)	101.53 (Top of Pump)	
PZ-211-SD		1225	22.97	22.16	99.35 (Top of Pump)	99.41 (Top of Pump)	
PZ-211-SS		1229	21.13	19.60	98.14 (Top of Pump)	98.18 (Top of Pump)	
PZ-212-SD		1010	15.43	13.26	92.62 (Top of Pump)	92.81 (Top of Pump)	
PZ-212-SS		1014	12.94	11.22	93.88 (Top of Pump)	94.00 (Top of Pump)	
PZ-305-AI		1428	31.84	28.59	43.70	43.67	
S-84	↓	1056 1052	25.57	21.02	32.89	32.91	

Herst & Associates, Inc. • 4631 North St. Peters Parkway • St. Charles, Missouri 63304 • Tele: (636) 939-9111 • Fax: (636) 939-9757

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-85	2/29/2016	0816	23.05	25.83	77.08	77.17	
I-68		0825	16.20	19.03	40.45	40.47	
I-73		1059	28.59	30.76	50.79	50.54	
LR-103		1053	37.11	39.29	49.79	49.80	
LR-104		1045	30.20	32.35	69.32	69.33	
MW-1204		1433	14.40	16.39	222.60	222.52	
PZ-100-KS		0841	22.90	23.77	381.95	381.32	
PZ-100-SD		0850	30.11	30.59	96.20 (Top of Pump)	96.21 (Top of Pump)	
PZ-100-SS		0852	28.52	28.56	89.08 (Top of Pump)	89.37 (Top of Pump)	
PZ-101-SS		1307	36.50	37.88	155.11	155.63	
PZ-102-SS		1317	20.09	19.88	91.25	91.25	
PZ-102R-SS		1314	19.17	19.80	91.14	91.15	
PZ-103-SS		1323	11.45	11.57	149.63	149.62	
PZ-104-KS		1355	16.47	17.24	93.25 (Top of Pump)	93.30 (Top of Pump)	
PZ-104-SD		1358	21.11	21.62	120.60 (Top of Pump)	120.63 (Top of Pump)	
PZ-104-SS		1402	19.65	20.33	140.27 (Top of Pump)	140.25 (Top of Pump)	
PZ-105-SS		1422	24.36	25.15	144.79 (Top of Pump)	144.85 (Top of Pump)	
PZ-106-KS		1121	2.20	3.02	375.01	375.00	
PZ-106-SD		1129	12.95	13.21	196.25 (Top of Pump)	196.23 (Top of Pump)	
PZ-106-SS		1135	12.82	12.49	161.57 (Top of Pump)	161.39 (Top of Pump)	
PZ-107-SS		1114	30.97	32.98	103.78	103.78	
PZ-109-SS		1032	21.91	25.43	130.94 (Top of Pump)	131.00 (Top of Pump)	
PZ-110-SS		1027	27.59	29.93	107.23 (Top of Pump)	107.21 (Top of Pump)	
PZ-111-KS		1013	6.76	7.45	374.51	374.60	
PZ-111-SD		1019	32.20	34.51	197.08 (Top of Pump)	197.08 (Top of Pump)	
PZ-112-AS		1006	28.75	31.22	38.33	38.37	
PZ-113-AD		0959	27.90	30.33	110.08	110.11	
PZ-113-AS		1001	27.80	30.25	39.15	39.01	
PZ-113-SS	2/29/16	0955	28.12	30.56	160.75	160.21	

Feezor Engineering, Inc. • 3405 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

Engineering for a Better World

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-114-AS	2/29/2016	0831	16.58	19.52	26.10 (Top of Pump)	26.11 (Top of Pump)	
PZ-115-SS		0833	12.65	15.28	81.02 (Top of Pump)	81.03 (Top of Pump)	
PZ-116-SS		1430	15.90	17.69	149.85 (Top of Pump)	149.65 (Top of Pump)	
PZ-200-SS		0906	20.30	20.41	99.50	99.49	Labeled as GMP-7.
PZ-201A-SS		0900	9.69	10.14	86.21 (Top of Pump)	86.20 (Top of Pump)	
PZ-202-SS		1339	11.65	12.55	85.20 (Top of Pump)	85.24 (Top of Pump)	
PZ-203-SS		1416	24.98	25.61	111.11	111.37	
PZ-204-SS		1147	7.33	10.31	87.98	88.00	
PZ-204A-SS		1144	4.39	5.12	84.31	84.38	
PZ-205-AS		1108	29.09	29.22	54.10	54.07	
PZ-205-SS		1104	28.99	30.90	92.91 (Top of Pump)	92.94 (Top of Pump)	
PZ-206-SS		1038	27.10	29.18	129.79	129.80	
PZ-207-AS		1200	28.39	31.05	39.00	38.95	
PZ-208-SS		0913	19.25	19.72	100.34	100.36	
PZ-209-SD		1330	23.39	24.35	101.44 (Top of Pump)	101.40 (Top of Pump)	
PZ-209-SS		1333	21.59	22.56	99.89 (Top of Pump)	99.90 (Top of Pump)	
PZ-210-SD		1411	26.51	27.16	101.51 (Top of Pump)	101.79 (Top of Pump)	
PZ-210-SS		1408	25.60	26.45	102.45 (Top of Pump)	101.44 (Top of Pump)	
PZ-211-SD		1348	21.94	22.97	99.30 (Top of Pump)	99.35 (Top of Pump)	
PZ-211-SS		1346	20.04	21.13	98.09 (Top of Pump)	98.14 (Top of Pump)	
PZ-212-SD		1449	14.22	15.43	92.85 (Top of Pump)	92.62 (Top of Pump)	
PZ-212-SS		1452	9.21	12.94	93.89 (Top of Pump)	93.88 (Top of Pump)	
PZ-305-AI		1047	29.89	31.84	43.65	43.70	
S-84	2/29/2016	0813	22.81	25.57	32.89	32.89	

Feezor Engineering, Inc. • 3405 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-81	5/3/2016	1134	17.64	20.34	62.54	62.75	Previous Event = Sept 2013
D-85	A	0813	23.09	23.05	77.20	77.08	
I-68		0825	16.48	16.20	40.47	40.45	
I-73		1340	28.69	28.59	50.79	50.79	
LR-100		1347	15.69	16.58	27.01	27.21	Previous Event = Sept 2013
LR-103		1402	37.10	37.11	49.84	49.79	
LR-104		ABANDONED					
LR-105		1354	30.46	31.39	37.91	37.96	Previous Event = Sept 2013
MW-104		1106	7.78	10.39	19.12	19.00	Previous Event = Sept 2013
MW-1204		1030	5.39	14.40	215.00	222.60	surface completion lowered between March 2106 & May 2016
PZ-100-KS		0845	22.65	22.90	384.65	381.95	Double checked TD measured TD 6/10/2016 @ 0842
PZ-100-SD		0842	31.00	30.11	96.19 (Top of Pump)	96.20 (Top of Pump)	
PZ-100-SS		0840	29.31	28.52	89.09 (Top of Pump)	89.08 (Top of Pump)	
PZ-101-SS		0915	37.06	36.50	155.10	155.11	
PZ-102-SS		0921	21.19	20.09	91.25	91.25	
PZ-102R-SS		0924	20.25	19.17	91.14	91.14	
PZ-103-SS		0928	11.52	11.45	149.65	149.63	
PZ-104-KS		1003	16.00	16.47	93.05 (Top of Pump)	93.25 (Top of Pump)	
PZ-104-SD		1001	20.43	21.11	120.64 (Top of Pump)	120.60 (Top of Pump)	
PZ-104-SS		0958	19.10	19.65	140.30 (Top of Pump)	140.27 (Top of Pump)	
PZ-105-SS		1021	23.81	24.36	144.90 (Top of Pump)	144.79 (Top of Pump)	
PZ-106-KS		1036	2.09	2.20	375.02	375.01	TD measured 6/10/2016 @ 1428
PZ-106-SD		1038	12.68	12.95	196.25 (Top of Pump)	196.25 (Top of Pump)	
PZ-106-SS		1041	12.14	12.32	161.40 (Top of Pump)	161.57 (Top of Pump)	
PZ-107-SS		1143	30.82	30.97	103.70	103.78	
PZ-109-SS		1329	22.42	21.91	131.04 (Top of Pump)	130.94 (Top of Pump)	
PZ-110-SS		1325	27.68	27.59	107.23 (Top of Pump)	107.23 (Top of Pump)	
PZ-111-KS	B	1318	6.67	6.76	374.59	374.51	TD measured 6/10/2016 @ 1416
PZ-111-SD	5/31/2016	1319	32.98	32.20	199.13 (Top of Pump)	197.08 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-112-AS	5/31/2016	0910	28.83	28.75	38.38	38.33	
PZ-113-AD	↑	1411	27.97	27.90	110.13	110.08	
PZ-113-AS		1414	27.90	27.80	39.25	39.15	
PZ-113-SS		1407	28.16	28.12	160.25	160.75	
PZ-114-AS		0830	16.78	16.58	26.20 (Top of Pump)	26.10 (Top of Pump)	
PZ-115-SS		0831	13.15	12.65	81.05 (Top of Pump)	81.02 (Top of Pump)	
PZ-116-SS		1027	6.19	15.90	142.74 (Top of Pump)	149.85 (Top of Pump)	surface completion lowered between March 2106 & May 2016
PZ-200-SS		0850	20.80	20.30	99.31	99.50	Labeled as GMP-7.
PZ-201A-SS		0855	9.61	9.69	86.10 (Top of Pump)	86.21 (Top of Pump)	
PZ-202-SS		0946	11.10	11.65	85.13 (Top of Pump)	85.20 (Top of Pump)	
PZ-203-SS		1015	24.49	24.98	111.34	111.11	
PZ-204-SS		1051	7.62	7.33	87.98	87.98	
PZ-204A-SS		1048	4.04	4.39	84.23	84.31	
PZ-205-AS		1151	30.24	29.09	54.03	54.10	
PZ-205-SS		1148	29.07	28.99	93.02 (Top of Pump)	92.91 (Top of Pump)	
PZ-206-SS		1335	27.14	27.10	129.82	129.79	
PZ-207-AS		1422	28.57	28.39	38.95	39.00	
PZ-208-SS		0903	19.40	19.25	100.35	100.34	
PZ-209-SD		0938	22.73	23.39	101.44 (Top of Pump)	101.44 (Top of Pump)	
PZ-209-SS		0941	20.90	21.59	99.70 (Top of Pump)	99.89 (Top of Pump)	
PZ-210-SD		1012	25.78	26.51	101.55 (Top of Pump)	101.51 (Top of Pump)	
PZ-210-SS		1009	24.86	25.60	101.51 (Top of Pump)	102.45 (Top of Pump)	
PZ-211-SD		0954	21.36	21.94	99.40 (Top of Pump)	99.30 (Top of Pump)	
PZ-211-SS		0952	~~13.66~~ (24)	20.04	98.14 (Top of Pump)	98.09 (Top of Pump)	WL: 19.86
PZ-212-SD		1203	13.79	14.22	92.89 (Top of Pump)	92.85 (Top of Pump)	
PZ-212-SS		1200	8.74	9.21	93.92 (Top of Pump)	93.89 (Top of Pump)	
PZ-302-AI		1100	17.83	20.52	44.60	44.25	Previous Event = Sept 2013
PZ-302-AS	↓	1058	17.58	20.56	24.51	24.54	Previous Event = Sept 2013
PZ-303-AS	5/31/2016	1116	21.03	23.08	28.31	28.29	Previous Event = Sept 2013

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-304-AI	5/31/2016	1125	20.76	23.48	51.99	52.20	Previous Event = Sept 2013
PZ-304-AS	A	1127	20.46	23.26	29.20	29.32	Previous Event = Sept 2013
PZ-305-AI	B	ABANDONED					
S-84	5/31/2016	0816	23.09	22.81	32.89	32.89	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	N/A	NA	NA	37.50	NA	107.86	Previous Event = Sept 2013
D-81	8/22/16	1136	18.25	17.64	62.53	62.54	
D-85	"	0813	23.85	23.09	77.19	77.20	
D-87	8/22/16	0842	31.67	44.05	114.61	112.75	Previous Event = Sept 2013
I-4	NA	NA	NA	35.39	NA	78.66	Previous Event = Sept 2013
I-68	8/22/16	0918	17.05	16.48	40.45	40.47	
I-73	"	1337	29.08	28.69	50.75	50.79	
LR-100		1332	15.76	15.69	26.99	27.01	
LR-103		1325	32.71	37.10	49.87	49.84	
MW-104		1142	8.35	7.78	19.15	19.12	
MW-1204		1059	7.55	5.39	215.19	215.00	
PZ-100-KS		1434	22.95	22.65	383.90	384.65	TD Measured @ 1005 on 9/7/16
PZ-100-SD		1435	31.51	31.00	96.19 (Top of Pump)	96.19 (Top of Pump)	Top of pump = 96.19
PZ-100-SS		1438	29.14	29.31	89.13 (Top of Pump)	89.09 (Top of Pump)	
PZ-101-SS		0919	37.62	37.06	155.49	155.10	
PZ-102-SS		0924	20.82	21.19	91.25	91.25	
PZ-102R-SS		0928	20.64	20.25	91.10	91.14	
PZ-103-SS		0934	13.71	11.52	149.66	149.65	
PZ-104-KS		1013	16.24	16.00	93.09 (Top of Pump)	93.05 (Top of Pump)	
PZ-104-SD		1010	20.94	20.43	120.66 (Top of Pump)	120.64 (Top of Pump)	
PZ-104-SS		1006	19.49	19.10	140.35 (Top of Pump)	140.30 (Top of Pump)	
PZ-105-SS		1020	23.84	23.81	~~103.78~~ (Top of Pump)	~~144.90~~ (Top of Pump)	Remeasure TD = 144.93
PZ-106-KS		1058	2.15	2.09	374.99	375.02	TD Measured @ 1315 on 9/17/16
PZ-106-SD		1059	13.49	12.68	196.29 (Top of Pump)	196.25 (Top of Pump)	
PZ-106-SS		1104	12.85	12.14	161.42 (Top of Pump)	161.40 (Top of Pump)	
PZ-107-SS *		1036	23.84	30.82	103.78	103.70	~~top of pump~~ (TD)
PZ-109-SS		1412	24.97	22.42	130.99 (Top of Pump)	131.04 (Top of Pump)	
PZ-110-SS		1417	28.28	27.68	107.23 (Top of Pump)	107.23 (Top of Pump)	
PZ-111-KS	8/22/16	1422	6.85	6.67	374.80	374.59	TD measured @ 1046 on 9/7/16

* 135 WL 31.34 TD: 103.67 PZ-107-SS

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-111-SD	8/22/16	1423	33.03	32.98	198.83 (Top of Pump)	199.13 (Top of Pump)	
PZ-112-AS		0905	29.38	28.83	38.41	38.38	
PZ-113-AD		0855	28.55	27.97	110.11	110.13	
PZ-113-AS		0858	29.50	27.90	39.17	39.25	
PZ-113-SS		0852	28.75	28.16	160.21	160.25	
PZ-114-AS		0823	17.48	16.78	26.32 (Top of Pump)	26.20 (Top of Pump)	
PZ-115-SS		0824	14.29	13.15	81.04 (Top of Pump)	81.05 (Top of Pump)	
PZ-116-SS		1045	10.30	6.19	142.64 (Top of Pump)	142.85 (Top of Pump)	
PZ-200-SS		1443	20.69	20.80	99.30	99.31	Labeled as GMP-7.
PZ-201A-SS		1448	10.03	9.61	86.34 (Top of Pump)	86.10 (Top of Pump)	WL: 10.03
PZ-202-SS		0949	11.43	11.10	85.22 (Top of Pump)	85.13 (Top of Pump)	
PZ-203-SS		1030	25.02	24.49	111.10	111.34	
PZ-204-SS		1113	8.12	7.62	87.98	87.98	
PZ-204A-SS		1113	4.55	4.04	84.33	84.23	
PZ-205-AS		1342	29.06	30.24	53.88	54.03	
PZ-205-SS		1346	29.52	29.07	98.00 (Top of Pump)	93.02 (Top of Pump)	
PZ-206-SS		1407	27.94	27.14	129.74	129.82	
PZ-207-AS		0835	29.12	28.57	38.92	38.95	
PZ-208-SS		1455	19.64	19.40	100.38	100.35	
PZ-209-SD		0941	23.05	22.73	101.40 (Top of Pump)	101.44 (Top of Pump)	
PZ-209-SS		0943	21.14	20.90	99.88 (Top of Pump)	99.70 (Top of Pump)	
PZ-210-SD		1022	26.03	25.78	101.57 (Top of Pump)	101.55 (Top of Pump)	
PZ-210-SS		1019	25.12	24.86	101.50 (Top of Pump)	101.51 (Top of Pump)	
PZ-211-SD		0959	21.71	21.36	99.35 (Top of Pump)	99.40 (Top of Pump)	
PZ-211-SS		0956	19.57	19.36	98.15 (Top of Pump)	98.14 (Top of Pump)	
PZ-212-SD		1507	14.13	13.79	92.80 (Top of Pump)	92.89 (Top of Pump)	
PZ-212-SS		1509	10.72	8.74	93.76 (Top of Pump)	93.92 (Top of Pump)	
PZ-302-AI		1125	18.44	17.83	44.09	44.10	
PZ-302-AS	8/22/16	1123	18.46	17.58	24.51	24.51	no pump

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.
Engineering for a Better World

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-303-AS	8/22/16	1149	21.85	21.03	28.30	28.31	no pump present
PZ-304-AI	"	1159	21.37	20.76	51.99	51.99	
PZ-304-AS	8/22/16	1157	21.09	20.46	29.21	29.20	
S-5	NA	NA	NA	35.76	NA	44.34	Previous Event = Sept 2013
S-53	8/22/16	1221	11.59	13.70	18.00	17.00	Previous Event = Sept 2013
S-84	8/22/16	0812	23.55	23.09	32.90	32.89	

Engineering for a Better World
FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	8/31/2016	0854	35.30	37.50	107.70	107.86	Previous Event = Sept 2013
D-85		0800	24.27	23.09	N/A	77.20	
D-87		0808	31.94	44.05	N/A	112.75	Previous Event = Sept 2013
I-4		0851	32.67	35.39	35.95*	78.66	Previous Event = Sept 2013
PZ-112-AS		0821	29.75	28.83	N/A	38.38	
PZ-113-AD		0815	28.85	27.97	N/A	110.13	
PZ-113-AS		0816	28.82	27.90	N/A	39.25	
PZ-113-SS		0814	29.09	28.16	N/A	160.25	
PZ-207-AS		0804	29.53	28.57	N/A	38.95	
S-5		0849	32.44	35.76	43.54	44.34	Previous Event = Sept 2013
S-84	8/31/2016	0758	24.02	23.09	N/A	32.89	

* Apparent pinch in PVC casing

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

Engineering for a Better World

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	11/7/2016	1150	35.45	35.30	107.69	107.70	
D-81		1436	18.36	18.25	62.55	62.73	
D-85		0839	24.42	23.85	76.74	~~23.09~~	
D-87		0904	32.14	31.67	115.06	114.61	
I-4		1149	32.82	32.67	35.96	35.95*	*Apparent blockage in PVC.
I-67		0846	9.19	11.45	40.45	40.59	Previous Event = Sept 2013
I-68		0850	17.55	17.05	40.46	40.45	
I-73		0938	29.50	29.08	50.55	50.75	
LR-100		1206	16.27	15.76	26.99	26.99	
LR-103		1212	38.05	37.71	49.82	49.82	
MW-103		1452	6.51	8.85	14.41	14.45	Previous Event = Sept 2013
MW-104		1439	8.39	8.35	19.15	19.15	
MW-1204		1012	8.77	7.55	215.19	215.19	
PZ-100-KS		1322	23.38	22.95	383.68	383.90	
PZ-100-SD		1330	32.55	31.51	96.42 (Top of Pump)	96.19 (Top of Pump)	
PZ-100-SS		1332	29.89	29.14	89.12 (Top of Pump)	89.13 (Top of Pump)	
PZ-101-SS		1124	39.19	37.68	155.43	155.49	
PZ-102-SS		1116	22.00	20.82	91.20	91.25	
PZ-102R-SS		1118	21.71	20.64	90.94	91.10	
PZ-103-SS		1111	15.96	13.71	149.62	149.66	
PZ-104-KS		1040	16.58	16.24	93.09 (Top of Pump)	93.09 (Top of Pump)	
PZ-104-SD		1042	20.81	20.94	120.68 (Top of Pump)	120.66 (Top of Pump)	
PZ-104-SS		1045	19.94	19.49	140.32 (Top of Pump)	140.35 (Top of Pump)	
PZ-105-SS		1024	23.33	23.84	144.86 (Top of Pump)	144.83 (Top of Pump)	
PZ-106-KS		0955	2.54	2.15	375.00	374.99	
PZ-106-SD		1001	13.82	13.49	196.48 (Top of Pump)	196.29 (Top of Pump)	
PZ-106-SS		1007	13.21	12.85	161.42 (Top of Pump)	161.42 (Top of Pump)	
PZ-107-SS		0949	31.60	31.39	103.80	103.67	
PZ-109-SS	11/7/2016	0929	28.11	24.97	130.98 (Top of Pump)	130.99 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

Engineering for a Better World
FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	11/7/2016	0924	29.76	28.28	107.19 (Top of Pump)	107.23 (Top of Pump)	
PZ-111-KS		1512	7.05	6.85	374.61	374.50	
PZ-111-SD		1519	34.19	33.03	197.20 (Top of Pump)	198.83 (Top of Pump)	
PZ-112-AS		0909	29.90	29.38	38.35	38.41	WL>29.90
PZ-113-AD		0917	29.07	28.55	110.11	110.11	
PZ-113-AS		0919	28.98	28.50	38.95	39.17	
PZ-113-SS		0913	29.35	28.75	160.25	160.21	
PZ-114-AS		0854	18.01	17.48	26.32 (Top of Pump)	26.32 (Top of Pump)	
PZ-115-SS		0856	15.05	14.29	81.11 (Top of Pump)	81.04 (Top of Pump)	
PZ-116-SS		1018	11.56	10.30	142.60 (Top of Pump)	142.64 (Top of Pump)	
PZ-200-SS		1337	21.59	20.69	99.29	99.30	Labeled as GMP-7.
PZ-201A-SS		1343	11.82	10.03	86.12 (Top of Pump)	86.34 (Top of Pump)	
PZ-202-SS		1104	11.44	11.43	85.15 (Top of Pump)	85.22 (Top of Pump)	
PZ-203-SS		1029	24.76	25.02	111.12	111.10	
PZ-204-SS		1421	7.93	8.12	87.99	87.98	
PZ-204A-SS		1418	4.45	4.55	84.51	84.33	
PZ-205-AS		0944	30.26	29.06	53.89	53.88	
PZ-205-SS		0942	30.20	29.52	92.98 (Top of Pump)	93.00 (Top of Pump)	
PZ-206-SS		0933	28.75	27.94	129.87	129.74	TD: 129.87
PZ-207-AS		0931	29.72	29.12	38.93	38.92	
PZ-208-SS		1350	19.75	19.64	100.37	100.38	
PZ-209-SD		1059	23.09	23.05	101.42 (Top of Pump)	101.40 (Top of Pump)	
PZ-209-SS		1057	21.55	21.14	99.91 (Top of Pump)	99.88 (Top of Pump)	
PZ-210-SD		1036	25.69	26.03	106.8 (Top of Pump)	101.57 (Top of Pump)	101.65 = TD
PZ-210-SS		1034	25.11	25.12	101.49 (Top of Pump)	101.50 (Top of Pump)	
PZ-211-SD		1052	21.74	21.71	99.33 (Top of Pump)	99.35 (Top of Pump)	
PZ-211-SS		1050	20.04	19.57	98.15 (Top of Pump)	98.15 (Top of Pump)	
PZ-212-SD		1405	14.30	14.13	92.80 (Top of Pump)	92.80 (Top of Pump)	
PZ-212-SS	11/7/2016	1403	10.24	10.72	93.74 (Top of Pump)	93.76 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

Engineering for a Better World

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-302-AI	11/7/2016	1432	18.59	18.44	44.15	44.09	
PZ-302-AS		1430	18.72	18.46	24.50	24.51	
PZ-303-AS		1537/14 ②	21.08	21.85	29.25	28.30	petroleum odor
PZ-304-AI		1445	21.56	21.37	51.98	51.99	
PZ-304-AS		1448	21.28	21.09	29.21	29.21	
S-5		1147	31.20	32.44	43.62	43.54	
S-53		1459	11.72	11.59	18.02	18.00	
S-84	11/7/2016	0836	24.11	23.55	32.74	32.90	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	2/6/2017	1336	38.10	35.45	107.65	107.69	
D-81	"	1446	21.11	18.36	62.49	62.55	
D-85		0812	27.30	24.42	76.73	76.74	
D-87		0918	34.90	32.14	115.15	115.06	
I-4		1338	35.55	32.82	35.85	35.96*	*Apparent blockage in PVC.
I-67		0821	12.19	9.19	40.45	40.45	
I-68		0827	20.47	17.55	40.47	40.46	
I-73		1143	32.04	29.50	50.56	50.55	
LR-100		1138	16.73	16.27	26.98	26.99	
LR-103		1400	40.65	38.05	49.81	49.82	
MW-103		1508	9.61	6.51	14.40	14.41	
MW-104		1450	11.19	8.39	18.95	19.15	
MW-1204		1039	10.12	8.77	215.21	215.18	
PZ-100-KS		0848	23.61	23.38	N/A	383.68	
PZ-100-SD		0845	31.41	32.55	96.27 (Top of Pump)	96.42 (Top of Pump)	
PZ-100-SS		0842	29.94	29.89	89.34 (Top of Pump)	89.12 (Top of Pump)	
PZ-101-SS		0929	39.10	39.19	157.35	155.43	Well extended January 2017
PZ-102-SS		0938	22.62	22.00	91.27	91.28	TD: 91.27
PZ-102R-SS		0935	26.62	21.71	94.03	90.94	Well extended January 2017
PZ-103-SS		0942	16.79	15.96	149.63	149.62	
PZ-104-KS		1011	17.16	16.58	93.01 (Top of Pump)	93.09 (Top of Pump)	
PZ-104-SD		1015	21.30	20.81	120.61 (Top of Pump)	120.68 (Top of Pump)	
PZ-104-SS		1018	20.33	19.94	140.54 (Top of Pump)	140.32 (Top of Pump)	
PZ-105-SS		1034	23.79	23.33	~~144.63~~ 144.86 (Top of Pump)	144.86 (Top of Pump)	144.63 - Top of pump
PZ-106-KS		1049	2.73	2.59	N/A	375.00	
PZ-106-SD		1050	14.48	13.82	196.47 (Top of Pump)	196.48 (Top of Pump)	
PZ-106-SS		1054	13.82	13.21	161.40 (Top of Pump)	161.42 (Top of Pump)	
PZ-107-SS	"	1120	34.23	31.60	103.72	103.80	
PZ-109-SS	2/6/2017	1149	22.08	28.11	130.92 (Top of Pump)	130.98 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	2/6/2017	~~1055~~ 1155	31.10	28.76	107.19 (Top of Pump)	107.19 (Top of Pump)	
PZ-111-KS		1200	7.13	7.05	N/A	374.61	
PZ-111-SD		1202	36.04	34.19	197.16 (Top of Pump)	197.20 (Top of Pump)	
PZ-112-AS		0923	32.59	29.90	38.35	38.35	
PZ-113-AD		1211	31.78	29.07	109.95	110.11	
PZ-113-AS		1210	31.69	28.98	39.18	38.95	
PZ-113-SS		1214	31.96	29.35	160.27	160.25	
PZ-114-AS		0835	20.85	18.01	26.29 (Top of Pump)	26.32 (Top of Pump)	
PZ-115-SS		0832	15.39	15.05	81.04 (Top of Pump)	81.11 (Top of Pump)	
PZ-116-SS		1043	12.98	11.56	142.68 (Top of Pump)	142.60 (Top of Pump)	
PZ-200-SS		0853	22.18	21.59	99.28	99.29	Labeled as GMP-7.
PZ-201A-SS		0859	12.75	11.82	86.09 (Top of Pump)	86.12 (Top of Pump)	
PZ-202-SS		0958	12.14	11.44	85.19 (Top of Pump)	85.15 (Top of Pump)	
PZ-203-SS		1029	25.05	24.76	111.30	111.12	
PZ-204-SS		1428	8.98	7.93	87.98	87.99	
PZ-204A-SS		1426	4.66	4.45	84.62	84.51	
PZ-205-AS		1124	33.10	30.26	53.83	53.89	
PZ-205-SS		1130	32.19	30.20	92.84 (Top of Pump)	92.98 (Top of Pump)	
PZ-206-SS		1354	29.72	28.75	129.84	129.87	
PZ-207-AS		0808	32.56	29.72	38.97	38.93	
PZ-208-SS		0906	19.92	19.75	100.30	100.37	
PZ-209-SD		0950	23.65	23.09	101.33 (Top of Pump)	101.42 (Top of Pump)	
PZ-209-SS		0953	21.98	21.55	99.88 (Top of Pump)	99.81 (Top of Pump)	
PZ-210-SD		1025	26.19	25.69	101.72 (Top of Pump)	101.65 (Top of Pump)	
PZ-210-SS		1023	25.60	25.11	101.48 (Top of Pump)	101.49 (Top of Pump)	
PZ-211-SD		1006	22.33	21.74	99.29 (Top of Pump)	99.33 (Top of Pump)	
PZ-211-SS		1004	20.36	20.04	98.13 (Top of Pump)	98.15 (Top of Pump)	
PZ-212-SD		1412	14.80	14.30	92.75 (Top of Pump)	92.80 (Top of Pump)	
PZ-212-SS	2/6/2017	1414	11.38	10.24	93.88 (Top of Pump)	93.74 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-302-AI	2/6/2017	1442	21.20	18.59	44.15	44.15	
PZ-302-AS	"	1440	21.45	18.72	24.49	24.50	
PZ-303-AS	"	1455	23.65	21.08	28.26	28.25	
PZ-304-AI	"	1502	24.29	21.56	51.99	51.98	
PZ-304-AS	"	1504	23.98	21.28	29.21	29.21	
S-5	"	1340	31.71	31.20	43.45	43.62	
S-53	"	1435	14.51	11.72	18.02	18.02	
S-84	2/6/2017	0815	27.09	24.11	32.72	32.74	

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-3	5/1/2017	1326	37.08	38.10	107.72	107.65	
D-81		1449	19.37	21.11	62.55	62.49	
D-85		0812	25.82	27.30	76.43	76.73	
D-87		0855	33.64	34.90	115.17	115.15	
I-4		1329	34.49	35.55	35.90	35.85*	*Apparent blockage in PVC.
I-67		1349	10.60	12.19	40.44	40.45	
I-68		1353	18.38	20.47	40.46	40.47	
I-73		0957	30.79	32.04	50.57	50.56	
LR-100		0950	15.79	16.73	26.98	26.98	
LR-103		0942	39.46	40.65	49.82	49.81	
MW-103		1505	6.95	9.61	14.41	14.40	
MW-104		1453	9.14	11.19	18.94	18.95	
MW-1204		1023	9.58	10.12	N/A	215.21	
PZ-100-KS		0830	22.83	23.61	N/A	383.68	
PZ-100-SD		0828	30.97	31.41	96.21 (Top of Pump)	96.27 (Top of Pump)	
PZ-100-SS		0826	29.89	29.94	89.33 (Top of Pump)	89.34 (Top of Pump)	
PZ-101-SS		1128	38.54	39.10	157.11	157.35	
PZ-102-SS		1120	21.45	22.62	91.27	91.27	
PZ-102R-SS		1123	25.20	26.62	94.02	94.03	
PZ-103-SS		1116	15.33	16.79	149.65	149.63	
PZ-104-KS		1053	15.73	17.16	93.29 (Top of Pump)	93.01 (Top of Pump)	
PZ-104-SD		1050	20.21	21.30	120.62 (Top of Pump)	120.61 (Top of Pump)	
PZ-104-SS		1047	19.49	20.33	140.29 (Top of Pump)	140.54 (Top of Pump)	
PZ-105-SS		1035	22.45	23.79	144.82 (Top of Pump)	144.63 (Top of Pump)	
PZ-106-KS		1012	1.93	2.73	N/A	375.00	
PZ-106-SD		1014	13.69	14.48	196.45 (Top of Pump)	196.47 (Top of Pump)	
PZ-106-SS		1017	12.98	13.82	161.39 (Top of Pump)	161.40 (Top of Pump)	
PZ-107-SS		1007	33.66	34.23	103.67	103.72	
PZ-109-SS	5/1/2017	0932	20.59	22.08	130.98 (Top of Pump)	130.92 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-110-SS	5/1/2017	Damaged		31.10	(Top of Pump)	107.19 (Top of Pump)	Not Measurable
PZ-111-KS		0918	6.52	7.13	N/A	374.61	
PZ-111-SD		0916	36.05	36.04	197.08 (Top of Pump)	197.16 (Top of Pump)	
PZ-112-AS		0902	31.45	32.59	38.45	38.35	
PZ-113-AD		0906	30.68	31.78	109.95	109.95	
PZ-113-AS		0909	30.65	31.69	39.22	39.18	
PZ-113-SS		0911	30.78	31.96	160.28	160.27	
PZ-114-AS		0818	18.25	20.85	26.04 (Top of Pump)	26.29 (Top of Pump)	
PZ-115-SS		0820	12.61	15.39	81.03 (Top of Pump)	81.04 (Top of Pump)	
PZ-116-SS		1024	12.69	12.98	142.87 (Top of Pump)	142.68 (Top of Pump)	
PZ-200-SS		0835	21.85	22.18	99.35	99.28	Labeled as GMP-7
PZ-201A-SS		0839	11.75	12.75	86.28 (Top of Pump)	86.09 (Top of Pump)	
PZ-202-SS		1111	10.45	12.14	85.19 (Top of Pump)	85.19 (Top of Pump)	
PZ-203-SS		1080	23.99	25.05	111.29	111.30	
PZ-204-SS		1430	8.33	8.98	87.98	87.98	
PZ-204A-SS		1427	3.95	4.66	84.74	84.62	
PZ-205-AS		1000	32.25	33.10	53.85	53.83	
PZ-205-SS		1002	30.54	32.19	103.61 (Top of Pump)	92.84 (Top of Pump)	TD measured w/out pump
PZ-206-SS		0937	28.85	29.72	129.85	129.84	
PZ-207-AS		0805	31.25	32.56	38.94	38.97	
PZ-208-SS		0846	17.59	19.92	100.35	100.30	
PZ-209-SD		1103	23.36	23.65	101.40 (Top of Pump)	101.33 (Top of Pump)	
PZ-209-SS		1105	20.94	21.98	99.89 (Top of Pump)	99.88 (Top of Pump)	
PZ-210-SD		1043	24.94	26.19	101.60 (Top of Pump)	101.72 (Top of Pump)	
PZ-210-SS		1042	24.59	25.60	101.46 (Top of Pump)	101.48 (Top of Pump)	
PZ-211-SD		1057	20.97	22.33	99.02 (Top of Pump)	99.29 (Top of Pump)	
PZ-211-SS		1059	19.44	20.36	98.12 (Top of Pump)	98.13 (Top of Pump)	
PZ-212-SD		1411	13.72	14.80	92.76 (Top of Pump)	92.75 (Top of Pump)	
PZ-212-SS	5/1/2017	1409	7.40	11.39	93.89 (Top of Pump)	93.88 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-302-AI	5/1/2017	1445	19.89	21.28	44.16	44.15	
PZ-302-AS		1443	19.95	21.45	24.52	24.49	
PZ-303-AS		1511	21.90	23.65	28.25	28.26	
PZ-304-AI		1458	22.62	24.29	51.98	51.99	
PZ-304-AS		1500	22.37	23.98	29.18	29.21	
S-5		1331	34.59	31.71	43.56	43.45	
S-53		1438	12.66	14.51	18.01	18.02	
S-84	5/1/2017	0811	~~24~~ 25.52	27.09	32.71	32.72	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
D-85	8/28/17	0818	24.82	25.82	76.41	76.43	
D-87		0755	32.24	33.64	115.25	115.17	WL= 32.24 TD: 115.25
I-67		1114	9.65	10.60	40.49	40.44	
I-68		1111	18.14	18.38	40.46	40.46	
I-73		1024	29.50	30.79	50.56	50.57	
LR-103		1106	38.15	39.43	49.65	49.82	
MW-1204		1003	10.67	9.58	N/A	215.21	
PZ-100-KS		0833	23.52	22.83	N/A	383.68	
PZ-100-SD		0831	30.51	30.97	96.24 (Top of Pump)	96.21 (Top of Pump)	
PZ-100-SS		0829	29.43	29.89	89.31 (Top of Pump)	89.33 (Top of Pump)	
PZ-101-SS		0905	38.19	38.54	157.43	157.11	
PZ-102-SS		0858	21.55	21.45	91.28	91.27	
PZ-102R-SS		0900	24.49	25.20	93.89	94.02	
PZ-103-SS		0911	15.34	15.33	149.66	149.65	
PZ-104-KS		0942	17.19	15.73	93.28 (Top of Pump)	93.29 (Top of Pump)	
PZ-104-SD		0943	21.30	20.21	120.59 (Top of Pump)	120.62 (Top of Pump)	
PZ-104-SS		0945	20.19	19.49	140.59 (Top of Pump)	140.29 (Top of Pump)	
PZ-105-SS		0958	23.39	22.45	~~144.83~~ (Top of Pump)	144.82 (Top of Pump)	TD = 144.98
PZ-106-KS		1011	2.54	1.93	N/A	375.00	
PZ-106-SD		1009	14.51	13.69	N/A (Top of Pump)	196.45 (Top of Pump)	
PZ-106-SS		1010	14.15	12.98	N/A (Top of Pump)	161.39 (Top of Pump)	
PZ-107-SS		1015	31.72	33.66	103.80	103.67	
PZ-109-SS		1041	19.82	20.59	130.86 (Top of Pump)	130.98 (Top of Pump)	
PZ-111-SS		N/A	N/A	N/A	N/A (Top of Pump)	N/A	Not finished Installed 8/2017
PZ-111-KS		1038	6.98	6.52	N/A	374.61	
PZ-111-SD		1037	33.49	36.05	N/A (Top of Pump)	197.08 (Top of Pump)	
PZ-112-AS		0801	29.95	31.45	38.35	38.45	
PZ-113-AD		0802	29.19	30.68	110.10	109.95	
PZ-113-AS	8/28/17	0809	29.13	30.65	39.31	39.22	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth Previous Event (ft)	Notes
PZ-113-SS	8/23/17	0804	29.35	30.78	160.23	160.28	
PZ-114-AS		0822	18.53	18.25	26.35 (Top of Pump)	26.04 (Top of Pump)	
PZ-115-SS		0823	14.26	12.61	81.09 (Top of Pump)	81.03 (Top of Pump)	
PZ-116-SS		1005	13.06	12.69	142.71 (Top of Pump)	142.87 (Top of Pump)	
PZ-200-SS		0835	21.70	21.85	99.30	99.35	Labeled as GMP-7
PZ-201A-SS		0840	11.68	11.75	86.36 (Top of Pump)	86.28 (Top of Pump)	
PZ-202-SS		0922	12.40	10.45	85.20 (Top of Pump)	85.19 (Top of Pump)	
PZ-203-SS		0954	24.85	23.99	111.19	111.29	
PZ-204-SS		1059	8.65	8.33	87.98	87.98	
PZ-204A-SS		1057	4.98	3.95	84.55	84.74	
PZ-205-AS		1020	31.32	32.25	53.84	53.85	
PZ-205-SS		1019	29.65	30.54	93.00 (Top of Pump)	92.84 (Top of Pump)	
PZ-206-SS		1050	27.73	28.85	129.95	129.85	
PZ-207-AS		0813	29.98	31.25	38.92	38.94	
PZ-208-SS		0845	19.69	17.59	100.37	100.35	
PZ-209-SD		0919	23.71	23.36	101.38 (Top of Pump)	101.40 (Top of Pump)	
PZ-209-SS		0917	22.09	20.94	99.98 (Top of Pump)	99.89 (Top of Pump)	
PZ-210-SD		0951	25.29	24.94	101.49 (Top of Pump)	101.60 (Top of Pump)	
PZ-210-SS		0950	25.95	24.59	101.56 (Top of Pump)	101.46 (Top of Pump)	
PZ-211-SD		0937	22.38	20.97	99.18 (Top of Pump)	99.02 (Top of Pump)	
PZ-211-SS		0935	20.41	19.44	98.19 (Top of Pump)	98.12 (Top of Pump)	
PZ-212-SD		0930	14.98	13.72	92.61 (Top of Pump)	92.76 (Top of Pump)	
PZ-212-SS		0929	13.65	7.40	93.95 (Top of Pump)	93.89 (Top of Pump)	
S-84	8/22/17	0816	24.55	25.52	32.61	32.71	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth May 2017 (ft)	Notes
D-85	11/2/2017	0913	26.44	24.82	N/A	76.41	
D-87		0900	33.88	32.24	N/A	115.17	
I-67		1241	11.28	9.65	N/A	40.44	
I-68		1239	19.62	18.14	N/A	40.46	
I-73		1231	31.01	29.50	N/A	50.57	
LR-103		1234	39.64	38.15	N/A	49.82	
MW-1204		1039	10.90	10.67	N/A	215.21	TD is from Feb 2017
PZ-100-SS		0927	29.30	29.43	N/A	89.33 (Top of Pump)	
PZ-100-SD		0926	31.06	30.51	N/A	96.21 (Top of Pump)	
PZ-100-KS		0925	23.89	23.52	N/A	383.68	TD is from Nov 2016
PZ-101-SS		0955	38.83	38.19	N/A	157.11	
PZ-102-SS		1001	22.19	21.55	N/A	91.27	
PZ-102R-SS		1000	24.98	24.49	N/A	94.02	
PZ-103-SS		1004	16.15	15.34	N/A	149.65	
PZ-104-SS		1026	20.27	20.19	N/A	140.29 (Top of Pump)	
PZ-104-SD		1024	21.45	21.30	N/A	120.62 (Top of Pump)	
PZ-104-KS		1023	17.83	17.19	N/A	93.29 (Top of Pump)	
PZ-105-SS		1035	23.49	23.39	N/A	144.82 (Top of Pump)	
PZ-106-SS		1044	14.02	14.15	N/A	161.39 (Top of Pump)	
PZ-106-SD		1043	14.52	14.51	N/A	196.45 (Top of Pump)	
PZ-106-KS		1042	3.00	2.59	N/A	375.00	TD is from Nov 2016
PZ-107-SS		1047	33.19	31.72	N/A	103.67	
PZ-109-SS		1220	20.89	19.82	N/A	130.98 (Top of Pump)	
PZ-111-SS		1214	33.40	31.98	N/A	115.30	Top of pump = 111.43 TD is from Aug 2017 - No pump installed
PZ-111-SD		1212	35.27	33.49	N/A	197.08 (Top of Pump)	
PZ-111-KS		1213	7.33	6.98	N/A	374.61	TD is from Nov 2016
PZ-112-AS		0944	31.57	29.95	N/A	38.45	
PZ-113-AD		0904	30.84	29.19	N/A	109.95	
PZ-113-AS	11/2/2017	0905	30.10	29.13	N/A	39.22	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth May 2017 (ft)	Notes
PZ-113-SS	11/2/2017	0903	30.96	29.35	N/A	160.28	
PZ-114-AS		0919	20.15	18.53	N/A	26.04 (Top of Pump)	
PZ-115-SS		0920	15.07	14.26	N/A	81.03 (Top of Pump)	
PZ-116-SS		1038	13.65	13.06	N/A	142.87 (Top of Pump)	
PZ-200-SS		0930	22.30	21.70	N/A	99.35	Labeled as GMP-7
PZ-201A-SS		0934	12.59	11.68	N/A	86.28 (Top of Pump)	
PZ-202-SS		1010	13.04	12.40	N/A	85.19 (Top of Pump)	
PZ-203-SS		1032	24.98	24.85	N/A	111.29	
PZ-204-SS		1053	8.72	8.65	N/A	87.98	
PZ-204A-SS		1051	5.17	4.98	N/A	84.74	
PZ-205-AS		1227	32.60	31.32	N/A	53.85	
PZ-205-SS		1228	30.95	29.65	N/A	93.00 (Top of Pump)	Top of Pump is from Aug 2017
PZ-206-SS		1222	29.09	27.73	N/A	129.85	
PZ-207-AS		0908	31.58	29.98	N/A	38.94	
PZ-208-SS		0939	19.98	19.69	N/A	100.35	
PZ-209-SS		1007	22.19	22.09	N/A	99.89 (Top of Pump)	
PZ-209-SD		1006	23.93	23.71	N/A	101.40 (Top of Pump)	
PZ-210-SS		1029	25.42	25.95	N/A	101.46 (Top of Pump)	
PZ-210-SD		1030	26.12	25.29	N/A	101.60 (Top of Pump)	
PZ-211-SS		1019	20.53	20.41	N/A	98.12 (Top of Pump)	
PZ-211-SD		1019	23.65	22.39	N/A	99.02 (Top of Pump)	WL: 23.65
PZ-212-SS		1015	14.80	13.65	N/A	93.89 (Top of Pump)	
PZ-212-SD		1016	15.64	14.98	N/A	92.76 (Top of Pump)	
S-84	11/2/2017	0912	26.16	24.55	N/A	32.71	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth May 2017 (ft)	Notes
D-85	2/14/2018	1340	28.95	26.44	N/A	76.41	top of pump = 62.54
D-87		0956	36.61	33.88	N/A	115.17	
I-67		1307	13.98	11.28	N/A	40.44	
I-68		1310	22.30	19.62	N/A	40.46	top of pump = 32.10
I-73		1136	33.70	31.01	N/A	50.57	Top of pump = 42.12
LR-103		1150	42.44	39.64	N/A	49.82	
MW-1204		1107	12.11	10.90	N/A	215.21	Top of pump = 50.30 TD is from Feb 2017
PZ-100-SS		1326	29.65	29.30	N/A	89.33 (Top of Pump)	
PZ-100-SD		1325	32.13	31.06	N/A	96.21 (Top of Pump)	
PZ-100-KS		1324	24.90	23.89	N/A	383.68	TD is from Nov 2016
PZ-101-SS		1007	40.14	38.83	N/A	157.11	Top of pump = 148.91
PZ-102-SS		1011	23.10	22.19	N/A	91.27	Top of pump = 82.93
PZ-102R-SS		1013	26.41	24.98	N/A	94.02	Top of pump = 85.80
PZ-103-SS		1018	18.49	16.15	N/A	149.65	Top of pump = 141.62
PZ-104-SS		1025	20.96	20.27	N/A	140.29 (Top of Pump)	
PZ-104-SD		1024	22.25	21.45	N/A	120.62 (Top of Pump)	
PZ-104-KS		1022	18.79	17.83	N/A	93.29 (Top of Pump)	
PZ-105-SS		1103	24.14	23.49	N/A	144.82 (Top of Pump)	
PZ-106-SS		1114	14.47	14.02	N/A	161.39 (Top of Pump)	
PZ-106-SD		1113	14.95	14.52	N/A	196.45 (Top of Pump)	
PZ-106-KS		1112	3.92	3.00	N/A	375.00	TD is from Nov 2016
PZ-107-SS		1117	35.98	33.19	N/A	103.67	Top of pump = 95.40
PZ-109-SS		1141	22.40	20.89	N/A	130.98 (Top of Pump)	
PZ-111-SS		1144	36.05	33.40	N/A	111.43 (Top of Pump)	
PZ-111-SD		1145	37.67	35.27	N/A	197.08 (Top of Pump)	
PZ-111-KS		1146	8.20	7.33	N/A	374.61	TD is from Nov 2016
PZ-112-AS		1001	>24.20 ft *	31.57	N/A	38.45	Obstruction @ 24.20 ft
PZ-113-AD		1257	53.51	30.84	N/A	109.95	top of pump = 101.80
PZ-113-AS	2/14/2018	~~1257~~ 1259 @	~~33.51~~ >32.80	30.10	N/A	39.22	top of pump = 32.80

No water detected above top of pump.

* unable to sink probe tip past blockage @ 24.20 ft TOC.

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth May 2017 (ft)	Notes
PZ-113-SS	2/14/2018	1254	33.59	30.96	N/A	160.28	top of pump = 152.00
PZ-114-AS	"	1314	22.74	20.15	N/A	26.04 (Top of Pump)	
PZ-115-SS		1313	16.59	15.07	N/A	81.03 (Top of Pump)	
PZ-116-SS		1106	14.51	13.65	N/A	142.87 (Top of Pump)	
PZ-200-SS		1329	23.17	22.30	N/A	99.35	Labeled as GMP-7
PZ-201A-SS		1332	14.38	12.59	N/A	86.28 (Top of Pump)	
PZ-202-SS		1041	14.05	13.04	N/A	85.19 (Top of Pump)	
PZ-203-SS		1059	25.89	24.98	N/A	111.29	Top of pump = 76.33
PZ-204-SS		1123	9.09	8.72	N/A	87.98	
PZ-204A-SS		1124	5.20	5.17	N/A	84.74	Top of pump = 45.75
PZ-205-AS		1133	34.79	32.60	N/A	53.85	Top of pump = 45.60
PZ-205-SS		1132	33.51	30.95	N/A	93.00 (Top of Pump)	Top of Pump is from Aug 2017
PZ-206-SS		1348	31.25	29.09	N/A	129.85	
PZ-207-AS		1302	34.35	31.58	N/A	38.94	top of pump = 35.85
PZ-208-SS		1336	20.45	19.98	N/A	100.35	
PZ-209-SS		1038	23.21	22.19	N/A	99.89 (Top of Pump)	
PZ-209-SD		1037	24.85	23.93	N/A	101.40 (Top of Pump)	
PZ-210-SS		1057	26.10	25.42	N/A	101.46 (Top of Pump)	
PZ-210-SD		1056	26.84	26.12	N/A	101.60 (Top of Pump)	
PZ-211-SS		1054	21.45	20.53	N/A	98.12 (Top of Pump)	
PZ-211-SD		1053	23.55	23.65	N/A	99.02 (Top of Pump)	
PZ-212-SS		1049	15.19	14.80	N/A	93.89 (Top of Pump)	
PZ-212-SD		1048	16.70	15.64	N/A	92.76 (Top of Pump)	
S-84	2/14/2018	1342	28.70	26.16	N/A	32.71	Top of pump = 29.70

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth May 2018 (ft)	Notes
D-85	8/6/2018	0806	26.11	26.55	N/A	62.57 (Top of Pump)	
D-87		0752	33.51	33.99	N/A	115.18	
I-67		0835	11.10	11.38	N/A	40.59	
I-68		0808	19.51	19.71	N/A	32.15 (Top of Pump)	
I-73		0855	30.54	31.16	N/A	41.81 (Top of Pump)	
LR-103		0853	39.35	39.81	N/A	49.83	
MW-1204		1034	15.37	13.20	N/A	50.20 (Top of Pump)	
PZ-100-SS		0819	30.11	29.55	N/A	89.10 (Top of Pump)	
PZ-100-SD		0817	32.19	31.76	N/A	96.44 (Top of Pump)	
PZ-100-KS		0816	24.35	23.39	N/A	385.02	
PZ-101-SS		0923	47.19	40.18	N/A	148.91 (Top of Pump)	Double checked WL
PZ-102-SS		0934	22.98	22.91	N/A	82.85 (Top of Pump)	
PZ-102R-SS		0932	26.32	25.72	N/A	85.83 (Top of Pump)	
PZ-103-SS		0938	20.49	18.69	N/A	141.59 (Top of Pump)	
PZ-104-SS		1044	21.41	19.79	N/A	140.28 (Top of Pump)	
PZ-104-SD		1043	22.39	20.91	N/A	120.63 (Top of Pump)	
PZ-104-KS		1042	18.10	16.94	N/A	93.16 (Top of Pump)	
PZ-105-SS		1004	23.75	22.25	N/A	144.84 (Top of Pump)	
PZ-106-SS		1010	15.20	14.65	N/A	161.38 (Top of Pump)	
PZ-106-SD		1009	15.82	15.23	N/A	196.25 (Top of Pump)	
PZ-106-KS		1008	3.57	2.55	N/A	377.49	
PZ-107-SS		0906	32.70	33.29	N/A	95.29 (Top of Pump)	
PZ-109-SS		0847	22.12	21.70	N/A	130.89 (Top of Pump)	
PZ-111-SS		0845	33.11	33.58	N/A	111.29 (Top of Pump)	
PZ-111-SD		0843	35.91	35.78	N/A	196.86 (Top of Pump)	
PZ-111-KS		0844	7.83	7.09	N/A	377.01	
PZ-112-AS		0755	>23.92	> 23.93*	N/A	23.93	Obstruction @ 23.93 ft below TOC
PZ-113-AD		0800	30.40	31.01	N/A	101.85 (Top of Pump)	
PZ-113-AS	8/6/2018	0801	30.32	30.91	N/A	32.79 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth May 2018 (ft)	Notes
PZ-113-SS	8/6/2018	0758	30.51	31.16	N/A	152.01 (Top of Pump)	
PZ-114-AS		0813	20.13	20.12	N/A	26.25 (Top of Pump)	
PZ-115-SS		0812	15.54	14.15	N/A	80.91 (Top of Pump)	
PZ-116-SS		1033	16.55	14.87	N/A	142.68 (Top of Pump)	
PZ-200-SS		0823	23.44	22.99	N/A	99.25	Labeled as GMP-7
PZ-201A-SS		0826	14.55	13.35	N/A	86.30 (Top of Pump)	
PZ-202-SS		0947	13.42	11.90	N/A	85.16 (Top of Pump)	
PZ-203-SS		1001	25.83	24.35	N/A	102.45 (Top of Pump)	
PZ-204-SS		0914	9.55	8.90	N/A	87.99	
PZ-204A-SS		0915	5.03	4.95	N/A	75.98 (Top of Pump)	
PZ-205-AS		0859	32.76	33.41	N/A	45.50 (Top of Pump)	Double checked WL
PZ-205-SS		0900	31.41	31.71	N/A	92.98 (Top of Pump)	
PZ-206-SS		0850	29.34	29.62	N/A	129.92	
PZ-207-AS		0838	31.38	31.73	N/A	35.79 (Top of Pump)	
PZ-208-SS		0831	20.31	19.99	N/A	100.30	
PZ-209-SS		0941	22.55	20.94	N/A	99.89 (Top of Pump)	
PZ-209-SD		0942	24.31	22.75	N/A	101.25 (Top of Pump)	
PZ-210-SS		1038	26.07	24.35	N/A	101.28 (Top of Pump)	
PZ-210-SD		1039	27.69	25.19	N/A	101.62 (Top of Pump)	
PZ-211-SS		0959	20.14	19.22	N/A	97.87 (Top of Pump)	
PZ-211-SD		1000	23.10	21.54	N/A	99.40 (Top of Pump)	
PZ-212-SS		0953	15.18	10.20	N/A	93.75 (Top of Pump)	
PZ-212-SD	↓	0954	15.97	14.33	N/A	92.59 (Top of Pump)	
S-84	8/6/2018	0805	25.89	26.28	N/A	29.75 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth May 2018 (ft)	Notes
D-85	11/13/2018	1115	24.91	26.11	N/A	62.57 (Top of Pump)	
D-87		1053	32.22	33.51	N/A	115.18	
I-67		1148	9.75	11.10	N/A	40.59	
I-68		1118	18.23	19.51	N/A	32.15 (Top of Pump)	
I-73		1205	29.48	30.54	N/A	41.81 (Top of Pump)	
LR-103		1426	38.07	39.35	N/A	49.83	
MW-1204		1415	16.28	15.37	N/A	50.20 (Top of Pump)	
PZ-100-SS		1132	29.59	30.11	N/A	89.10 (Top of Pump)	
PZ-100-SD		1131	31.66	32.19	N/A	96.44 (Top of Pump)	
PZ-100-KS		1130	24.34	24.35	N/A	385.02	
PZ-101-SS		1321	47.30	47.19	N/A	148.91 (Top of Pump)	
PZ-102-SS		1324	22.38	22.98	N/A	82.85 (Top of Pump)	
PZ-102R-SS		1326	26.15	26.32	N/A	85.83 (Top of Pump)	
PZ-103-SS		1329	20.41	20.49	N/A	141.59 (Top of Pump)	
PZ-104-SS		1358	21.82	21.41	N/A	140.28 (Top of Pump)	
PZ-104-SD		1357	22.43	22.39	N/A	120.63 (Top of Pump)	
PZ-104-KS		1355	17.61	18.10	N/A	93.16 (Top of Pump)	
PZ-105-SS		1409	23.42	23.75	N/A	144.84 (Top of Pump)	
PZ-106-SS		1421	13.69	15.20	N/A	161.38 (Top of Pump)	
PZ-106-SD		1420	~~14.39~~ 14.39	15.82	N/A	196.25 (Top of Pump)	
PZ-106-KS		1419	3.62	3.57	N/A	377.49	
PZ-107-SS		1213	31.62	32.70	N/A	95.29 (Top of Pump)	
PZ-109-SS		1159	21.86	22.12	N/A	130.89 (Top of Pump)	
PZ-111-SS		1156	31.97	33.11	N/A	111.29 (Top of Pump)	
PZ-111-SD		1154	33.99	35.91	N/A	196.86 (Top of Pump)	
PZ-111-KS		1155	8.17	7.83	N/A	377.01	
PZ-112-AS		1058	Dry @ 23.91	> 23.93*	N/A	23.93	Obstruction @ 23.93 ft below TOC
PZ-113-AD		1102	29.29	30.40	N/A	101.85 (Top of Pump)	
PZ-113-AS	11/13/2018	1104	29.21	30.32	N/A	32.79 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

FEEZOR ENGINEERING, INC.

GROUNDWATER ELEVATION MEASUREMENTS

Site: Bridgeton Landfill, Bridgeton, Missouri

Personnel: Michael Spurgeon & Jonathan Wilkinson

Well ID	Date	Time	Depth to Water (ft)	Depth to Water Previous Event (ft)	Total Depth (ft)	Total Depth May 2018 (ft)	Notes
PZ-113-SS	11/13/2018	1101	29.39	30.51	N/A	152.01 (Top of Pump)	
PZ-114-AS		1123	18.75	20.13	N/A	26.25 (Top of Pump)	
PZ-115-SS		1124	14.60	15.54	N/A	80.91 (Top of Pump)	
PZ-116-SS		1413	16.65	16.55	N/A	142.68 (Top of Pump)	
PZ-200-SS		1135	23.02	23.44	N/A	99.25	Labeled as GMP-7
PZ-201A-SS		1138	13.50	14.55	N/A	86.30 (Top of Pump)	
PZ-202-SS		1337	12.22	13.42	N/A	85.16 (Top of Pump)	
PZ-203-SS		1404	26.06	25.83	N/A	102.45 (Top of Pump)	
PZ-204-SS		1221	8.91	9.55	N/A	87.99	
PZ-204A-SS		1219	4.43	5.03	N/A	75.98 (Top of Pump)	
PZ-205-AS		1209	31.04	32.76	N/A	45.50 (Top of Pump)	
PZ-205-SS		1208	30.28	31.41	N/A	92.98 (Top of Pump)	
PZ-206-SS		1207	28.33	29.34	N/A	129.92	
PZ-207-AS		1107	30.10	31.38	N/A	35.79 (Top of Pump)	
PZ-208-SS		1145	20.25	20.31	N/A	100.30	
PZ-209-SS		1333	21.89	22.55	N/A	99.89 (Top of Pump)	
PZ-209-SD		1334	23.72	24.31	N/A	101.25 (Top of Pump)	
PZ-210-SS		1403	26.15	26.07	N/A	101.28 (Top of Pump)	
PZ-210-SD		1401	26.49	27.69	N/A	101.62 (Top of Pump)	
PZ-211-SS		1349	20.37	20.14	N/A	97.87 (Top of Pump)	
PZ-211-SD		1351	22.56	23.10	N/A	99.40 (Top of Pump)	
PZ-212-SS		1345	14.72	15.18	N/A	93.75 (Top of Pump)	
PZ-212-SD		1343	15.47	15.97	N/A	92.59 (Top of Pump)	
S-84	11/13/18	1111	24.70	25.89	N/A	29.75 (Top of Pump)	

Feezor Engineering, Inc. • 3377 Hollenberg Drive • Bridgeton, Missouri 63044

APPENDIX N

POTENTIOMETRIC SURFACE FIGURES

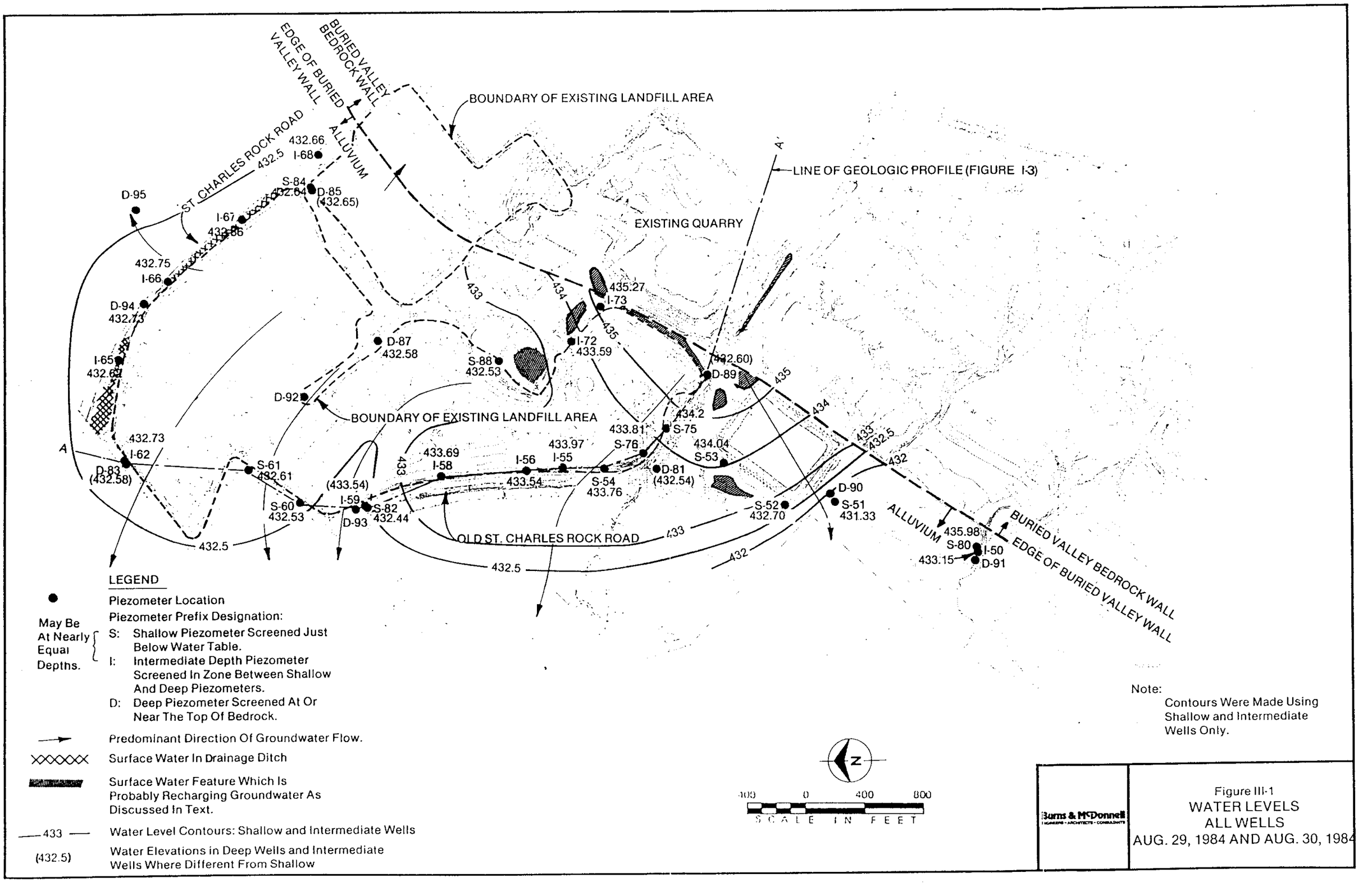
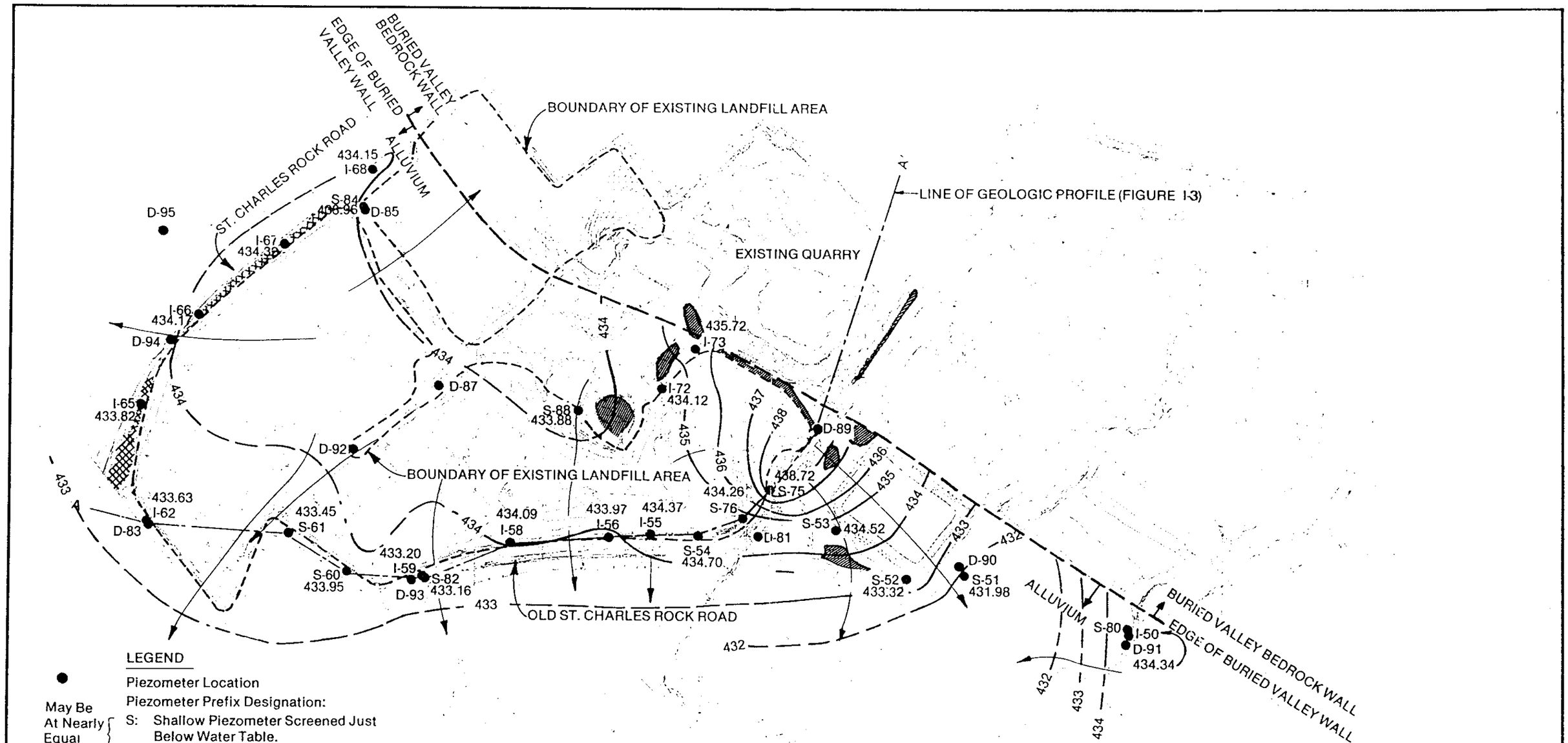


Figure III-1
WATER LEVELS
ALL WELLS
AUG. 29, 1984 AND AUG. 30, 1984



LEGEND

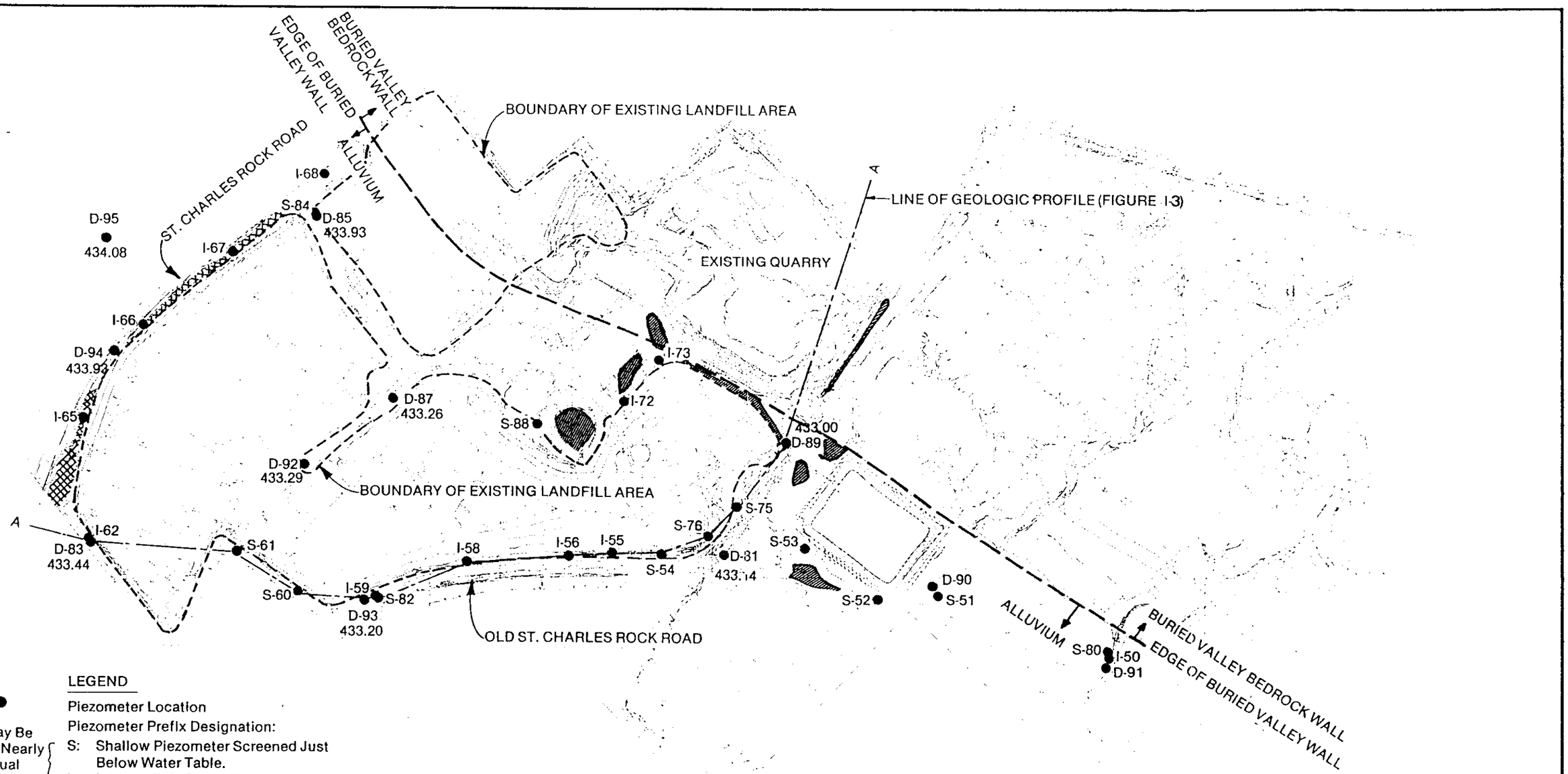
- Piezometer Location
- Piezometer Prefix Designation:
  - S: Shallow Piezometer Screened Just Below Water Table.
  - I: Intermediate Depth Piezometer Screened In Zone Between Shallow And Deep Piezometers.
  - D: Deep Piezometer Screened At Or Near The Top Of Bedrock.

(May Be At Nearly Equal Depths.)

- Predominant Direction Of Groundwater Flow.
- Surface Water In Drainage Ditch
- Surface Water Feature Which Is Probably Recharging Groundwater As Discussed In Text.
- 428 — Water Level Contours

Burns & McDonnell

Figure III-4
WATER LEVEL CONTOURS
SHALLOW AND
INTERMEDIATE WELLS
AUG. 8, 1985



LEGEND

- ● Piezometer Location
- Piezometer Prefix Designation (May Be At Nearly Equal Depths.):
  - S: Shallow Piezometer Screened Just Below Water Table.
  - I: Intermediate Depth Piezometer Screened In Zone Between Shallow And Deep Piezometers.
  - D: Deep Piezometer Screened At Or Near The Top Of Bedrock.
- XXXXXX Surface Water In Drainage Ditch
- Surface Water Feature Which Is Probably Recharging Groundwater As Discussed In Text.

NOTE: Relief On Water Table Is Too Low To Permit Contouring; Flow Of Groundwater Is Negligable.

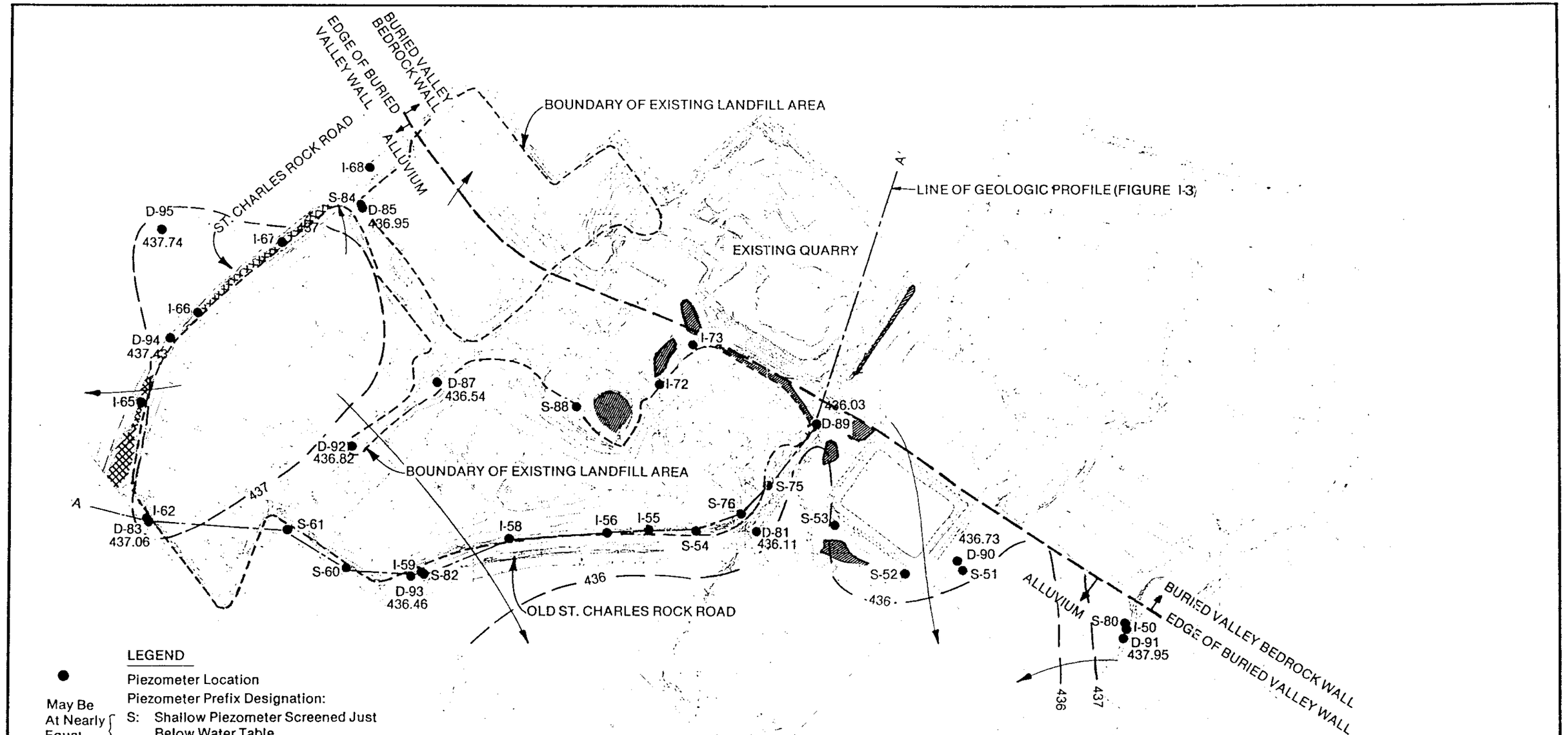
N

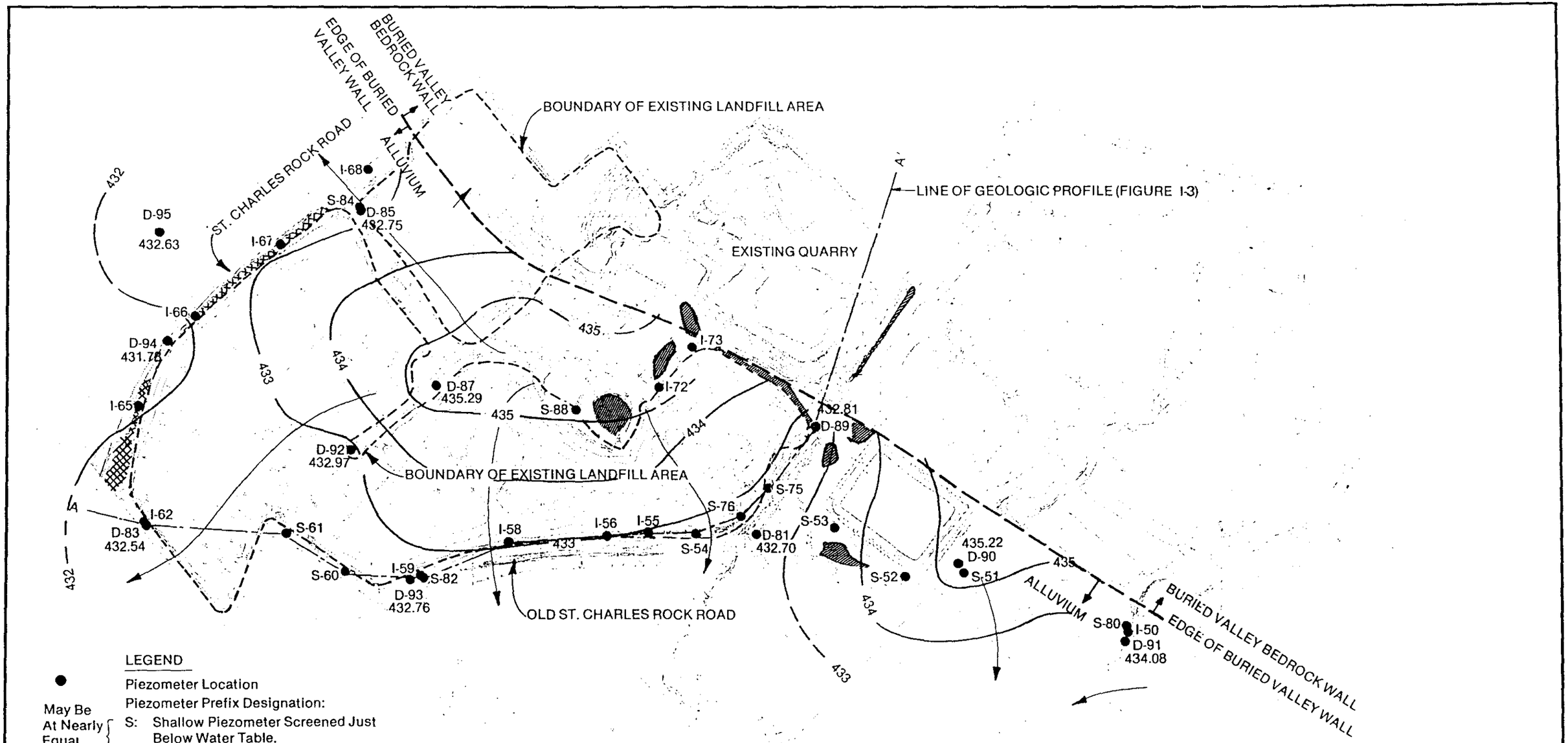
400 0 400 800

SCALE IN FEET

Burns & McDonnell

Figure III-5
GROUNDWATER ELEVATIONS
DEEP WELLS
AUG. 8, 1985


EDGE OF BURIED VALLEY WALL
BURIED VALLEY BEDROCK WALL
ALLUVIUM
BOUNDARY OF EXISTING LANDFILL AREA
LINE OF GEOLOGIC PROFILE (FIGURE I-3)
ST. CHARLES ROCK ROAD
EXISTING QUARRY
I-68
S-84
D-85
436.95
D-95
437.74
I-67
I-66
D-94
437.43
I-65
I-73
I-72
D-87
436.54
S-88
436.03
D-89
D-92
436.82
BOUNDARY OF EXISTING LANDFILL AREA
S-75
S-76
S-53
I-62
D-83
437.06
S-61
I-58
I-56
I-55
S-54
D-81
436.11
436.73
D-90
S-51
S-52
S-60
I-59
S-82
D-93
436.46
OLD ST. CHARLES ROCK ROAD
ALLUVIUM
S-80
I-50
D-91
437.95
BURIED VALLEY BEDROCK WALL
EDGE OF BURIED VALLEY WALL
436
437
A
A'
LEGEND
Piezometer Location
May Be At Nearly Equal Depths.
Piezometer Prefix Designation:
S: Shallow Piezometer Screened Just Below Water Table.
I: Intermediate Depth Piezometer Screened In Zone Between Shallow And Deep Piezometers.
D: Deep Piezometer Screened At Or Near The Top Of Bedrock.
Predominant Direction Of Groundwater Flow.
Surface Water In Drainage Ditch
Surface Water Feature Which Is Probably Recharging Groundwater As Discussed In Text.
Water Level Contours
N
400
0
400
800
SCALE IN FEET
Burns & McDonnell
Figure III-6
WATER LEVEL CONTOURS
DEEP WELLS
DEC. 11, 1985



LEGEND

- ● Piezometer Location
- Piezometer Prefix Designation:
  - May Be At Nearly Equal Depths.
  - S: Shallow Piezometer Screened Just Below Water Table.
  - I: Intermediate Depth Piezometer Screened In Zone Between Shallow And Deep Piezometers.
  - D: Deep Piezometer Screened At Or Near The Top Of Bedrock.
- → Predominant Direction Of Groundwater Flow.
- XXXXXX Surface Water In Drainage Ditch
- ▒▒▒▒ Surface Water Feature Which Is Probably Recharging Groundwater As Discussed In Text.
- —434— Water Level Contours

N

400 0 400 800

SCALE IN FEET

Burns & McDonnell

Figure III-7
WATER LEVEL CONTOURS
DEEP WELLS
MAY 20, 1986

1983 1984

NOV. DEC. JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.

ELEVATION IN FEET

PIEZOMETER NO. I-50

436 434 432 430

PIEZOMETER NO. I-59

436 434 432 430

PIEZOMETEF NO. D-83

434 432 430 428

PIEZOMETER NO. I-62

438 436 434 432 430 428

PIEZOMETER NO. I-68

436 434 432 430 428

Missouri River Stage
At St. Charles

444 442 440 438 436 434 432 430 428

ELEVATION IN FEET

444 442 440 438 436 434 432 430 428

Burns & McDonnell
ENGINEERS · ARCHITECTS · CONSULTANTS

Figure III- 2
PIEZOMETER AND RIVER
HYDROGRAPHS
NOV. 1983-DEC. 1984

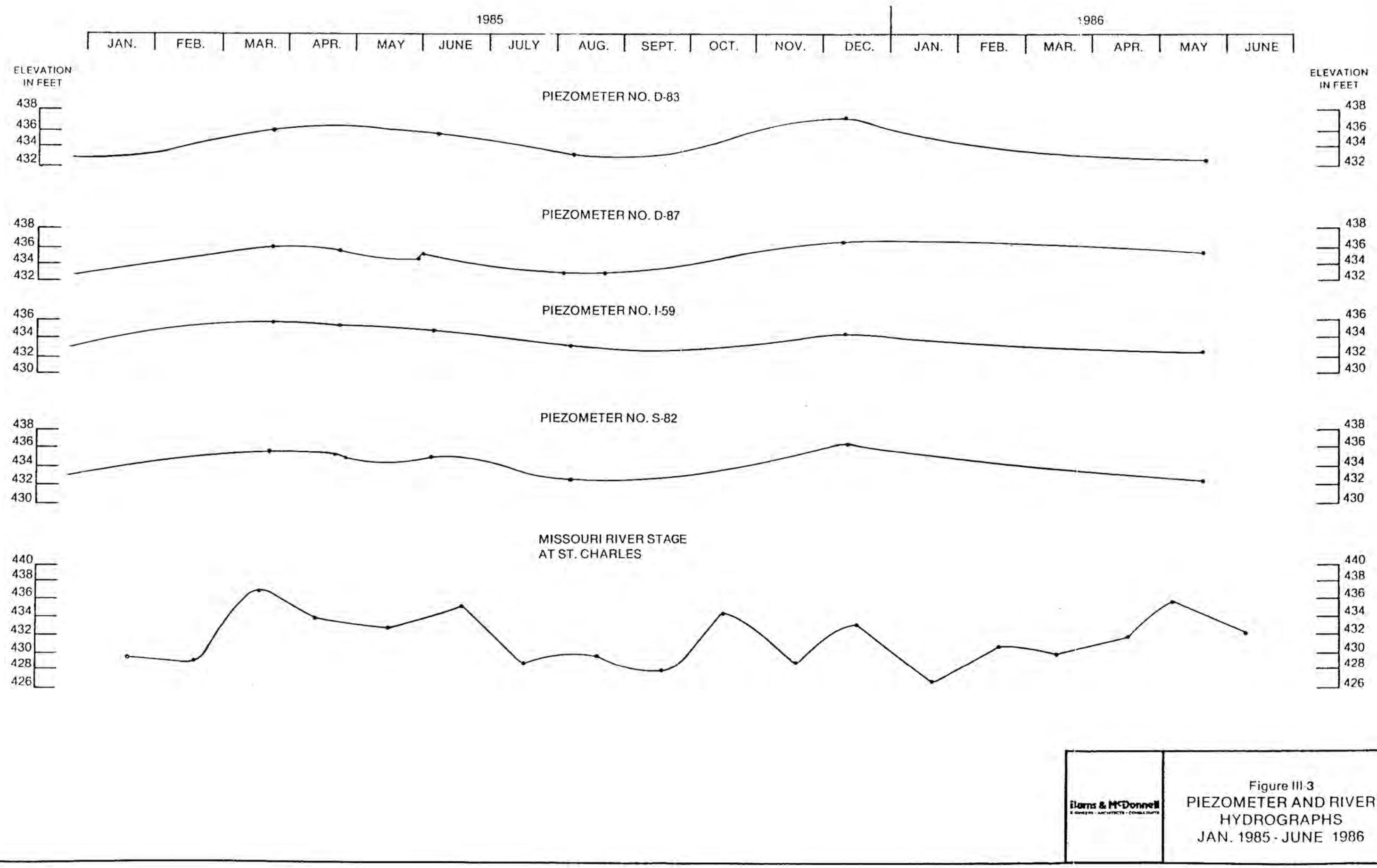
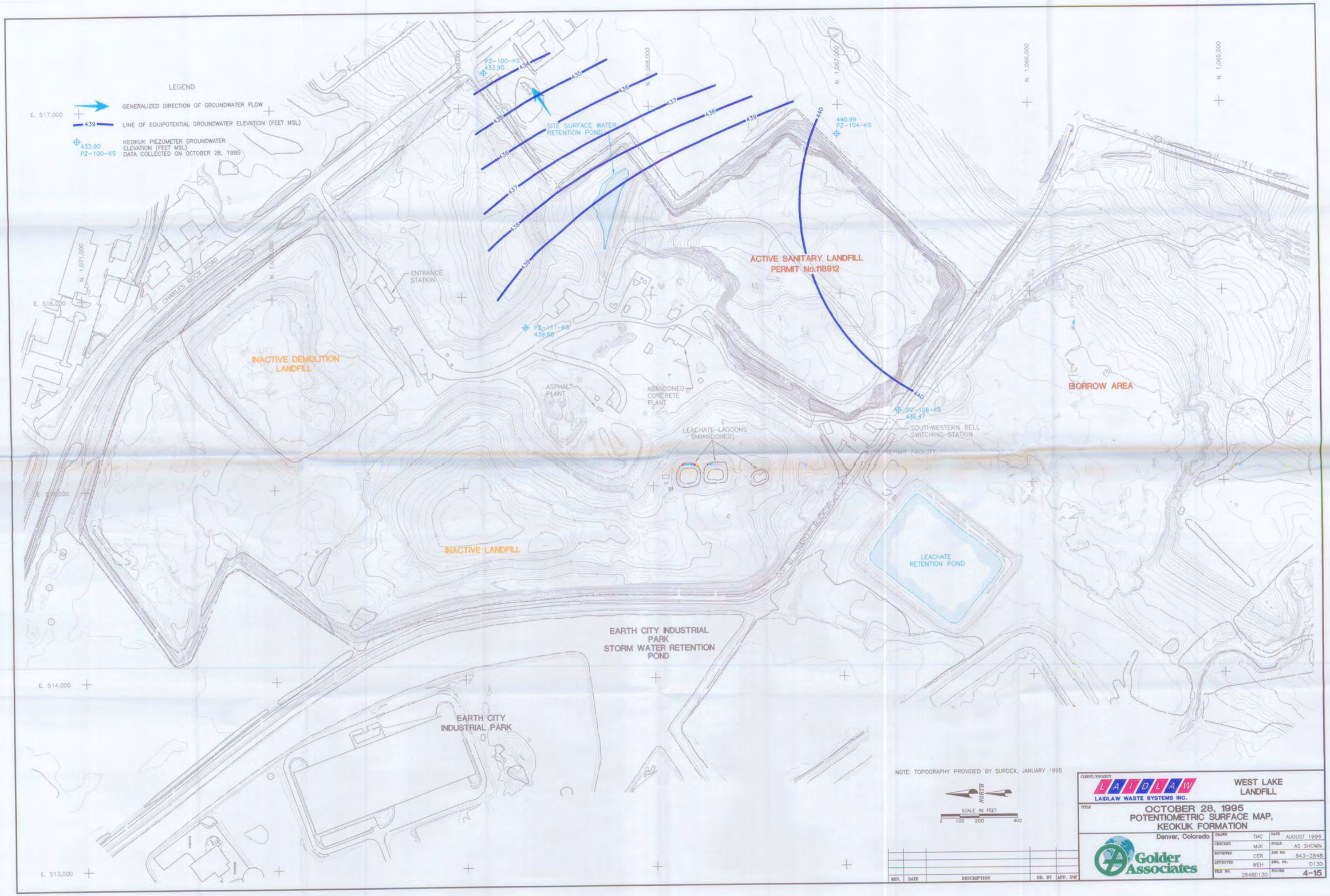


Figure III-3
PIEZOMETER AND RIVER HYDROGRAPHS
JAN. 1985 - JUNE 1986



NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

NORTH

SCALE IN FEET
0 100 200 400

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.

WEST LAKE LANDFILL

TITLE
OCTOBER 28, 1995
POTENTIOMETRIC SURFACE MAP,
KEOKUK FORMATION

Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D130
FILE NO.	2848D130	FIGURE	4-15

LEGEND

GENERALIZED DIRECTION OF GROUNDWATER FLOW

439 — LINE OF EQUIPOTENTIAL GROUNDWATER ELEVATION (FEET MSL)

432.69 PZ-100-KS — KEOKUK PIEZOMETER GROUNDWATER ELEVATION (FEET MSL) DATA COLLECTED ON JANUARY 4, 1996.

E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000
N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000

PZ-100-KS 432.69

434 435 436 437 438

SITE SURFACE WATER RETENTION POND

439 440

440.22 PZ-104-KS

ACTIVE SANITARY LANDFILL
PERMIT No. 118912

ST. CHARLES ROCK ROAD

ENTRANCE STATION

PZ-111-KS 438.77

INACTIVE DEMOLITION LANDFILL

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

PZ-106-KS 438.61

SOUTHWESTERN BELL SWITCHING STATION

AUTO REPAIR FACILITY

BORROW AREA

INACTIVE LANDFILL

OLD ST. CHARLES ROCK ROAD

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

PAVING

PAVING

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

NORTH

SCALE IN FEET
0 100 200 400

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL

TITLE
JANUARY 4, 1996 POTENTIOMETRIC SURFACE MAP, KEOKUK FORMATION

Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D133
FILE NO.	2848D133	FIGURE	4-16

LEGEND

GENERALIZED DIRECTION OF GROUNDWATER FLOW

439 LINE OF EQUIPOTENTIAL GROUNDWATER ELEVATION (FEET MSL)

435.71 PZ-100-KS KEOKUK PIEZOMETER GROUNDWATER ELEVATION (FEET MSL) DATA COLLECTED ON APRIL 3, 1996.

E. 517,000

N. 1,069,000

N. 1,068,000

N. 1,067,000

N. 1,066,000

N. 1,065,000

N. 1,071,000

E. 516,000

E. 515,000

E. 514,000

E. 513,000

PZ-100-KS 435.71

PZ-104-KS 442.94

PZ-106-KS 440.50

PZ-111-KS 440.13

436

437

438

439

440

441

442

443

SITE SURFACE WATER RETENTION POND

ACTIVE SANITARY LANDFILL PERMIT No.118912

BORROW AREA

ST. CHARLES ROCK ROAD

ENTRANCE STATION

INACTIVE DEMOLITION LANDFILL

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

SOUTHWESTERN BELL SWITCHING STATION

AUTO REPAIR FACILITY

OLD ST. CHARLES ROCK ROAD

INACTIVE LANDFILL

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

NORTH

SCALE IN FEET

0 100 200 400

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT

LAIDLAW WASTE SYSTEMS INC.

WEST LAKE LANDFILL

TITLE

APRIL 3, 1996 POTENTIOMETRIC SURFACE MAP, KEOKUK FORMATION

Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D156
FILE NO.	2848D156	FIGURE	4-17

LEGEND

GENERALIZED DIRECTION OF GROUNDWATER FLOW

439 LINE OF EQUIPOTENTIAL GROUNDWATER ELEVATION (FEET MSL)

439.35 PZ-100-KS KEOKUK PIEZOMETER GROUNDWATER ELEVATION (FEET MSL) DATA COLLECTED ON JULY 12, 1996.

E. 517,000

E. 516,000

E. 515,000

E. 514,000

E. 513,000

N. 1,071,000

N. 1,070,000

N. 1,069,000

N. 1,068,000

N. 1,067,000

N. 1,066,000

N. 1,065,000

ST. CHARLES ROCK ROAD

PZ-100-KS 439.35

PZ-104-KS 447.40

PZ-106-KS 444.46

PZ-111-KS 443.66

SITE SURFACE WATER RETENTION POND

ENTRANCE STATION

ACTIVE SANITARY LANDFILL PERMIT No.11891?

INACTIVE DEMOLITION LANDFILL

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

SOUTHWESTERN BELL SWITCHING STATION

AUTO REPAIR FACILITY

BORROW AREA

OLD ST. CHARLES ROCK ROAD

LEACHATE RETENTION POND

INACTIVE LANDFILL

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

NORTH

SCALE IN FEET

0 100 200 400

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT

LAIDLAW WASTE SYSTEMS INC.

WEST LAKE LANDFILL

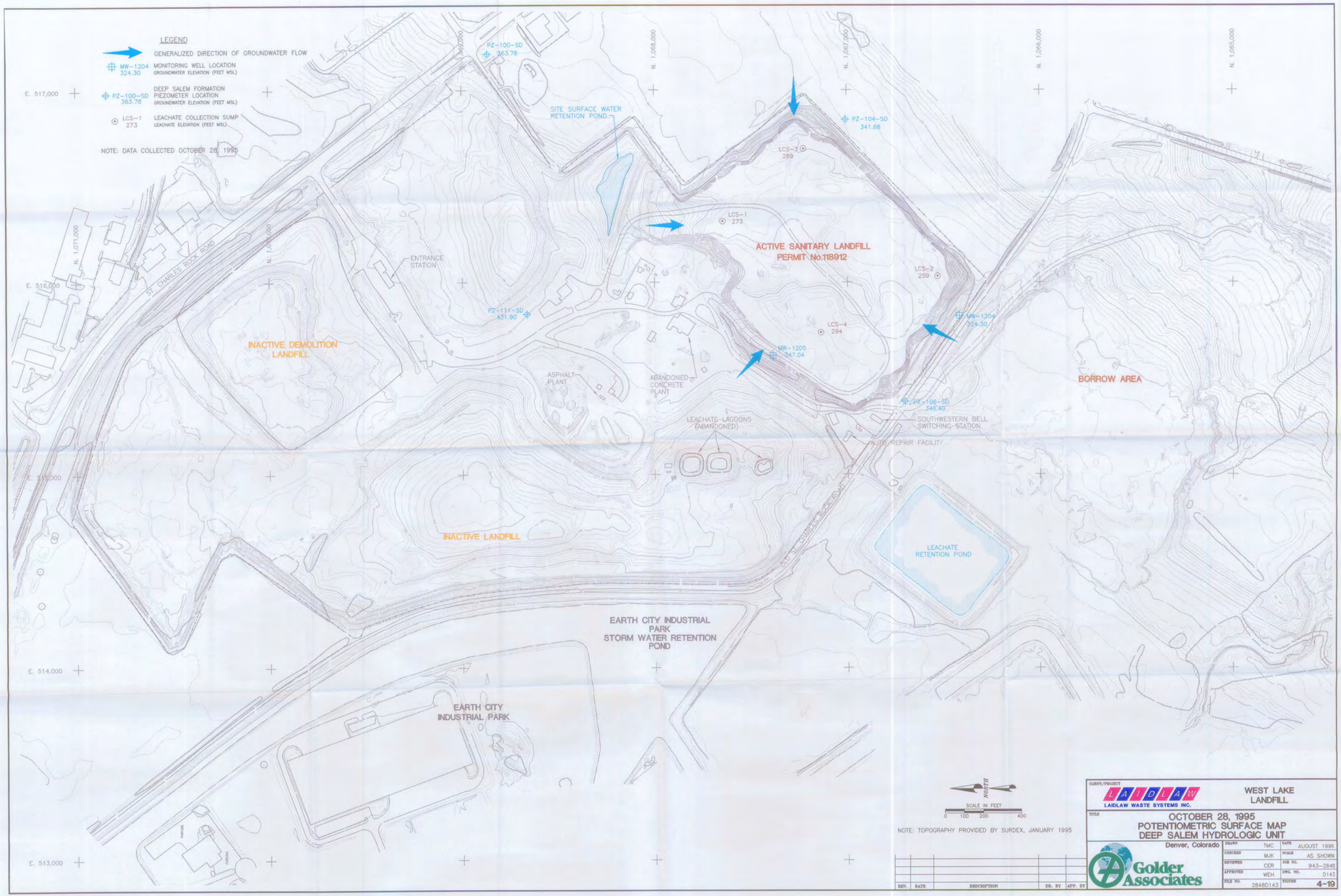
TITLE

JULY 12, 1996
POTENTIOMETRIC SURFACE MAP,
KEOKUK FORMATION

Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D165
FILE NO.	2848D165	FIGURE	4-18



REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.

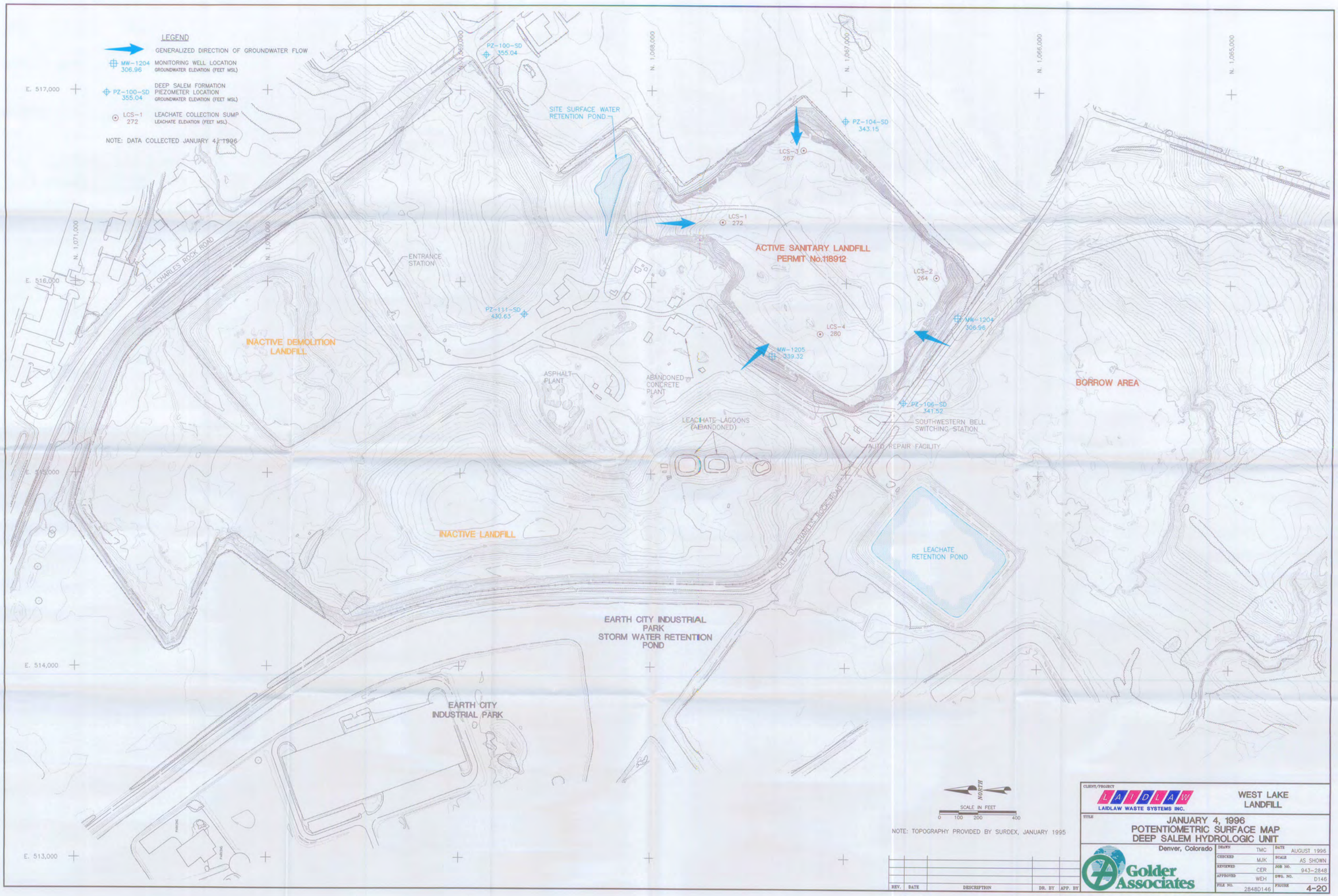
WEST LAKE LANDFILL

TITLE
OCTOBER 28, 1995
POTENTIOMETRIC SURFACE MAP
DEEP SALEM HYDROLOGIC UNIT

Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D143
FILE NO.	2848D143	FIGURE	4-19



NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.

WEST LAKE LANDFILL

TITLE
JANUARY 4, 1996
POTENTIOMETRIC SURFACE MAP
DEEP SALEM HYDROLOGIC UNIT

Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D146
FILE NO.	2848D146	FIGURE	4-20

LEGEND
GENERALIZED DIRECTION OF GROUNDWATER FLOW
MW-1204 332.51 MONITORING WELL LOCATION GROUNDWATER ELEVATION (FEET MSL)
PZ-100-SD 372.88 DEEP SALEM FORMATION PIEZOMETER LOCATION GROUNDWATER ELEVATION (FEET MSL)
LCS-1 274 LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
NOTE: DATA COLLECTED APRIL 3, 1996
E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000
N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
ST. CHARLES ROCK ROAD
OLD ST. CHARLES ROCK ROAD
PZ-100-SD 372.88
SITE SURFACE WATER RETENTION POND
PZ-104-SD 360.25
LCS-3 279
D-71 364.90
LCS-1 274
ACTIVE SANITARY LANDFILL PERMIT No.18912
ENTRANCE STATION
LCS-2 264
PZ-111-SD 428.90
LCS-4 278
MW-1204 332.51
MW-1205 342.90
INACTIVE DEMOLITION LANDFILL
ASPHALT PLANT
ABANDONED CONCRETE PLANT
BORROW AREA
PZ-106-SD 360.17
SOUTHWESTERN BELL SWITCHING STATION
LEACHATE LAGOONS (ABANDONED)
AUTO REPAIR FACILITY
LEACHATE RETENTION POND
INACTIVE LANDFILL
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
NORTH
SCALE IN FEET
0 100 200 400
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995
REV. DATE DESCRIPTION DR. BY APP. BY
CLIENT/PROJECT
LAIDLAW
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL
TITLE
APRIL 3, 1996
POTENTIOMETRIC SURFACE MAP
DEEP SALEM HYDROLOGIC UNIT
Denver, Colorado
Golder Associates
DRAWN TMC
DATE AUGUST 1996
CHECKED MJK
SCALE AS SHOWN
REVIEWED CER
JOB NO. 943-2848
APPROVED WEH
DWG. NO. D158
FILE NO. 2848D158
FIGURE 4-21

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

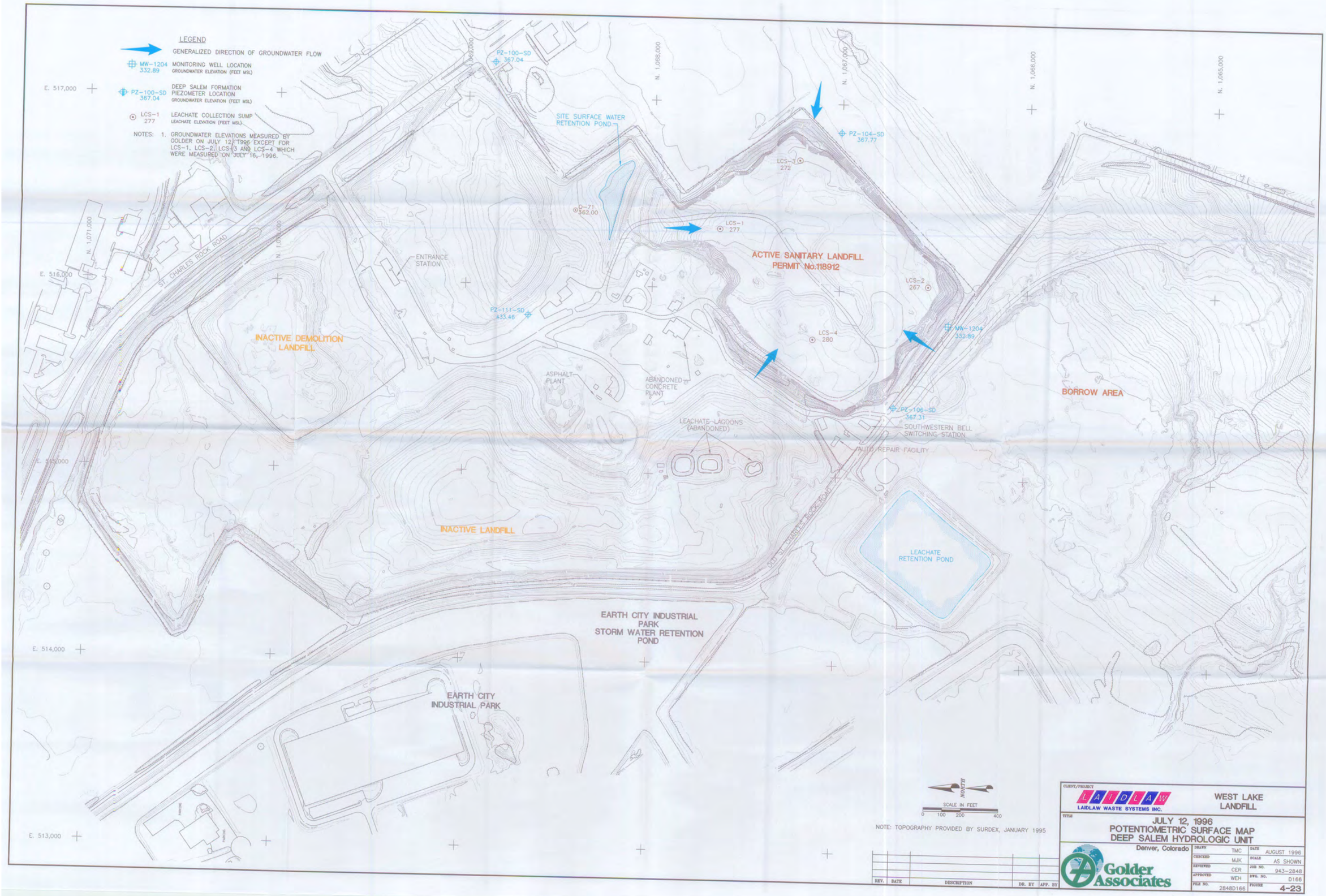
REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

TITLE: MAY 3, 1996 POTENTIOMETRIC SURFACE MAP DEEP SALEM HYDROLOGIC UNIT

Golder Associates — Denver, Colorado

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D161
FILE NO.	2848D161	FIGURE	4-22


LEGEND
GENERALIZED DIRECTION OF GROUNDWATER FLOW
MW-1204 332.89 MONITORING WELL LOCATION GROUNDWATER ELEVATION (FEET MSL)
PZ-100-SD 367.04 DEEP SALEM FORMATION PIEZOMETER LOCATION GROUNDWATER ELEVATION (FEET MSL)
LCS-1 277 LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
NOTES: 1. GROUNDWATER ELEVATIONS MEASURED BY GOLDER ON JULY 12, 1996 EXCEPT FOR LCS-1, LCS-2, LCS-3 AND LCS-4 WHICH WERE MEASURED ON JULY 16, 1996.
E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000
N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
ST. CHARLES ROCK ROAD
PZ-100-SD 367.04
SITE SURFACE WATER RETENTION POND
D-71 562.00
ENTRANCE STATION
PZ-111-SD 433.46
INACTIVE DEMOLITION LANDFILL
ASPHALT PLANT
ABANDONED CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
INACTIVE LANDFILL
EARTH CITY INDUSTRIAL PARK
STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
PZ-104-SD 367.77
LCS-3 272
LCS-1 277
ACTIVE SANITARY LANDFILL PERMIT No.118912
LCS-2 267
LCS-4 280
MW-1204 332.89
PZ-106-SD 367.31
SOUTHWESTERN BELL SWITCHING STATION
AUTO REPAIR FACILITY
OLD ST. CHARLES ROCK ROAD
LEACHATE RETENTION POND
BORROW AREA
NORTH
SCALE IN FEET
0 100 200 400
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995
REV. DATE DESCRIPTION DR. BY APP. BY
CLIENT/PROJECT
LAIDLAW
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL
TITLE
JULY 12, 1996
POTENTIOMETRIC SURFACE MAP
DEEP SALEM HYDROLOGIC UNIT
Denver, Colorado
Golder Associates
DRAWN TMC
CHECKED MJK
REVIEWED CER
APPROVED WEH
FILE NO. 2848D166
DATE AUGUST 1996
SCALE AS SHOWN
JOB NO. 943-2848
DWG. NO. D166
FIGURE 4-23

LEGEND

GENERALIZED DIRECTION OF GROUNDWATER FLOW

420 LINE OF EQUIPOTENTIAL
GROUNDWATER ELEVATION, (FEET MSL), DASHED WHERE INFERRED

MW-1206 361.31 MONITORING WELL LOCATION
GROUNDWATER ELEVATION (FEET MSL).

PZ-200-SS 413.34 ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION
GROUNDWATER ELEVATION (FEET MSL)

LCS-3 289 LEACHATE COLLECTION SUMP
LEACHATE ELEVATION (FEET MSL)

NOTE: DATA COLLECTED OCTOBER 28, 1995.

ACTIVE SANITARY LANDFILL
PERMIT No.18912

INACTIVE DEMOLITION LANDFILL

INACTIVE LANDFILL

BORROW AREA

EARTH CITY INDUSTRIAL PARK
STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

LEACHATE RETENTION POND

ENTRANCE STATION

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

SOUTHWESTERN BELL SWITCHING STATION

OLD ST. CHARLES ROCK ROAD

ST. CHARLES ROCK ROAD

SCALE IN FEET
0 100 200 400

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT
LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

WEST LAKE LANDFILL

TITLE
OCTOBER 28, 1995
POTENTIOMETRIC SURFACE MAP, ST. LOUIS/ UPPER SALEM HYDROLOGIC UNIT

Denver, Colorado
Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D125
FILE NO.	2848D125	FIGURE	4-24

LEGEND

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- 420 — LINE OF EQUIPOTENTIAL — GROUNDWATER ELEVATION, (FEET MSL), DASHED WHERE INFERRED
- MW-1206 348.17 — MONITORING WELL LOCATION — GROUNDWATER ELEVATION (FEET MSL)
- PZ-200-SS 412.73 — ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION — GROUNDWATER ELEVATION (FEET MSL)
- LCS-1 272 — LEACHATE COLLECTION SUMP — LEACHATE ELEVATION (FEET MSL)

NOTE: DATA COLLECTED JANUARY 4, 1996.

ACTIVE SANITARY LANDFILL
PERMIT No.118912

INACTIVE DEMOLITION LANDFILL

INACTIVE LANDFILL

BORROW AREA

ENTRANCE STATION

ST. CHARLES ROCK ROAD

OLD ST. CHARLES ROCK ROAD

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

SOUTHWESTERN BELL SWITCHING STATION

REPAIR FACILITY

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

PARKING

PZ-208-SS 428.60
PZ-115-SS 414.48
PZ-100-SS 417.47
PZ-200-SS 412.70
PZ-102R-SS 420.58
PZ-201A-SS 412.15
PZ-202-SS 439.64
PZ-101-SS 382.48
PZ-103-SS 381.44
PZ-104-SS 361.53
PZ-203-SS DRY
PZ-105-SS 343.21
PZ-109-SS 390.40
PZ-108-SS 346.47
PZ-110-SS 425.67.11
PZ-206-SS 414.72
PZ-113-SS 431.18
PZ-205-SS 420.28
PZ-107-SS 430.90
PZ-116-SS 380.99
PZ-204A-SS 403.78
PZ-106-SS 343.70
PZ-301-SS 385.65
PZ-300-SS 427.50
MW-1206 348.17
LCS-1 272
LCS-2 264
LCS-3 267
LCS-4 280

N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000

NORTH
SCALE IN FEET
0 100 200 400

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

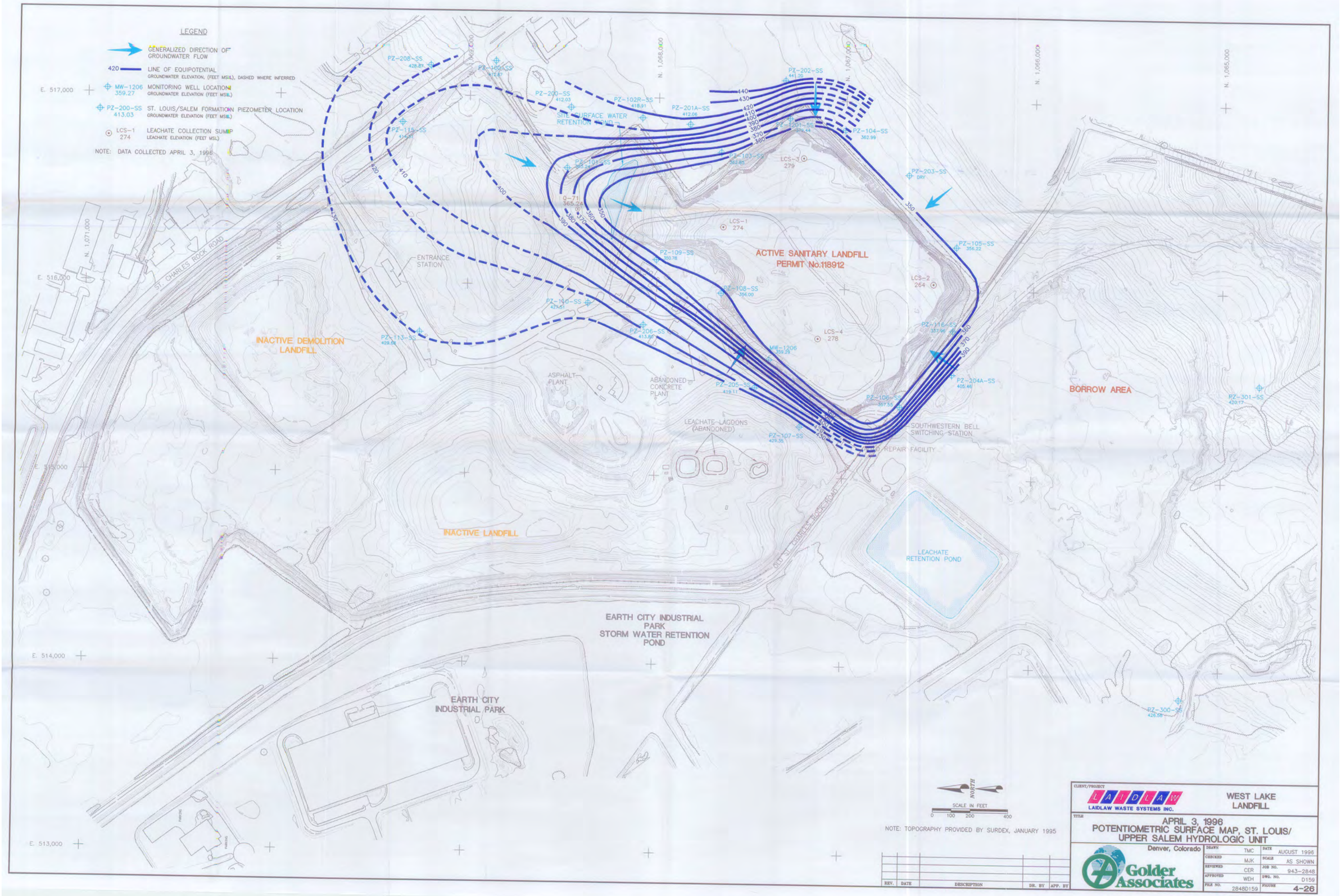
REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL

TITLE
JANUARY 4, 1996
POTENTIOMETRIC SURFACE MAP, ST. LOUIS/ UPPER SALEM HYDROLOGIC UNIT

Denver, Colorado
Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D136
FILE NO.	2848D136	FIGURE	4-25


LEGEND
GENERALIZED DIRECTION OF GROUNDWATER FLOW
420 LINE OF EQUIPOTENTIAL GROUNDWATER ELEVATION, (FEET MSL), DASHED WHERE INFERRED
MW-1206 359.27 MONITORING WELL LOCATION GROUNDWATER ELEVATION (FEET MSL)
PZ-200-SS 413.03 ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION GROUNDWATER ELEVATION (FEET MSL)
LCS-1 274 LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
NOTE: DATA COLLECTED APRIL 3, 1996
ACTIVE SANITARY LANDFILL PERMIT No.118912
INACTIVE DEMOLITION LANDFILL
INACTIVE LANDFILL
BORROW AREA
ENTRANCE STATION
ST. CHARLES ROCK ROAD
OLD ST. CHARLES ROCK ROAD
ASPHALT PLANT
ABANDONED CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
SOUTHWESTERN BELL SWITCHING STATION
REPAIR FACILITY
SITE SURFACE WATER RETENTION POND
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
PZ-208-SS 428.87
PZ-115-SS 414.91
PZ-200-SS 412.03
PZ-102R-SS 418.91
PZ-201A-SS 412.06
PZ-202-SS 441.20
PZ-201-SS 424.44
PZ-104-SS 362.99
PZ-103-SS 382.85
PZ-203-SS DRY
PZ-101-SS 382.44
PZ-109-SS 359.78
PZ-105-SS 356.22
PZ-108-SS 356.00
PZ-110-SS 427.61
PZ-206-SS 413.97
PZ-113-SS 429.61
PZ-205-SS 419.11
PZ-116-SS 357.96
PZ-204A-SS 405.46
PZ-106-SS 357.58
PZ-107-SS 429.35
PZ-301-SS 420.17
PZ-300-SS 426.58
MW-1206 359.28
Q-71 365.24
LCS-1 274
LCS-2 264
LCS-3 279
LCS-4 276
N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000
NORTH
SCALE IN FEET
0 100 200 400
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995
REV. DATE DESCRIPTION DR. BY APP. BY
CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL
TITLE
APRIL 3, 1996
POTENTIOMETRIC SURFACE MAP, ST. LOUIS/ UPPER SALEM HYDROLOGIC UNIT
Denver, Colorado
Golder Associates
DRAWN TMC
CHECKED MJK
REVIEWED CER
APPROVED WEH
FILE NO. 28480159
DATE AUGUST 1996
SCALE AS SHOWN
JOB NO. 943-2848
DWG. NO. D159
FIGURE 4-26

LEGEND

GENERALIZED DIRECTION OF GROUNDWATER FLOW

420 LINE OF EQUIPOTENTIAL
GROUNDWATER ELEVATION, (FEET MSL), DASHED WHERE INFERRED

PZ-200-SS 412.05 ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION
GROUNDWATER ELEVATION (FEET MSL)

LCS-1 337 LEACHATE COLLECTION SUMP
LEACHATE ELEVATION (FEET MSL)

NOTE: WATER LEVEL ELEVATION DATA COLLECTED ON MAY 3, 1996 EXCEPT FOR Q-71, PZ-1201-SS, LCS-1, LCS-2, LCS-3 AND LCS-4 WHICH WAS COLLECTED ON MAY 2, 1996.

E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
N. 1,071,000
N. 1,070,000

PZ-208-SS 432.84
PZ-100-SS 412.84
PZ-202-SS 441.81
PZ-200-SS 412.05
PZ-102R-SS 418.24
PZ-201A-SS 412.03
PZ-115-SS 423.81
PZ-201-SS 379.57
PZ-104-SS 376.44
PZ-103-SS 363.71
LCS-3 300
PZ-107-SS 369.98
PZ-203-SS 377.66
Q-71 365.30
LCS-1 337
PZ-105-SS 376.83
PZ-109-SS 352.41
PZ-108-SS 350.97
LCS-2 279
PZ-110-SS 428.46
PZ-116-SS 383.41
PZ-206-SS 414.87
LCS-4 350
PZ-113-SS 430.89
PZ-205-SS 420.13
PZ-106-SS 391.74
PZ-204A-SS 406.69
PZ-107-SS 430.34
PZ-301-SS 423.96

SITE SURFACE WATER RETENTION POND

ACTIVE SANITARY LANDFILL
PERMIT No.118912

INACTIVE DEMOLITION LANDFILL

INACTIVE LANDFILL

BORROW AREA

ENTRANCE STATION

ST. CHARLES ROCK ROAD

OLD ST. CHARLES ROCK ROAD

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

SOUTHWESTERN BELL SWITCHING STATION

REPAIR FACILITY

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

PARKING

PARKING

NORTH

SCALE IN FEET
0 100 200 400

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT
LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

WEST LAKE LANDFILL

TITLE
MAY 3, 1996
POTENTIOMETRIC SURFACE MAP, ST. LOUIS/ UPPER SALEM HYDROLOGIC UNIT

Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	CER	SCALE	AS SHOWN
REVIEWED	BGT	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D160
FILE NO.	2848D160	FIGURE	4-27

LEGEND

GENERALIZED DIRECTION OF GROUNDWATER FLOW

420 LINE OF EQUIPOTENTIAL
GROUNDWATER ELEVATION, (FEET MSL), DASHED WHERE INFERRED

PZ-200-SS 412.28 ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION
GROUNDWATER ELEVATION (FEET MSL)

LCS-1 277 LEACHATE COLLECTION SUMP
LEACHATE ELEVATION (FEET MSL)

NOTE: WATER LEVEL ELEVATION DATA COLLECTED ON JULY 12, 1996 EXCEPT FOR LCS-1, LCS-2, LCS-3 AND LCS-4 WHICH WAS COLLECTED ON JULY 16, 1996.

ACTIVE SANITARY LANDFILL
PERMIT No.18912

INACTIVE DEMOLITION LANDFILL

INACTIVE LANDFILL

BORROW AREA

SITE SURFACE WATER RETENTION POND

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK
STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

ENTRANCE STATION

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

SOUTHWESTERN BELL SWITCHING STATION

REPAIR FACILITY

ST. CHARLES ROCK ROAD

PZ-208-SS 434.75
PZ-100-SS 412.54
PZ-115-SS 421.85
PZ-200-SS 412.28
PZ-102R-SS 420.80
PZ-201A-SS 413.08
PZ-202-SS 447.77
PZ-120-SS 390.34
PZ-104-SS 371.10
PZ-103-SS 364.42
LCS-3 272
PZ-203-SS 375.82
PZ-101-SS 387.08
G-7II 563.06
PZ-109-SS 360.57
LCS-1 277
PZ-105-SS 379.61
PZ-108-SS 358.19
LCS-2 267
PZ-110-SS 432.09
PZ-206-SS 418.89
PZ-116-SS 369.91
LCS-4 280
PZ-113-SS 434.46
PZ-205-SS 422.97
PZ-204A-SS 405.53
PZ-106 368.41
PZ-107-SS 433.55
PZ-301-SS 428.76

N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000

NORTH
SCALE IN FEET
0 100 200 400

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

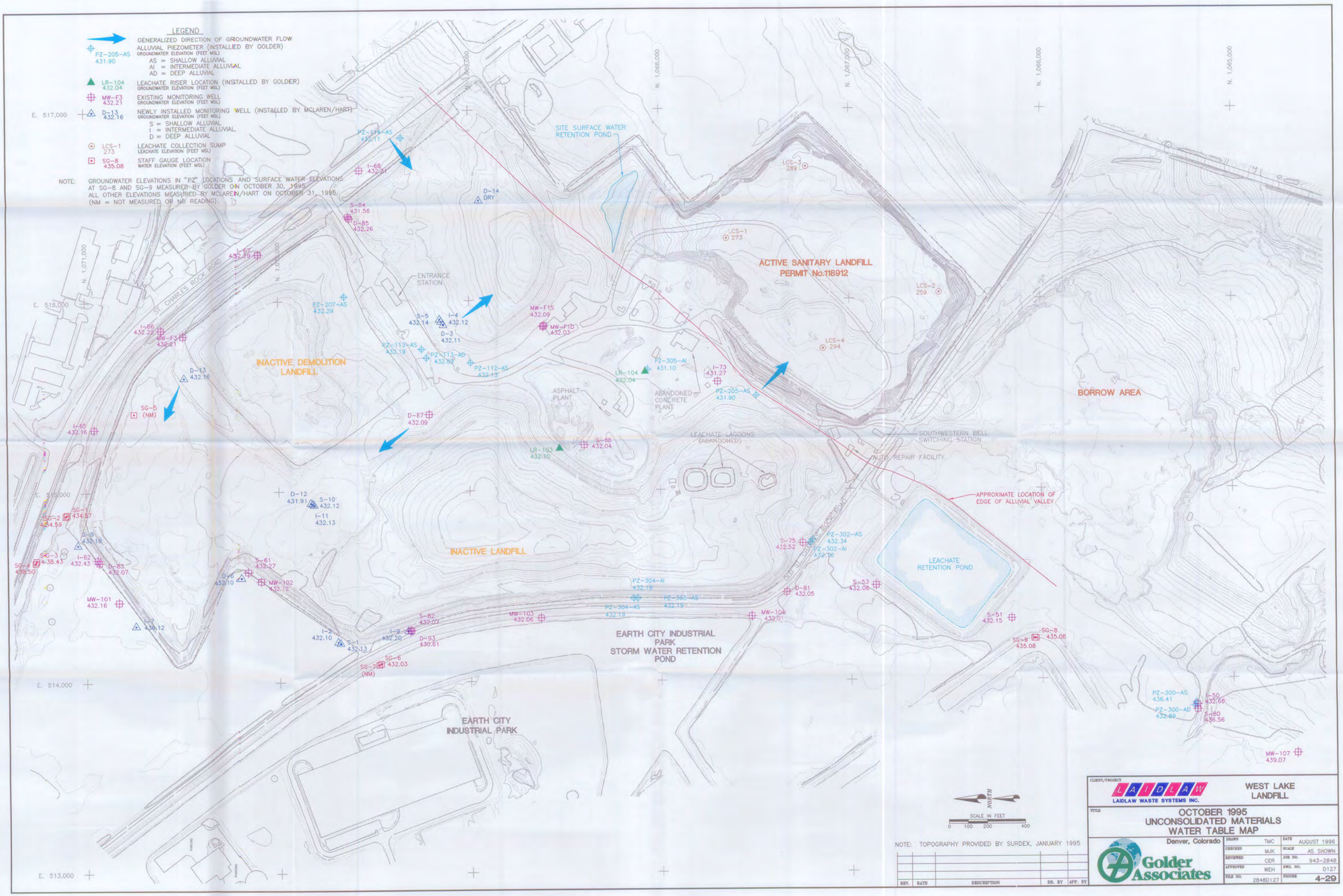
REV.	DATE	DESCRIPTION	DR. BY	APP. BY

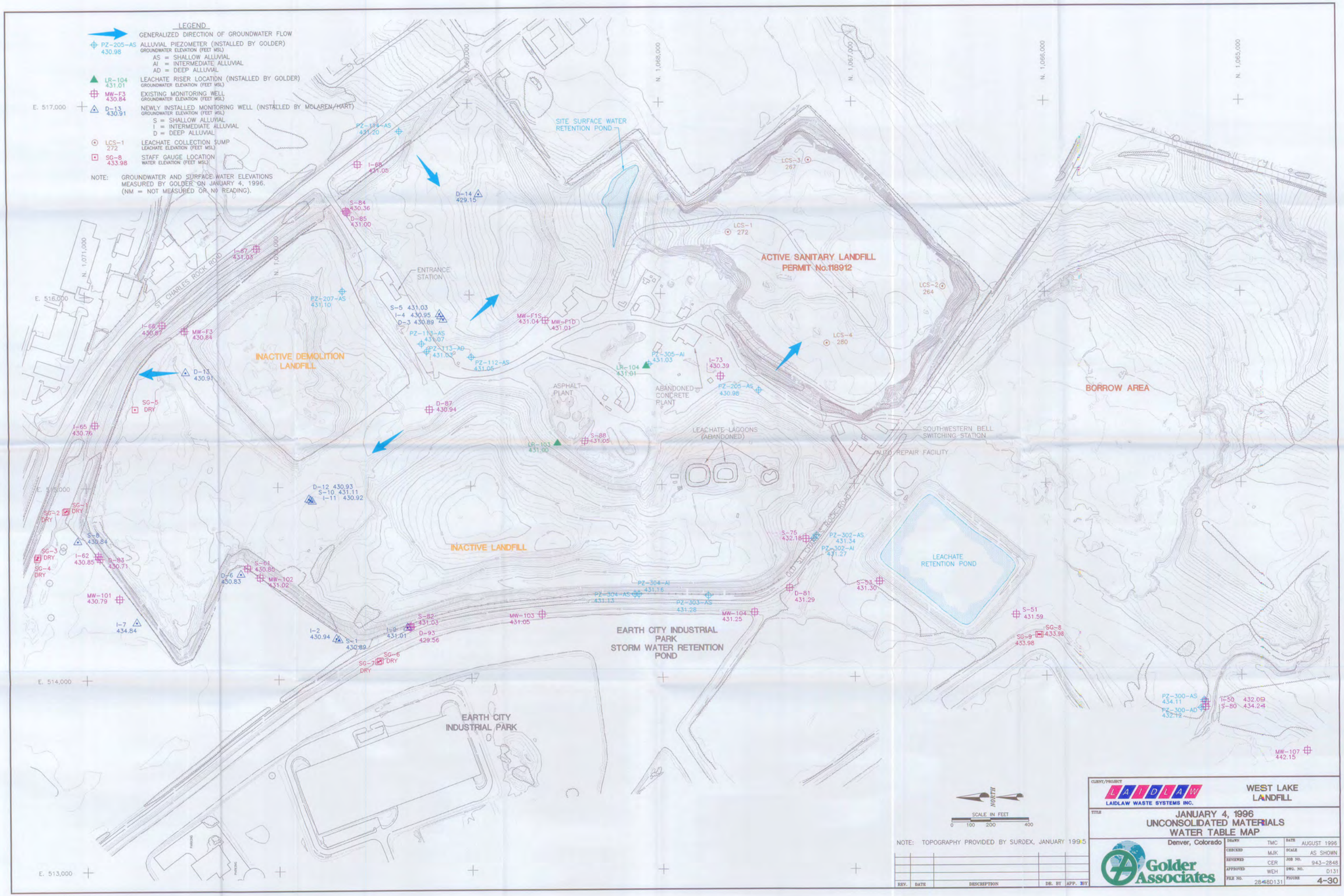
CLIENT/PROJECT
LAIDLAW
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL

TITLE
JULY 12, 1996
POTENTIOMETRIC SURFACE MAP, ST. LOUIS/ UPPER SALEM HYDROLOGIC UNIT

Denver, Colorado
Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D167
FILE NO.	2848D167	FIGURE	4-28


LEGEND
GENERALIZED DIRECTION OF GROUNDWATER FLOW
PZ-205-AS 431.90 ALLUVIAL PIEZOMETER (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
AS = SHALLOW ALLUVIAL
AI = INTERMEDIATE ALLUVIAL
AD = DEEP ALLUVIAL
LR-104 432.04 LEACHATE RISER LOCATION (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
MW-F3 432.21 EXISTING MONITORING WELL GROUNDWATER ELEVATION (FEET MSL)
D-13 432.16 NEWLY INSTALLED MONITORING WELL (INSTALLED BY MCLAREN/HART) GROUNDWATER ELEVATION (FEET MSL)
S = SHALLOW ALLUVIAL
I = INTERMEDIATE ALLUVIAL
D = DEEP ALLUVIAL
LCS-1 273 LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
SG-8 435.08 STAFF GAUGE LOCATION WATER ELEVATION (FEET MSL)
NOTE: GROUNDWATER ELEVATIONS IN "PZ" LOCATIONS AND SURFACE WATER ELEVATIONS AT SG-8 AND SG-9 MEASURED BY GOLDER ON OCTOBER 30, 1995. ALL OTHER ELEVATIONS MEASURED BY MCLAREN/HART ON OCTOBER 31, 1995. (NM = NOT MEASURED, OR NO READING).
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
N. 1,071,000
N. 1,070,000
E. 517,000
E. 516,000
E. 514,000
E. 513,000
SITE SURFACE WATER RETENTION POND
ACTIVE SANITARY LANDFILL PERMIT No.118912
INACTIVE DEMOLITION LANDFILL
INACTIVE LANDFILL
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
BORROW AREA
LEACHATE RETENTION POND
ENTRANCE STATION
ASPHALT PLANT
ABANDONED CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
AUTO REPAIR FACILITY
SOUTHWESTERN BELL SWITCHING STATION
ST. CHARLES ROCK ROAD
OLD ST. CHARLES ROAD
APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY
PZ-114-AS 432.11
I-68 432.21
S-84 431.56
D-85 432.26
D-14 DRY
LCS-3 289
LCS-1 273
LCS-2 259
LCS-4 294
I-67 432.29
PZ-207-AS 432.29
I-66 432.22
MW-F3 432.21
S-5 432.14
I-4 432.12
D-3 432.11
MW-F1S 432.09
MW-F1D 432.03
PZ-113-AS 432.19
PZ-113-AD 432.59
PZ-112-AS 432.13
PZ-305-AI 431.10
LR-104 432.04
I-73 431.27
PZ-205-AS 431.90
D-13 432.16
SG-5 (NM)
I-65 432.16
D-87 432.09
LR-193 432.10
S-88 432.04
D-12 431.91
S-10 432.12
I-11 432.13
SG-2 434.59
SG-1 434.57
S-9 432.18
SG-3 438.43
SG-4 438.50
I-62 432.43
D-83 432.07
S-61 432.27
D-6 432.10
MW-102 432.12
MW-101 432.16
I-7 436.12
I-2 432.10
S-1 432.13
I-9 432.20
S-82 432.07
D-93 430.61
SG-7 (NM)
SG-6 432.03
MW-103 432.06
PZ-304-AI 432.19
PZ-303-AS 432.19
PZ-304-AS 432.19
MW-104 432.01
D-81 432.05
S-53 432.06
S-75 432.52
PZ-302-AS 432.34
PZ-302-AI 432.16
S-51 432.15
SG-9 435.08
SG-8 435.08
PZ-300-AS 436.41
PZ-300-AD 432.69
I-50 432.66
S-80 436.56
MW-107 439.07
PARKING
PARKING
NORTH
SCALE IN FEET
0 100 200 400
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995
REV. DATE DESCRIPTION DR. BY APP. BY
CLIENT/PROJECT
LAIDLAW
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL
TITLE
OCTOBER 1995
UNCONSOLIDATED MATERIALS
WATER TABLE MAP
Denver, Colorado
Golder Associates
DRAWN TMC
CHECKED MJK
REVIEWED CER
APPROVED WEH
FILE NO. 28480127
DATE AUGUST 1996
SCALE AS SHOWN
JOB NO. 943-2848
DWG. NO. D127
FIGURE 4-29


LEGEND
GENERALIZED DIRECTION OF GROUNDWATER FLOW
PZ-205-AS 430.98 ALLUVIAL PIEZOMETER (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
AS = SHALLOW ALLUVIAL
AI = INTERMEDIATE ALLUVIAL
AD = DEEP ALLUVIAL
LR-104 431.01 LEACHATE RISER LOCATION (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
MW-F3 430.84 EXISTING MONITORING WELL GROUNDWATER ELEVATION (FEET MSL)
D-13 430.91 NEWLY INSTALLED MONITORING WELL (INSTALLED BY MCLAREN/HART) GROUNDWATER ELEVATION (FEET MSL)
S = SHALLOW ALLUVIAL
I = INTERMEDIATE ALLUVIAL
D = DEEP ALLUVIAL
LCS-1 272 LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
SG-8 433.98 STAFF GAUGE LOCATION WATER ELEVATION (FEET MSL)
NOTE: GROUNDWATER AND SURFACE WATER ELEVATIONS MEASURED BY GOLDER ON JANUARY 4, 1996. (NM = NOT MEASURED OR NO READING).
E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000
N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
ST. CHARLES ROCK ROAD
SITE SURFACE WATER RETENTION POND
ENTRANCE STATION
ACTIVE SANITARY LANDFILL PERMIT No.118912
INACTIVE DEMOLITION LANDFILL
INACTIVE LANDFILL
ASPHALT PLANT
ABANDONED CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
SOUTHWESTERN BELL SWITCHING STATION
AUTO REPAIR FACILITY
BORROW AREA
LEACHATE RETENTION POND
OLD ST. CHARLES ROCK ROAD
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
PZ-114-AS 431.20
I-68 431.05
D-14 429.15
S-84 430.36
D-85 431.00
I-67 431.03
PZ-207-AS 431.10
S-5 431.03
I-4 430.95
D-3 430.89
PZ-110-AS 431.07
PZ-113-AD 431.03
PZ-112-AS 431.05
MW-F1S 431.04
MW-F1D 431.01
I-68 430.87
MW-F3 430.84
D-13 430.91
SG-5 DRY
I-65 430.76
D-87 430.94
LR-103 431.00
S-88 431.05
D-12 430.93
S-10 431.11
I-11 430.92
SG-2 DRY
SG-1 DRY
S-8 430.84
SG-3 DRY
SG-4 DRY
I-62 430.85
D-88 430.71
S-61 430.86
D-6 430.83
MW-102 431.02
MW-101 430.79
I-7 434.84
I-2 430.94
S-1 430.89
I-9 431.01
S-82 431.03
D-93 429.56
SG-6 DRY
SG-7 DRY
MW-103 431.05
PZ-304-AI 431.15
PZ-304-AS 431.13
PZ-303-AS 431.28
MW-104 431.25
D-81 431.29
S-75 432.18
PZ-302-AS 431.34
PZ-302-AI 431.27
S-53 431.30
S-51 431.59
SG-9 433.98
SG-8 433.98
PZ-300-AS 434.11
PZ-300-AD 432.12
I-50 432.09
S-80 434.24
MW-107 442.15
LCS-3 267
LCS-1 272
LCS-2 264
LCS-4 280
PZ-305-AI 431.03
LR-104 431.01
I-73 430.39
PZ-205-AS 430.98
NORTH
SCALE IN FEET
0 100 200 400
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995
REV. DATE DESCRIPTION DR. BY APP. BY
CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL
TITLE
JANUARY 4, 1996
UNCONSOLIDATED MATERIALS
WATER TABLE MAP
Denver, Colorado
Golder Associates
DRAWN TMC DATE AUGUST 1996
CHECKED MJK SCALE AS SHOWN
REVIEWED CER JOB NO. 943-2848
APPROVED WEH DWG. NO. D131
FILE NO. 2848D131 FIGURE 4-30

LEGEND

GENERALIZED DIRECTION OF GROUNDWATER FLOW

PZ-205-AS 429.85 — ALLUVIAL PIEZOMETER (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
AS = SHALLOW ALLUVIAL
AI = INTERMEDIATE ALLUVIAL
AD = DEEP ALLUVIAL

LR-104 429.82 — LEACHATE RISER LOCATION (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)

MW-F3 429.63 — EXISTING MONITORING WELL GROUNDWATER ELEVATION (FEET MSL)

D-13 429.61 — NEWLY INSTALLED MONITORING WELL (INSTALLED BY MCLAREN/HART) GROUNDWATER ELEVATION (FEET MSL)
S = SHALLOW ALLUVIAL
I = INTERMEDIATE ALLUVIAL
D = DEEP ALLUVIAL

LCS-1 274 — LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)

SG-8 433.99 — STAFF GAUGE LOCATION WATER ELEVATION (FEET MSL)

NOTE: GROUNDWATER AND SURFACE WATER ELEVATIONS AT SG-8 AND SG-9 MEASURED BY GOLDER ON APRIL 3, 1996. GROUNDWATER ELEVATIONS IN "S", "I", "D", "MW", AND SURFACE WATER ELEVATIONS AT SG-6 AND SG-7 LOCATIONS MEASURED BY MCLAREN/HART ON APRIL 3, 1996. (NM = NOT MEASURED OR NO READING).

N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
N. 1,071,000
N. 1,070,000
E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000

ST. CHARLES ROCK ROAD

SITE SURFACE WATER RETENTION POND

ACTIVE SANITARY LANDFILL
PERMIT No.118912

INACTIVE DEMOLITION LANDFILL

INACTIVE LANDFILL

BORROW AREA

ENTRANCE STATION

ASPHALT PLANT

ABANDONED CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

SOUTHWESTERN BELL SWITCHING STATION

AUTO REPAIR FACILITY

OLD ST. CHARLES ROCK ROAD

APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK
STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

PZ-114-AS 429.93
I-68 429.66
D-14 428.08
S-84 429.16
D-85 429.74
I-67 429.74
PZ-207-AS 429.66
I-66 429.63
MW-F3 428.63
D-13 429.61
SG-5 DRY
I-65 429.51
S-5 429.69
I-4 429.65
D-3 429.62
PZ-113-AS 429.48
PZ-113-AD 429.62
PZ-112-AS 429.53
D-87 429.51
MW-F1S 429.71
MW-F1D 429.70
PZ-305-AI 429.79
LR-104 429.82
I-73 429.04
PZ-205-AS 429.85
LR-103 429.71
S-88 429.65
D-12 429.49
S-10 429.42
I-11 429.52
SG-2 DRY
SG-1 DRY
S-8 429.53
SG-3 DRY
I-62 429.50
D-83 429.47
SG-4 DRY
S-61 429.49
D-6 429.44
MW-102 429.51
MW-101 429.46
I-7 433.47
I-2 429.51
S-1 429.57
I-9 429.59
S-82 429.57
D-93 426.11
SG-7 DRY
SG-6 DRY
MW-103 429.70
PZ-304-AI 429.62
PZ-303-AS 429.77
MW-F2 (NM)
PZ-304-AS 429.59
MW-104 429.85
D-81 429.89
S-75 432.19
PZ-302-AS 430.03
PZ-302-AI 428.75
S-53 429.91
S-51 430.48
SG-8 433.99
SG-9 433.97
LCS-1 274
LCS-2 264
LCS-3 279
LCS-4 278
D-71 565.24
PZ-300-AS 434.02
I-50 430.61
PZ-300-AD 430.63
S-80 434.12
MW-107 442.46

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

SCALE IN FEET
0 100 200 400

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL

TITLE
APRIL 3, 1996
UNCONSOLIDATED MATERIALS
WATER TABLE MAP

Denver, Colorado
Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MJK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D157
FILE NO.	2848D157	FIGURE	4-31

LEGEND

GENERALIZED DIRECTION OF GROUNDWATER FLOW

PZ-205-AS 430.68 — ALLUVIAL PIEZOMETER (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
AS = SHALLOW ALLUVIAL
AI = INTERMEDIATE ALLUVIAL
AD = DEEP ALLUVIAL

LR-104 430.59 — LEACHATE RISER LOCATION (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)

MW-F3 431.35 — EXISTING MONITORING WELL GROUNDWATER ELEVATION (FEET MSL)

D-13 431.32 — NEWLY INSTALLED MONITORING WELL (INSTALLED BY MCLAREN/HART) GROUNDWATER ELEVATION (FEET MSL)
S = SHALLOW ALLUVIAL
I = INTERMEDIATE ALLUVIAL
D = DEEP ALLUVIAL

LCS-1 337 — LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)

SG-8 433.07 — STAFF GAUGE LOCATION WATER ELEVATION (FEET MSL)

NOTE: GROUNDWATER AND SURFACE WATER ELEVATIONS MEASURED BY GOLDER ON MAY 3, 1996. (NM = NOT MEASURED OR NO READING).

E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000
N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000

ST. CHARLES ROCK ROAD
OLD ST. CHARLES ROCK ROAD

SITE SURFACE WATER RETENTION POND
ENTRANCE STATION
ACTIVE SANITARY LANDFILL PERMIT No.18912
INACTIVE DEMOLITION LANDFILL
INACTIVE LANDFILL
ASPHALT PLANT
ABANDONED CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
SOUTHWESTERN BELL SWITCHING STATION
AUTO REPAIR FACILITY
BORROW AREA
APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

PZ-113-AS 431.60
I-68 431.62
D-14 430.02
S-84 429.16
D-85 431.33
D-71 365.30
LCS-3 300
LCS-1 337
I-67 431.84
PZ-207-AS 431.12
ENTRANCE STATION
S-5 430.86
I-4 430.93
D-3 430.88
MW-F1S 430.61
MW-F1D 430.63
LCS-2 279
LCS-4 350
I-66 431.39
MW-F3 431.35
PZ-113-AS 430.79
PZ-113-AD 430.83
PZ-112-AS 430.75
PZ-305-AI 430.65
I-73 430.14
LR-104 430.59
PZ-205-AS 430.68
D-13 431.32
SG-5 456.44
D-87 430.83
I-65 431.29
LR-103 430.75
S-88 430.72
D-12 431.06
S-10 431.01
I-11 431.11
SG-2 DRY
SG-1 DRY
S-8 431.45
SG-3 DRY
I-62 431.35
D-83 430.65
SG-4 430.05
S-61 431.12
D-6 431.09
MW-102 431.10
MW-101 431.17
I-7 439.15
I-2 431.15
S-1 431.51
I-9 431.12
S-82 431.10
D-93 429.66
SG-7 432.71
SG-6 432.78
MW-103 431.61
PZ-304-AI 431.13
PZ-303-AS 430.99
MW-F2 (NM)
PZ-304-AS 431.07
MW-104 431.18
S-75 433.17
PZ-302-AS 431.26
PZ-302-AI 431.30
D-81 431.23
S-53 431.31
S-51 431.25
SG-8 433.02
SG-8 433.07
MW-107 443.79

NORTH
SCALE IN FEET
0 100 200 400

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

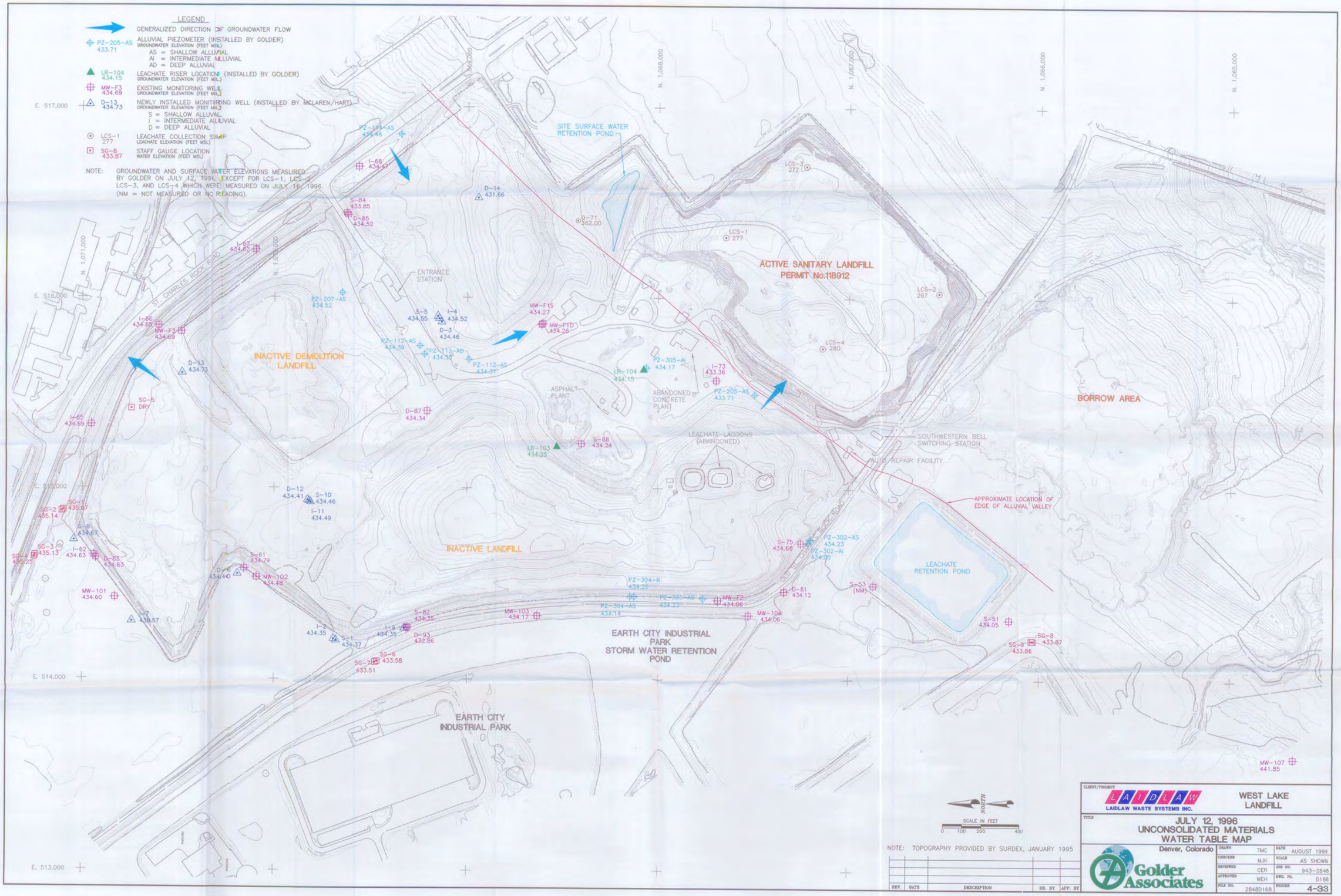
REV.	DATE	DESCRIPTION	DR. BY	APP. BY

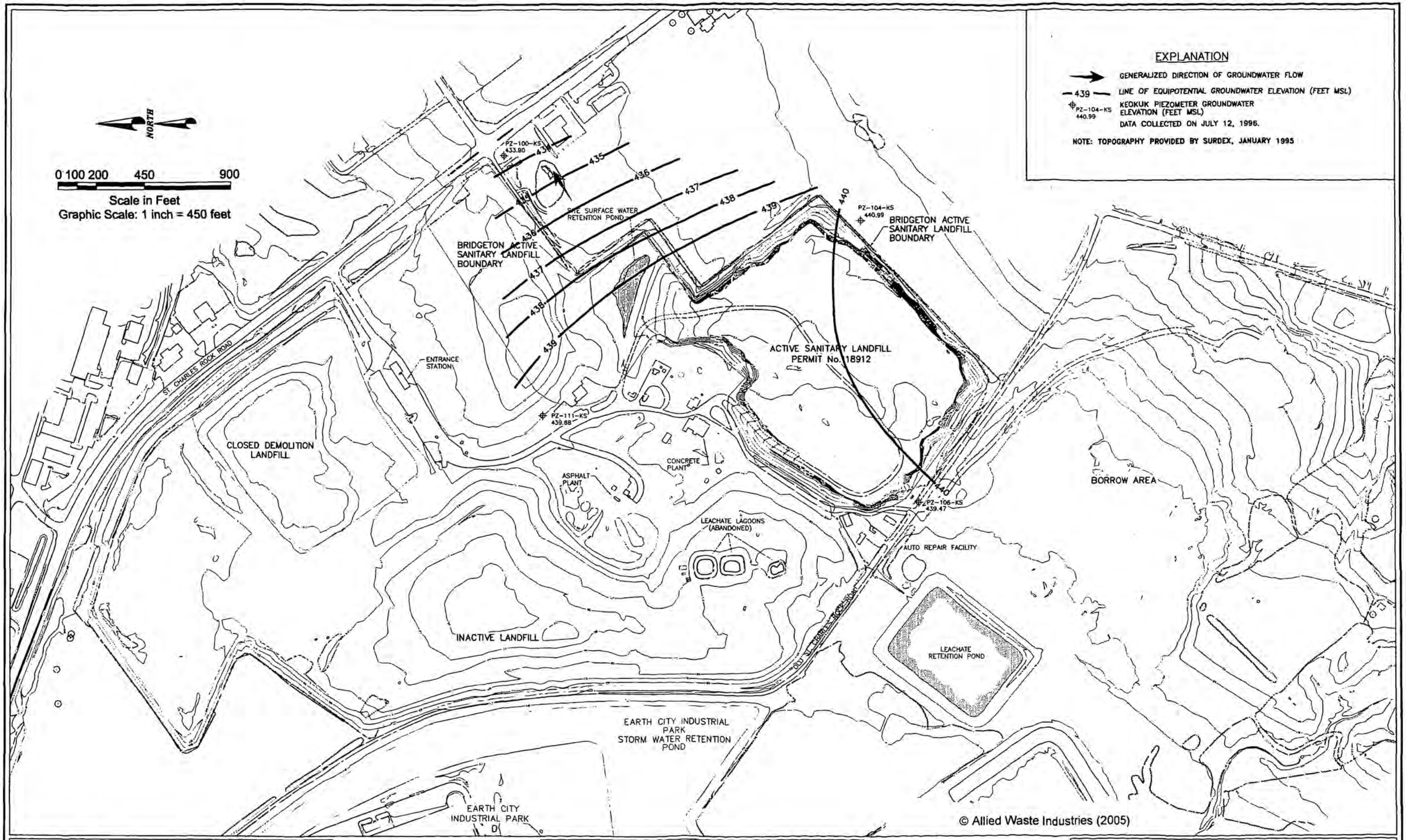
CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL

TITLE
MAY 3, 1996
UNCONSOLIDATED MATERIALS
WATER TABLE MAP
Denver, Colorado

Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	BGT	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D162
FILE NO.	2848D162	FIGURE	4-32

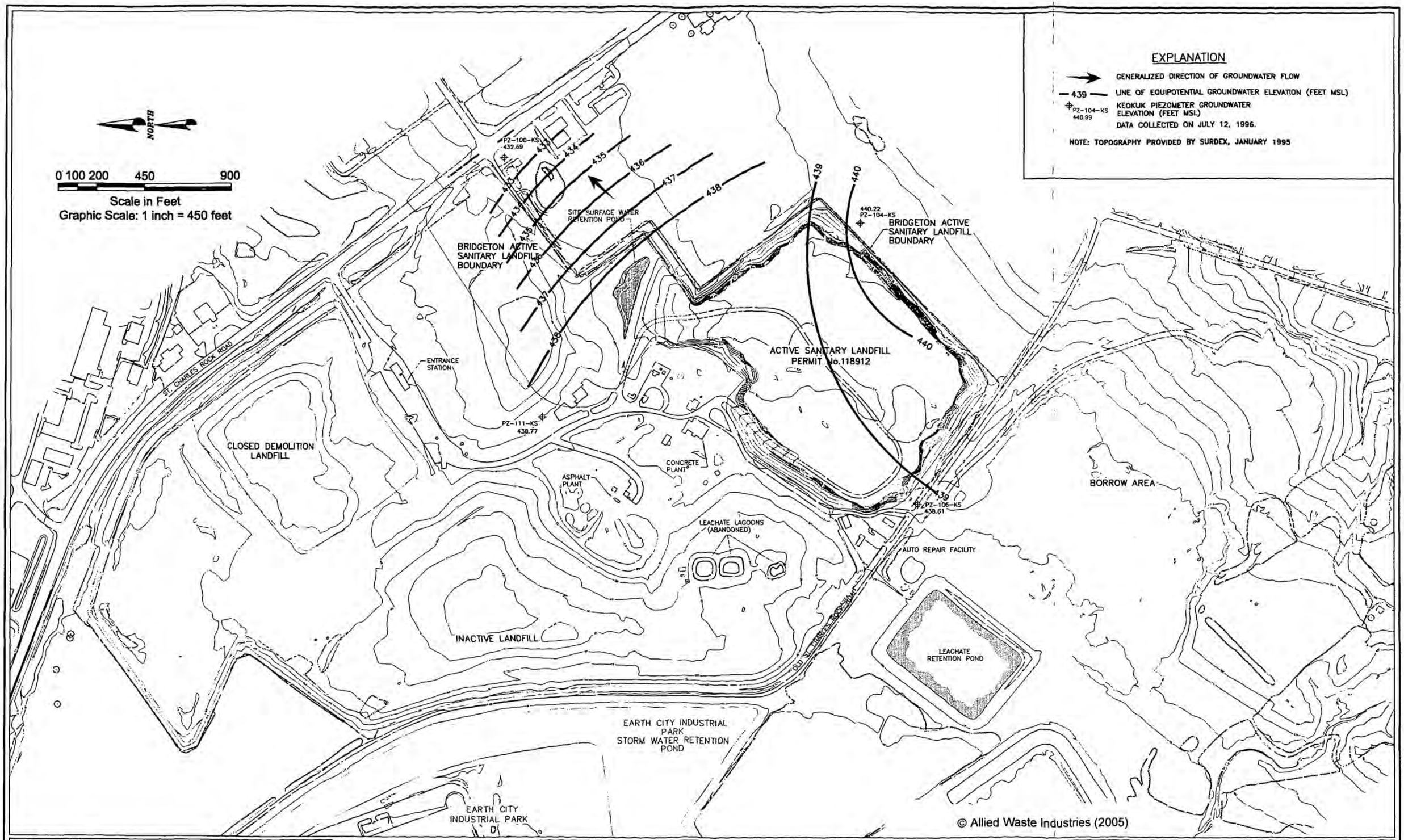

LEGEND
GENERALIZED DIRECTION OF GROUNDWATER FLOW
PZ-205-AS 433.71 ALLUVIAL PIEZOMETER (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
AS = SHALLOW ALLUVIAL
AI = INTERMEDIATE ALLUVIAL
AD = DEEP ALLUVIAL
LR-104 434.15 LEACHATE RISER LOCATION (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
MW-F3 434.69 EXISTING MONITORING WELL GROUNDWATER ELEVATION (FEET MSL)
D-13 434.73 NEWLY INSTALLED MONITORING WELL (INSTALLED BY MCLAREN/HART) GROUNDWATER ELEVATION (FEET MSL)
S = SHALLOW ALLUVIAL
I = INTERMEDIATE ALLUVIAL
D = DEEP ALLUVIAL
LCS-1 277 LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
SG-8 433.87 STAFF GAUGE LOCATION WATER ELEVATION (FEET MSL)
NOTE: GROUNDWATER AND SURFACE WATER ELEVATIONS MEASURED BY GOLDER ON JULY 12, 1996, EXCEPT FOR LCS-1, LCS-2, LCS-3, AND LCS-4 WHICH WERE MEASURED ON JULY 16, 1996. (NM = NOT MEASURED OR NO READING).
E. 517,000
E. 516,000
E. 515,000
E. 514,000
E. 513,000
N. 1,071,000
N. 1,070,000
N. 1,069,000
N. 1,068,000
N. 1,067,000
N. 1,066,000
N. 1,065,000
ST. CHARLES ROCK ROAD
SITE SURFACE WATER RETENTION POND
ENTRANCE STATION
ACTIVE SANITARY LANDFILL PERMIT No.118912
INACTIVE DEMOLITION LANDFILL
INACTIVE LANDFILL
ASPHALT PLANT
ABANDONED CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
SOUTHWESTERN BELL SWITCHING STATION
UNITED REPAIR FACILITY
APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY
OLD ST. CHARLES ROCK ROAD
LEACHATE RETENTION POND
BORROW AREA
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
PZ-113-AS 434.46
I-68 434.47
S-84 433.85
D-85 434.52
D-14 431.66
D-71 362.00
LCS-3 272
LCS-1 277
LCS-2 267
LCS-4 280
I-67 434.62
PZ-207-AS 434.52
I-66 434.65
MW-F3 434.69
D-13 434.73
SG-5 DRY
I-65 434.69
S-5 434.55
I-4 434.52
D-3 434.46
MW-F1S 434.27
MW-F1D 434.26
PZ-113-AS 434.39
PZ-113-AD 434.35
PZ-112-AS 434.31
PZ-305-AI 434.17
LR-104 434.15
I-73 433.36
PZ-205-AS 433.71
D-87 434.34
LR-193 434.25
S-88 434.24
D-12 434.41
S-10 434.46
I-11 434.49
SG-2 435.14
SG-1 435.07
S-9 434.67
SG-3 435.13
SG-4 435.25
I-62 434.63
D-83 434.63
S-61 434.79
D-6 434.40
MW-102 434.48
MW-101 434.60
I-7 434.57
I-2 434.35
S-1 434.37
I-9 434.36
S-82 434.35
D-93 432.86
SG-7 433.51
SG-6 433.58
MW-103 434.17
PZ-304-AI 434.20
PZ-304-AS 434.14
PZ-303-AS 434.23
MW-F2 434.06
MW-104 434.06
S-75 434.68
PZ-302-AS 434.23
PZ-302-AI 434.05
D-81 434.12
S-53 (NM)
S-51 434.05
SG-9 433.86
SG-8 433.87
MW-107 441.85
SCALE IN FEET
0 100 200 400
NORTH
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995
REV. DATE DESCRIPTION DR. BY APP. BY
CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL
TITLE
JULY 12, 1996
UNCONSOLIDATED MATERIALS
WATER TABLE MAP
Denver, Colorado
Golder Associates
DRAWN TMC
CHECKED MJK
REVIEWED CER
APPROVED WEH
FILE NO. 2848D168
DATE AUGUST 1996
SCALE AS SHOWN
JOB NO. 943-2848
DWG. NO. D168
FIGURE 4-33



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

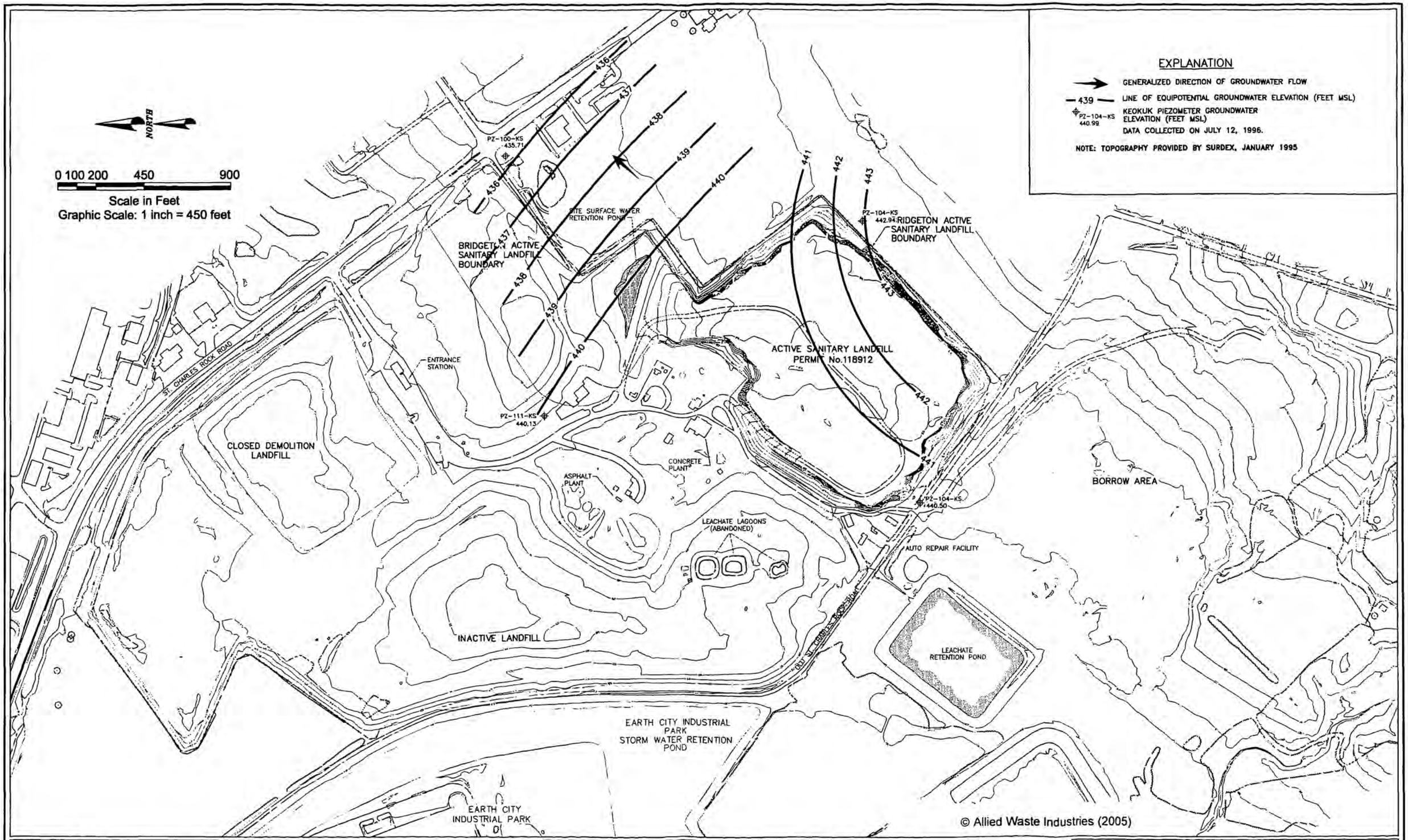
Figure 3-13
Keokuk Hydrologic Unit
October 28, 1995
Potentiometric Surface Map



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-14
Keokuk Hydrologic Unit
January 4, 1996
Potentiometric Surface Map



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-15
Keokuk Hydrologic Unit
Potentiometric Surface Map
April 3, 1996

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- 439 — LINE OF EQUIPOTENTIAL GROUNDWATER ELEVATION (FEET MSL)
- PZ-104-KS 440.99 — KEOKUK PIEZOMETER GROUNDWATER ELEVATION (FEET MSL) DATA COLLECTED ON JULY 12, 1996.

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

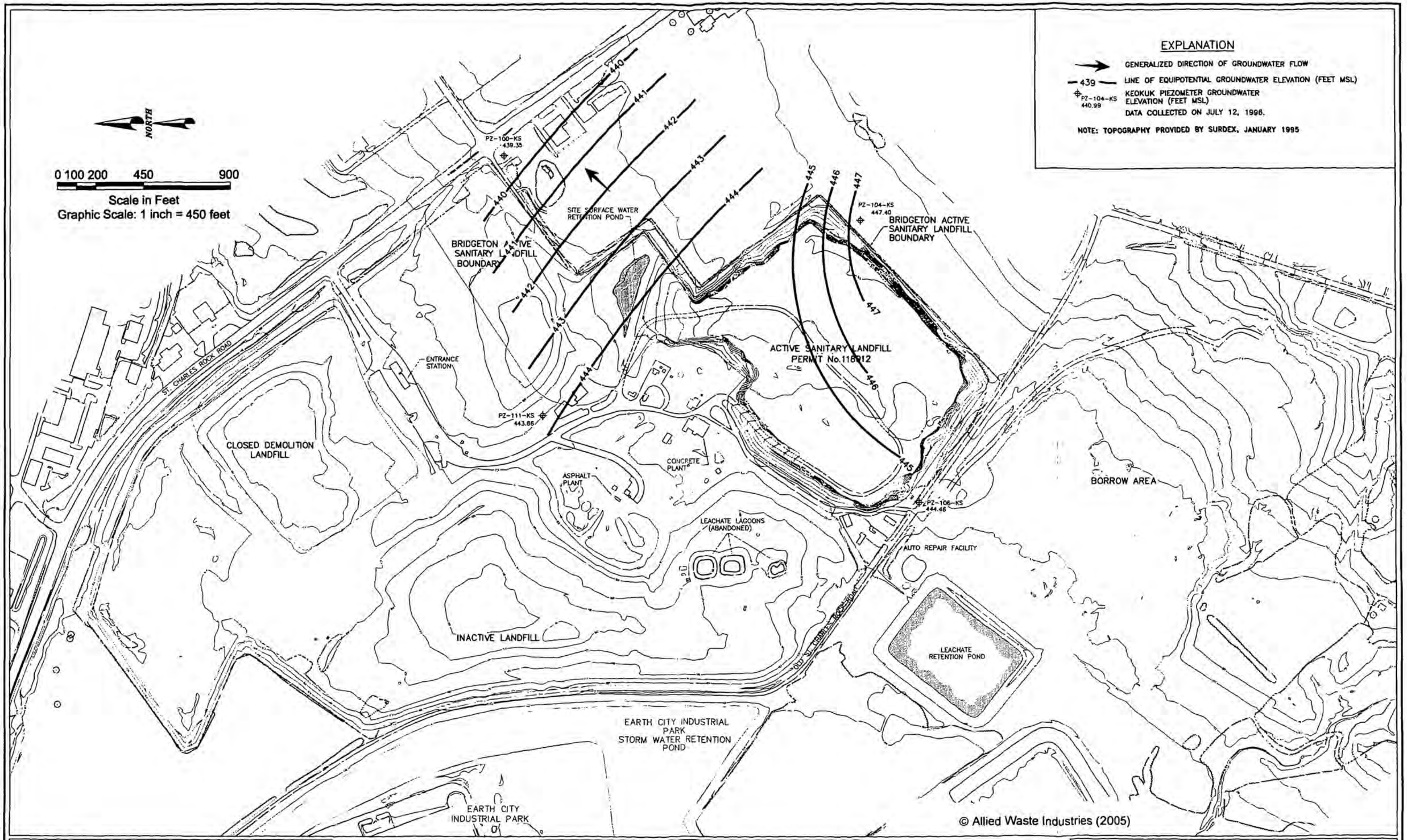
PZ-100-KS 435.56
PZ-104-KS 443.35
PZ-111-KS 440.16
PZ-108-KS 440.68
SITE SURFACE WATER RETENTION POND
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
ACTIVE SANITARY LANDFILL PERMIT No.118912
ENTRANCE STATION
ST. CHARLES ROCK ROAD
CLOSED DEMOLITION LANDFILL
ASPHALT PLANT
CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
INACTIVE LANDFILL
AUTO REPAIR FACILITY
LEACHATE RETENTION POND
BORROW AREA
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

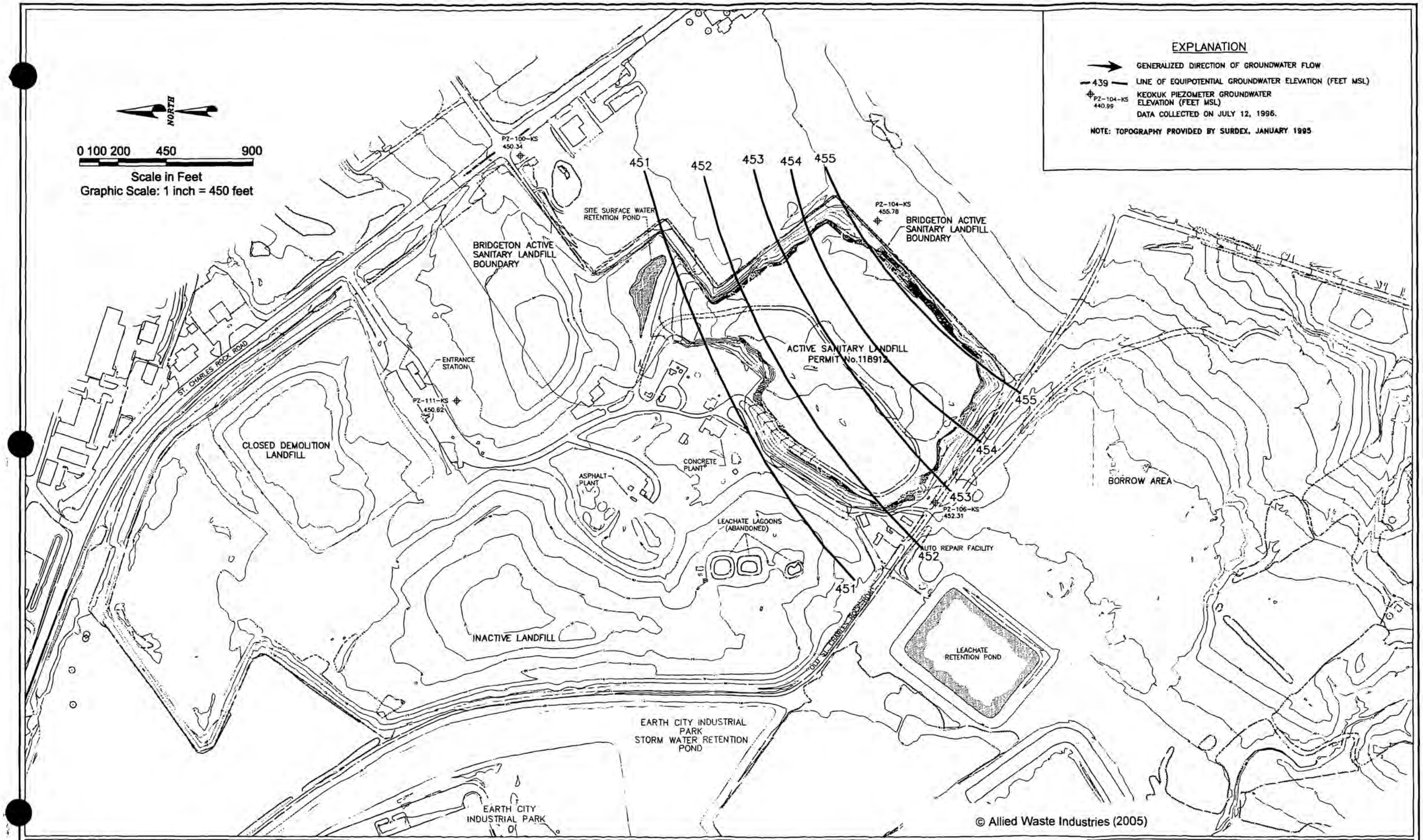
Figure 3-16
Keokuk Hydrologic Unit
May 3, 1996
Potentiometric Surface Map



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

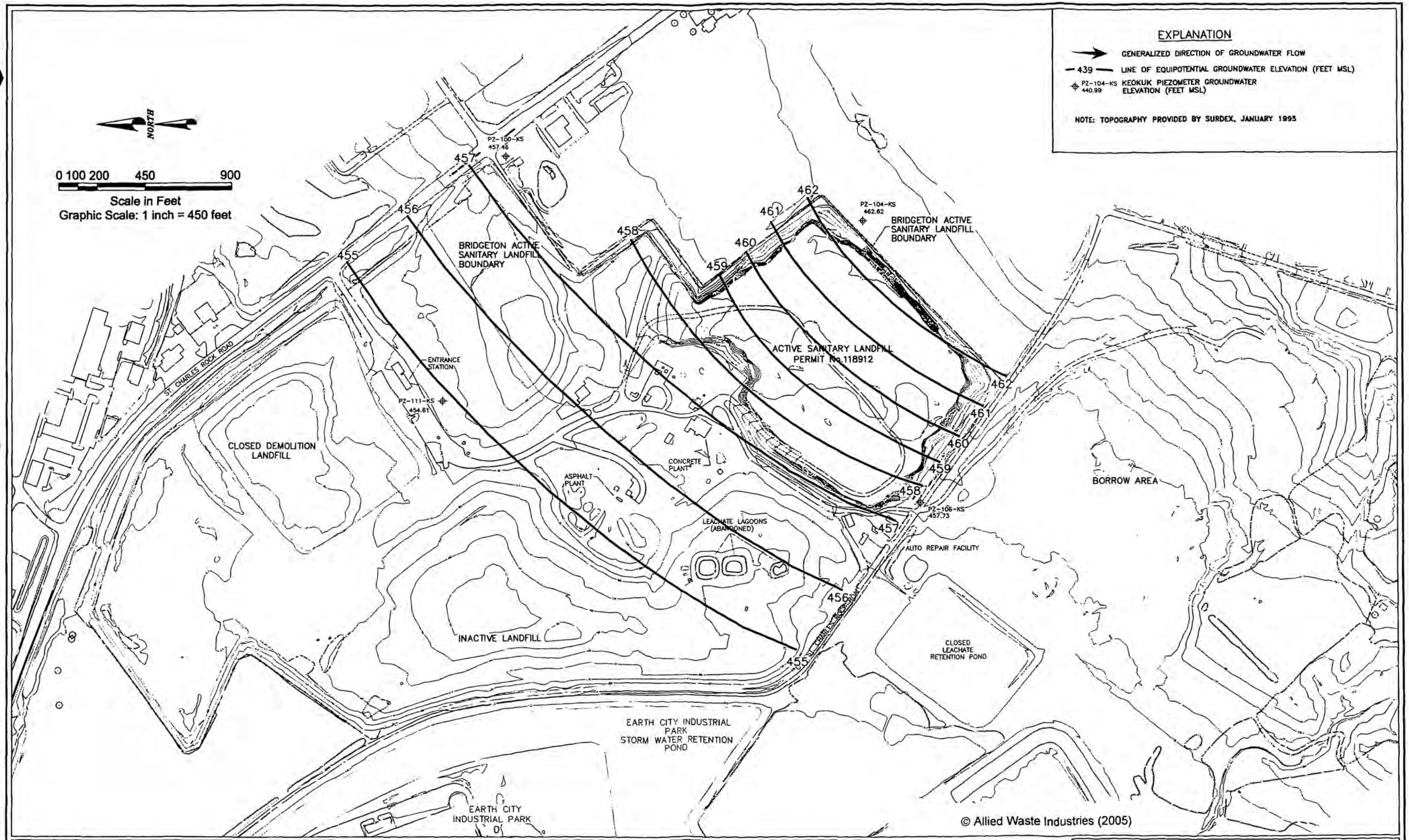
Figure 3-17
Keokuk Hydrologic Unit
July 12, 1996
Potentiometric Surface Map



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-18
Keokuk Hydrologic Unit
May 22, 2000
Potentiometric Surface Map



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-19
Keokuk Hydrologic Unit
November 19, 2003
Potentiometric Surface Map

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

GENERALIZED DIRECTION OF GROUNDWATER FLOW

439 LINE OF EQUIPOTENTIAL GROUNDWATER ELEVATION (FEET MSL)

PZ-104-KS 440.99 KEOKUK PIEZOMETER GROUNDWATER ELEVATION (FEET MSL)

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

PZ-100-KS 456.52

PZ-104-KS 462.72

PZ-111-KS 454.89

PZ-106-KS 457.89

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

ACTIVE SANITARY LANDFILL PERMIT No.118912

ST. CHARLES ROCK ROAD

ENTRANCE STATION

CLOSED DEMOLITION LANDFILL

ASPHALT PLANT

CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

BORROW AREA

INACTIVE LANDFILL

CLOSED LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-20
Keokuk Hydrologic Unit
May 10, 2004
Potentiometric Surface Map

NORTH

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- MW-1205 339.32 — DEEP SALEM FORMATION MONITORING WELL LOCATION (GROUNDWATER ELEVATION (FEET MSL))
- PZ-100-SD 372.88 — DEEP SALEM FORMATION PIEZOMETER LOCATION (GROUNDWATER ELEVATION (FEET MSL))
- LCS-1 274 — LEACHATE COLLECTION SUMP (LEACHATE ELEVATION (FEET MSL))

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

PZ-100-SD 363.78

SITE SURFACE WATER RETENTION POND

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

PZ-104-SD 341.68

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

LCS-3 289

LCS-1 273

ACTIVE SANITARY LANDFILL PERMIT No.118912

LCS-2 250

ST. CHARLES ROCK ROAD

ENTRANCE STATION

PZ-111-SD 431.90

MW-1204 324.30

LCS-4 294

CLOSED DEMOLITION LANDFILL

MW-1205 347.04

CONCRETE PLANT

ASPHALT PLANT

BORROW AREA

PZ-106-SD 346.40

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

INACTIVE LANDFILL

OLD ST. CHARLES ROCK ROAD

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-21

Deep Salem Hydrologic Unit
October 28, 1995
Potentiometric Surface Map

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- MW-1205 339.32 — DEEP SALEM FORMATION MONITORING WELL LOCATION (GROUNDWATER ELEVATION (FEET MSL))
- PZ-100-SD 372.88 — DEEP SALEM FORMATION PIEZOMETER LOCATION (GROUNDWATER ELEVATION (FEET MSL))
- LCS-1 274 — LEACHATE COLLECTION SUMP (LEACHATE ELEVATION (FEET MSL))

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

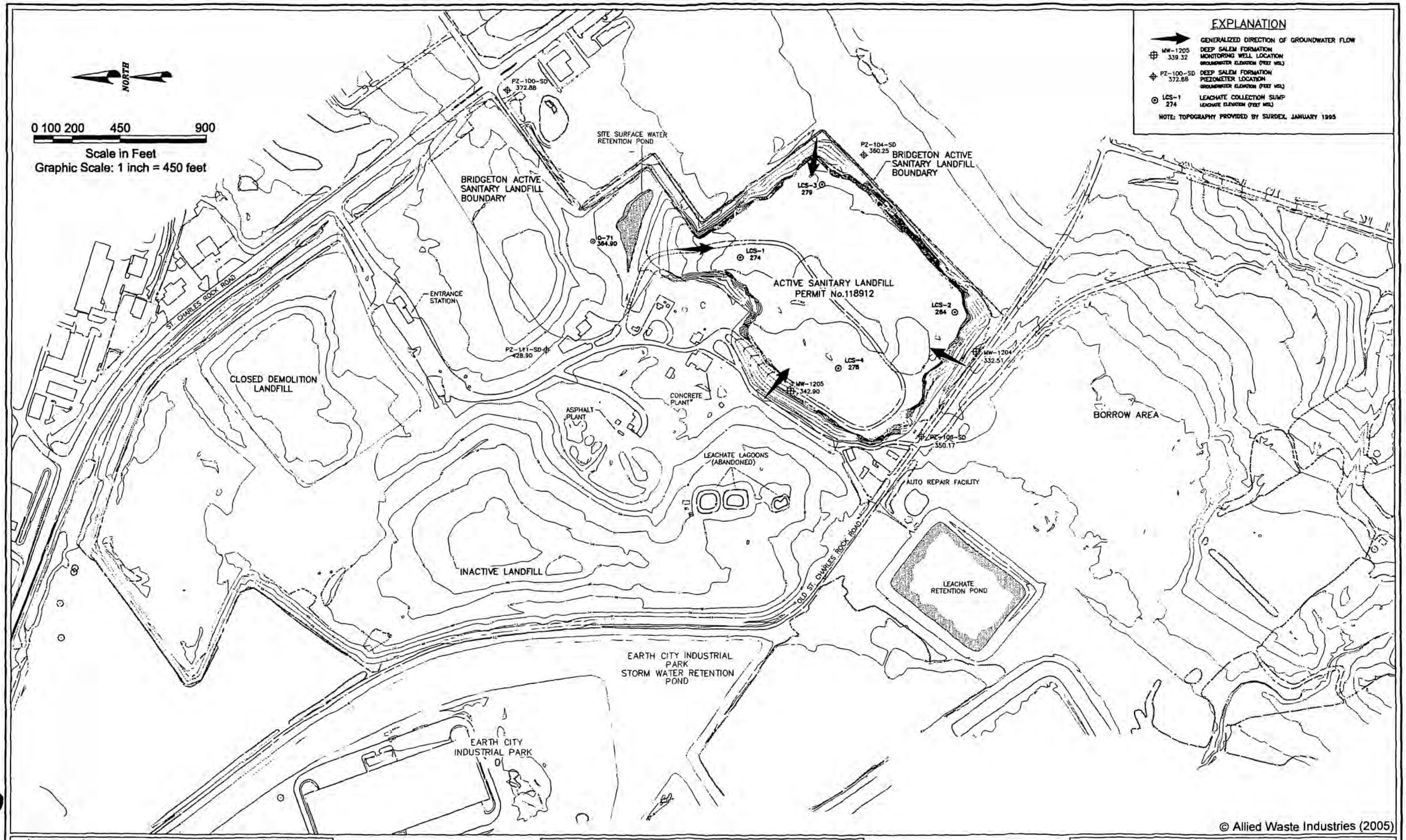
PZ-100-SD 355.04
SITE SURFACE WATER RETENTION POND
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
PZ-104-SD 343.15
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
LCS-3 287
LCS-1 272
ACTIVE SANITARY LANDFILL PERMIT No.118912
LCS-2 284
ENTRANCE STATION
ST. CHARLES ROCK ROAD
PZ-111-SD 430.83
LCS-4 280
MW-1204 308.95
CLOSED DEMOLITION LANDFILL
MW-1205 339.32
CONCRETE PLANT
ASPHALT PLANT
BORROW AREA
PZ-108-SD 341.52
LEACHATE LAGOONS (ABANDONED)
AUTO REPAIR FACILITY
OLD ST. CHARLES ROCK ROAD
LEACHATE RETENTION POND
INACTIVE LANDFILL
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-22
Deep Salem Hydrologic Unit
January 4, 1996
Potentiometric Surface Map



© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-23
Deep Salem Hydrologic Unit
April 3, 1996

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- MW-1205 339.32 — DEEP SALEM FORMATION MONITORING WELL LOCATION GROUNDWATER ELEVATION (FEET MSL)
- PZ-100-SD 372.88 — DEEP SALEM FORMATION PIEZOMETER LOCATION GROUNDWATER ELEVATION (FEET MSL)
- LCS-1 274 — LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

NOTE: GROUNDWATER ELEVATIONS MEASURED BY GOLDER ON MAY 5, 1996 EXCEPT O-71 LCS-1, LCS-2, LCS-3, AND LCS-4 WHICH WERE MEASRED ON MAY 2, 1996.

PZ-100-SD 367.82
SITE SURFACE WATER RETENTION POND
PZ-104-SD 370.88
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
LCS-3 261
O-71 365.30
LCS-1 277
ACTIVE SANITARY LANDFILL PERMIT No.118912
ENTRANCE STATION
ST. CHARLES ROCK ROAD
PZ-111-SD 429.00
LCS-2 279
MW-1204 344.32
LCS-4 295
CLOSED DEMOLITION LANDFILL
CONCRETE PLANT
ASPHALT PLANT
BORROW AREA
PZ-108-SD 364.81
LEACHATE LAGOONS (ABANDONED)
AUTO REPAIR FACILITY
INACTIVE LANDFILL
OLD ST. CHARLES ROCK ROAD
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

HERST & ASSOCIATES, INC.®
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-24
Deep Salem Hydrologic Unit
May 3, 1996
Potentiometric Surface Map

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- MW-1205 339.32 — DEEP SALEM FORMATION MONITORING WELL LOCATION (GROUNDWATER ELEVATION (FEET MSL))
- PZ-100-SD 372.88 — DEEP SALEM FORMATION PIEZOMETER LOCATION (GROUNDWATER ELEVATION (FEET MSL))
- LCS-1 274 — LEACHATE COLLECTION SUMP (LEACHATE ELEVATION (FEET MSL))

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

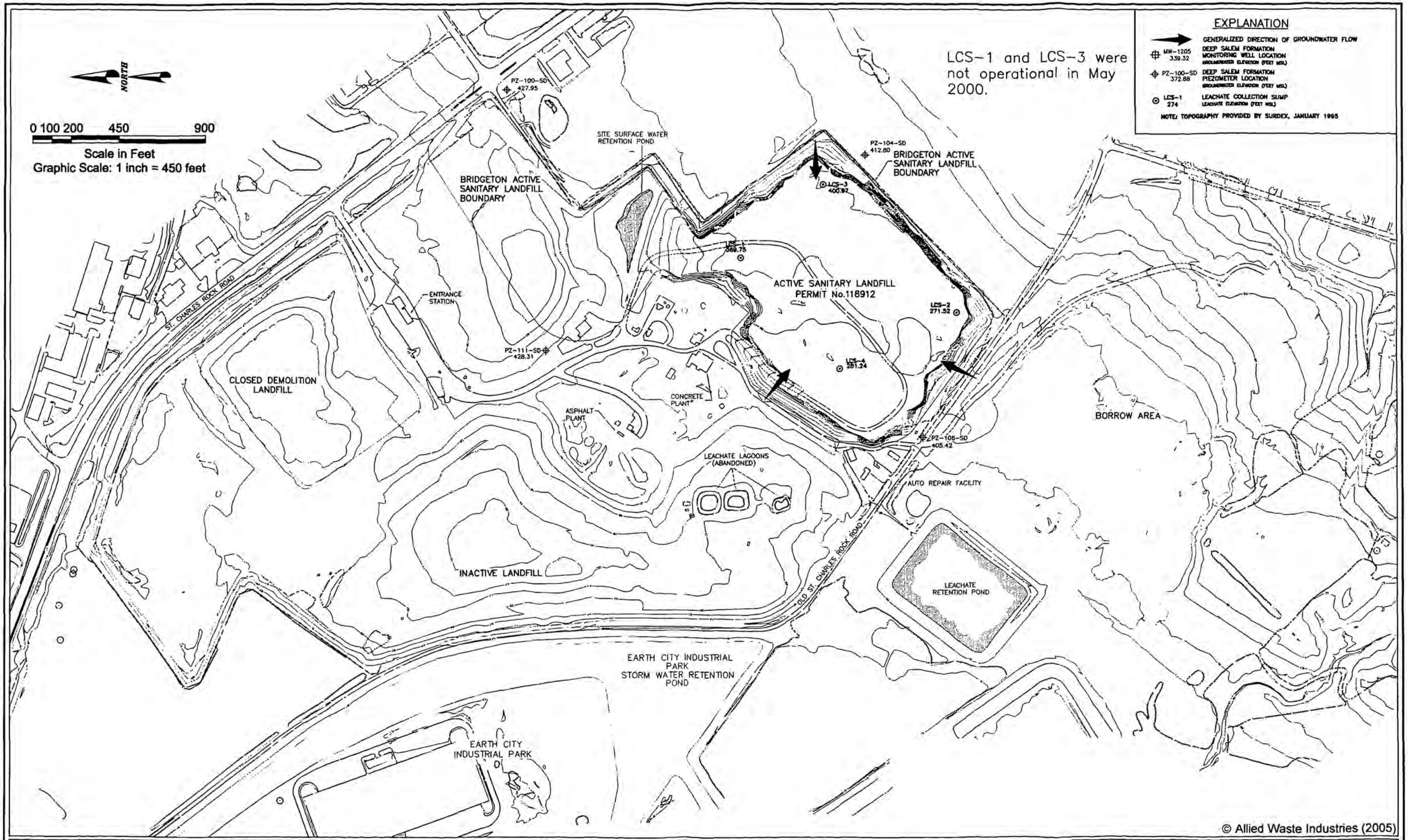
PZ-100-SD 367.04
SITE SURFACE WATER RETENTION POND
PZ-104-SD 367.77
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
LCS-3 272
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
D-71 382.00
LCS-1 277
ACTIVE SANITARY LANDFILL PERMIT No.118912
ENTRANCE STATION
ST. CHARLES ROCK ROAD
LCS-2 287
PZ-111-SD 433.48
MW-1204 332.89
CLOSED DEMOLITION LANDFILL
LCS-4 280
CONCRETE PLANT
ASPHALT PLANT
BORROW AREA
PZ-108-SD 367.31
LEACHATE LAGOONS (ABANDONED)
AUTO REPAIR FACILITY
OLD ST. CHARLES ROCK ROAD
INACTIVE LANDFILL
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-25
Deep Salem Hydrologic Unit
July 12, 1996
Potentiometric Surface Map

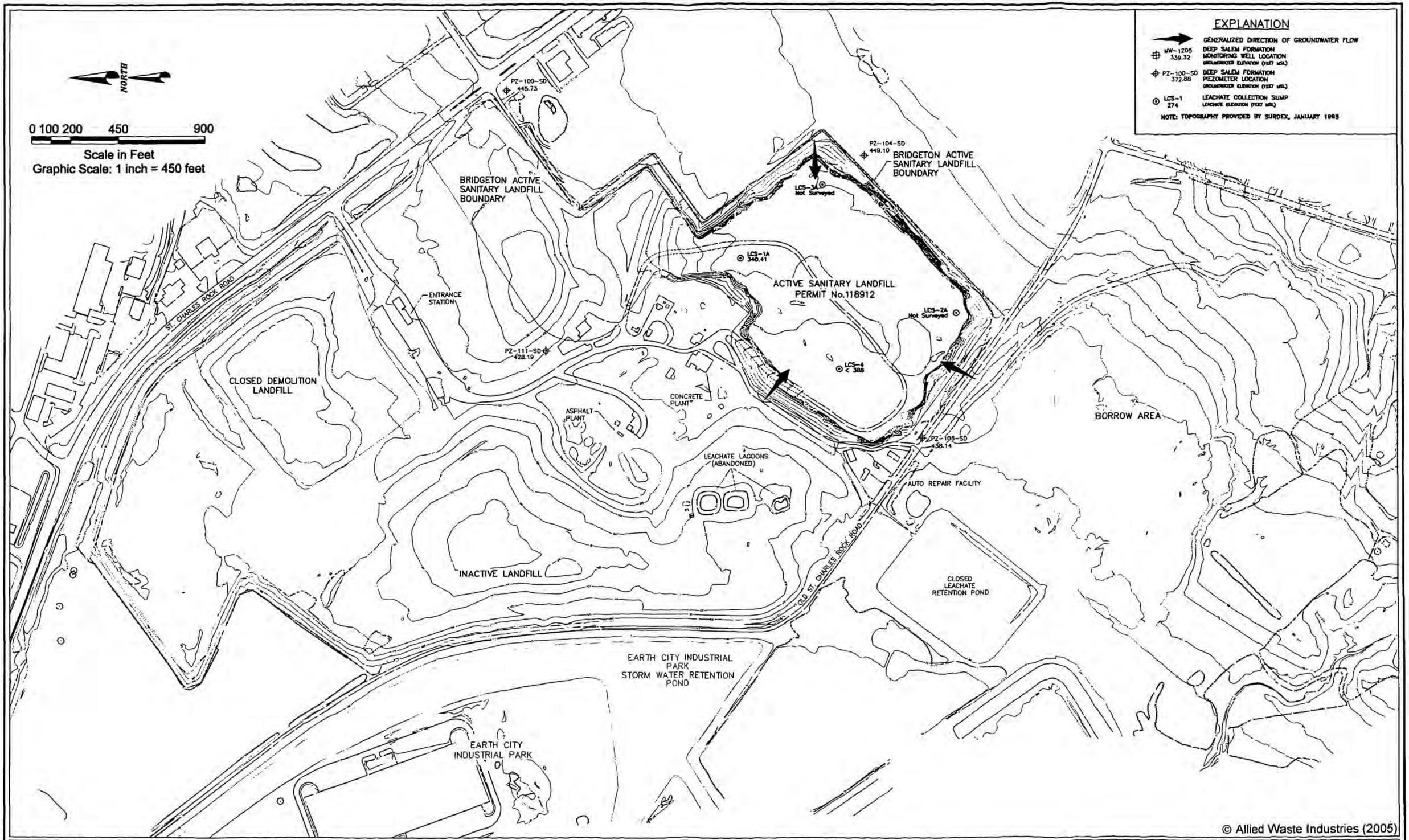


© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-26
Deep Salem Hydrologic Unit
May 22, 2000
Potentiometric Surface Map

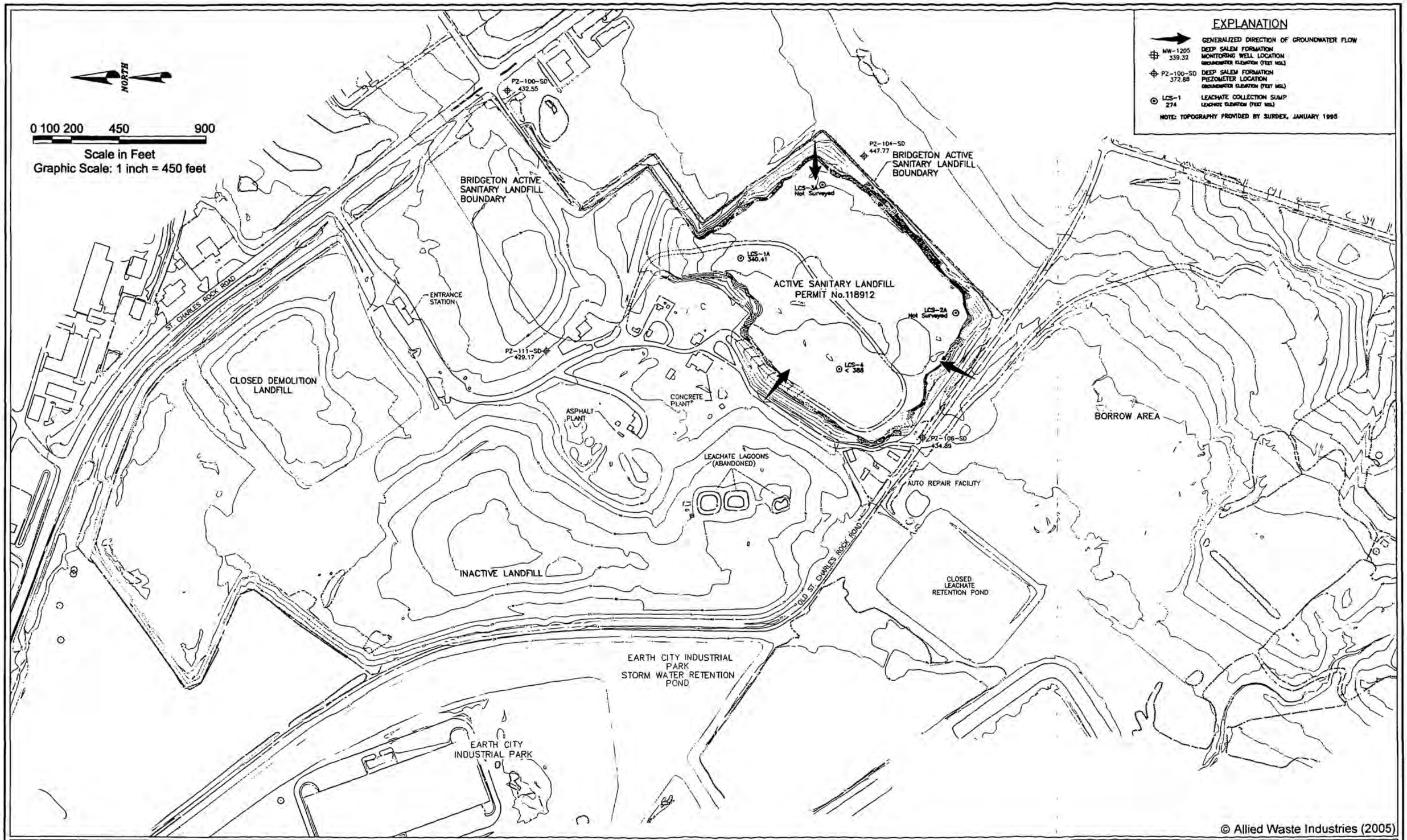


© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-27
Deep Salem Hydrologic Unit
November 19, 2003
Potentiometric Surface Map



© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-28
Deep Salem Hydrologic Unit
May 10, 2004
Potentiometric Surface Map

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

- PZ-200-SS 413.34 — ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION, GROUNDWATER ELEVATION (FEET MSL)
- LCS-3 289 — LEACHATE COLLECTION SUMP, LEACHATE ELEVATION (FEET MSL)
- MW-1206 361.31 — MONITORING WELL LOCATION, GROUNDWATER ELEVATION (FEET MSL).
- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- 420 — LINE OF EQUIPOTENTIAL, DASHED WHERE INFERRED
- 420 - - - INFERRED LINE OF EQUIPOTENTIAL, GROUNDWATER ELEVATION, (FEET MSL)

NOTE: DATA COLLECTED OCTOBER 28, 1995.
NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

PZ-208-SS 429.86
PZ-100-SS 414.04
PZ-202-SS 440.20
PZ-200-SS 413.34
PZ-102R-SS 421.99
PZ-201A-SS 412.85
SITE SURFACE WATER RETENTION POND
PZ-115-SS 413.09
PZ-1201-SS 375.25
PZ-104-SS 380.34
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
PZ-103-SS 360.69
PZ-101-SS 386.98
LCS-3 289
PZ-203-SS DRY
LCS-1 273
PZ-105-SS 343.23
ACTIVE SANITARY LANDFILL PERMIT No.118912
ENTRANCE STATION
PZ-109-SS 354.64
LCS-2 259
PZ-108-SS 355.88
PZ-110-SS 430.93
PZ-206-SS 415.34
PZ-113-SS 432.29
LCS-4 294
PZ-116-SS 333.08
PZ-204A-SS 403.82
ST. CHARLES ROCK ROAD
CLOSED DEMOLITION LANDFILL
CONCRETE PLANT
MW-1206 361.31
ASPHALT PLANT
PZ-205-SS 421.89
BORROW AREA
PZ-301-SS 358.09
PZ-106-SS 350.41
LEACHATE LAGOONS (ABANDONED)
PZ-107-SS 431.91
AUTO REPAIR FACILITY
INACTIVE LANDFILL
OLD ST. CHARLES ROCK ROAD
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
PZ-300-SS 428.62

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-29
St. Louis/Upper Salem Hydrologic Unit
October 28, 1995
Potentiometric Surface Map

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

PZ-200-SS 413.34 — ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION, GROUNDWATER ELEVATION (FEET MSL)

LCS-3 280 — LEACHATE COLLECTION SUMP, LEACHATE ELEVATION (FEET MSL)

MW-1206 361.31 — MONITORING WELL LOCATION, GROUNDWATER ELEVATION (FEET MSL).

GENERALIZED DIRECTION OF GROUNDWATER FLOW

420 —— LINE OF EQUIPOTENTIAL

420 — — INFERRED LINE OF EQUIPOTENTIAL

NOTE: DATA COLLECTED JANUARY 4, 1996.

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

PZ-208-SS 428.60
PZ-100-SS 413.63
PZ-200-SS 412.70
PZ-102R-SS 420.59
PZ-201A-SS 412.15
PZ-202-SS 438.64
PZ-104-SS 361.53
PZ-1201-SS 376.00
PZ-115-SS 414.34
SITE SURFACE WATER RETENTION POND
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
PZ-101-SS 387.48
PZ-103-SS 361.44
LCS-3 279
PZ-203-SS DRY
LCS-1 272
PZ-105-SS 343.21
ACTIVE SANITARY LANDFILL PERMIT No.118912
PZ-109-SS 350.40
LCS-2 284
PZ-108-SS 346.47
PZ-116-SS 330.68
ENTRANCE STATION
ST. CHARLES ROCK ROAD
PZ-110-SS 429.87
PZ-113-SS 431.18
PZ-208-SS 414.13
LCS-4 280
MW-1206 348.17
CLOSED DEMOLITION LANDFILL
CONCRETE PLANT
ASPHALT PLANT
PZ-205-SS 420.28
PZ-204A-SS 403.78
PZ-106-SS 343.70
BORROW AREA
PZ-301-SS 395.85
LEACHATE LAGOONS (ABANDONED)
PZ-107-SS 430.90
AUTO REPAIR FACILITY
INACTIVE LANDFILL
OLD ST. CHARLES ROCK ROAD
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
PZ-300-SS 427.50

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-30
St. Louis/Upper Salem Hydrologic Unit
January 4, 1996
Potentiometric Surface Map

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

- PZ-200-SS 413.34 — ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION, GROUNDWATER ELEVATION (FEET MSL)
- LCS-3 259 — LEACHATE COLLECTION SUMP, LEACHATE ELEVATION (FEET MSL)
- MW-1206 361.31 — MONITORING WELL LOCATION, GROUNDWATER ELEVATION (FEET MSL).
- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- 420 — LINE OF EQUIPOTENTIAL
- 420 - - INFERRED LINE OF EQUIPOTENTIAL
- NOTE: DATA COLLECTED APRIL 3, 1996
- NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

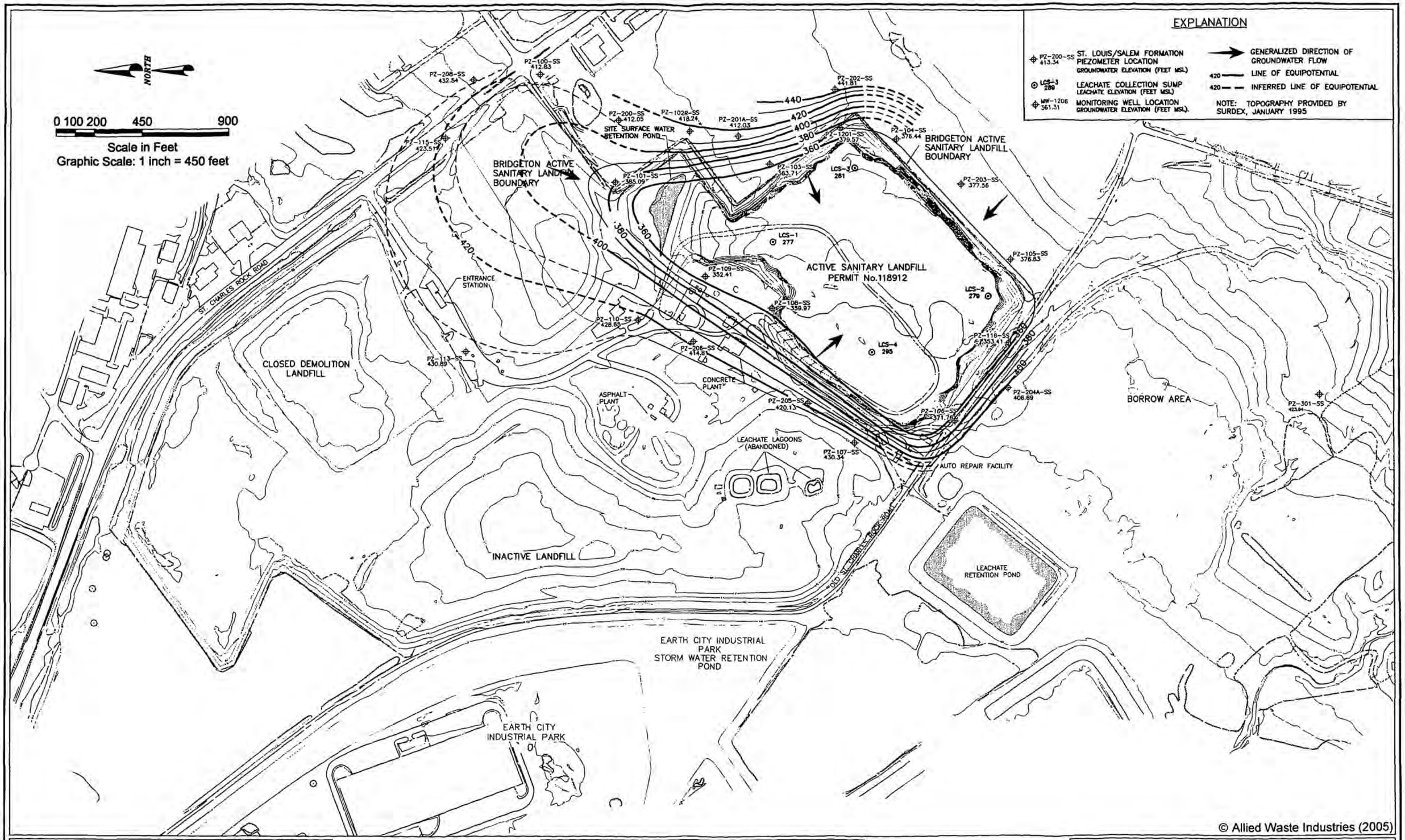
PZ-208-SS 428.87
PZ-100-SS 412.87
PZ-200-SS 412.03
PZ-102R-SS 418.91
PZ-201A-SS 412.06
SITE SURFACE WATER RETENTION POND
PZ-202-SS 441.20
PZ-104-SS 362.99
PZ-120T-SS 379.44
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
PZ-115-SS 414.31
PZ-103-SS 362.85
PZ-101-SS 385.24
LCS-3
PZ-203-SS DRY
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
G-71 384.80
LCS-1 274
PZ-105-SS 356.22
ACTIVE SANITARY LANDFILL PERMIT No.118912
PZ-109-SS 350.78
ENTRANCE STATION
LCS-2 284
PZ-108-SS 356.00
PZ-110-SS 427.51
PZ-116-SS 337.96
LCS-4 278
PZ-206-SS 413.80
MW-1206 359.29
PZ-113-SS 429.68
CONCRETE PLANT
ASPHALT PLANT
PZ-204A-SS 405.46
BORROW AREA
PZ-205-SS 419.11
PZ-106-SS 357.55
PZ-301-SS 420.17
LEACHATE LAGOONS (ABANDONED)
PZ-107-SS 429.35
AUTO REPAIR FACILITY
CLOSED DEMOLITION LANDFILL
ST. CHARLES ROCK ROAD
INACTIVE LANDFILL
OLD ST. CHARLES ROCK ROAD
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK
PZ-300-SS 426.58

© Allied Waste Industries (2005)

HERST & ASSOCIATES, INC.®
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-31
St. Louis/Upper Salem Hydrologic Unit
April 27, 1996
Potentiometric Surface Map



© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-32
St. Louis/Upper Salem Hydrologic Unit
May 3, 1996
Potentiometric Surface Map

NORTH

0 100 200 450 900

Scale in Feet
Graphic Scale: 1 inch = 450 feet

EXPLANATION

- PZ-200-SS 413.34 — ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION GROUNDWATER ELEVATION (FEET MSL)
- LCS-3 289 — LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
- MW-1208 361.31 — MONITORING WELL LOCATION GROUNDWATER ELEVATION (FEET MSL).
- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- 420 — LINE OF EQUIPOTENTIAL
- 420 — — INFERRED LINE OF EQUIPOTENTIAL

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

PZ-208-SS 432.54
PZ-115-SS 421.85
PZ-100-SS 412.83
PZ-200-SS 412.05
PZ-102R-SS 420.60
PZ-201A-SS 412.03
SITE SURFACE WATER RETENTION POND
PZ-202-SS 441.81
PZ-1201-SS 378.57
PZ-104 376.44
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
PZ-101-SS 385.09
PZ-103-SS 363.71
LCS-3 272
PZ-203-SS 377.56
LCS-1 277
PZ-105-SS 376.83
ACTIVE SANITARY LANDFILL PERMIT No.118912
PZ-109-SS 352.41
PZ-108-SS 359.97
LCS-2 267
PZ-116-SS 365.56
LCS-4 260
PZ-110-SS 432.09
ENTRANCE STATION
ST. CHARLES ROCK ROAD
PZ-113-SS 430.89
CLOSED DEMOLITION LANDFILL
PZ-206-SS 418.89
CONCRETE PLANT
ASPHALT PLANT
PZ-205-SS 420.13
PZ-204A-SS 406.69
BORROW AREA
PZ-301-SS 423.94
PZ-106-SS 371.76
LEACHATE LAGOONS (ABANDONED)
PZ-107-SS 430.34
AUTO REPAIR FACILITY
OLD ST. CHARLES ROCK ROAD
INACTIVE LANDFILL
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-33
St. Louis/Upper Salem Hydrologic Unit
July 12, 1996
Potentiometric Surface Map

LCS-1 and LCS-3 were not operational in May 2000.

EXPLANATION

- PZ-200-SS 413.34 — ST. LOUIS/SALEM FORMATION PIEZOMETER LOCATION, GROUNDWATER ELEVATION (FEET MSL)
- LCS-3 289 — LEACHATE COLLECTION SUMP, LEACHATE ELEVATION (FEET MSL)
- MW-1206 361.31 — MONITORING WELL LOCATION, GROUNDWATER ELEVATION (FEET MSL).
- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- 420 — LINE OF EQUIPOTENTIAL
- 420 - - - INFERRED LINE OF EQUIPOTENTIAL

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

NORTH

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

PZ-208-SS 443.01
PZ-100-SS 425.55
PZ-200-SS 431.34
PZ-102R-SS 437.30
PZ-201A-SS 430.09
PZ-202-SS 455.98
PZ-120-SS 420.00
PZ-104-SS 417.78
PZ-115-SS 426.24
PZ-103-SS 416.77
PZ-101-SS 419.16
LCS-3 400.97
PZ-203-SS 414.11
LCS-1 389.75
PZ-105-SS 410.92
PZ-109-SS 406.71
PZ-108-SS 404.48
LCS-2 271.52
PZ-110-SS 425.12
PZ-206-SS 425.00
LCS-4 281.24
PZ-116-SS 398.09
PZ-113-SS 428.42
PZ-204A-SS 413.86
PZ-106-SS 406.03
PZ-205-SS 424.45
PZ-107-SS 428.59

SITE SURFACE WATER RETENTION POND

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

ACTIVE SANITARY LANDFILL PERMIT No.118912

ENTRANCE STATION

ST. CHARLES ROCK ROAD

CLOSED DEMOLITION LANDFILL

ASPHALT PLANT

CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

BORROW AREA

INACTIVE LANDFILL

OLD ST. CHARLES ROCK ROAD

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

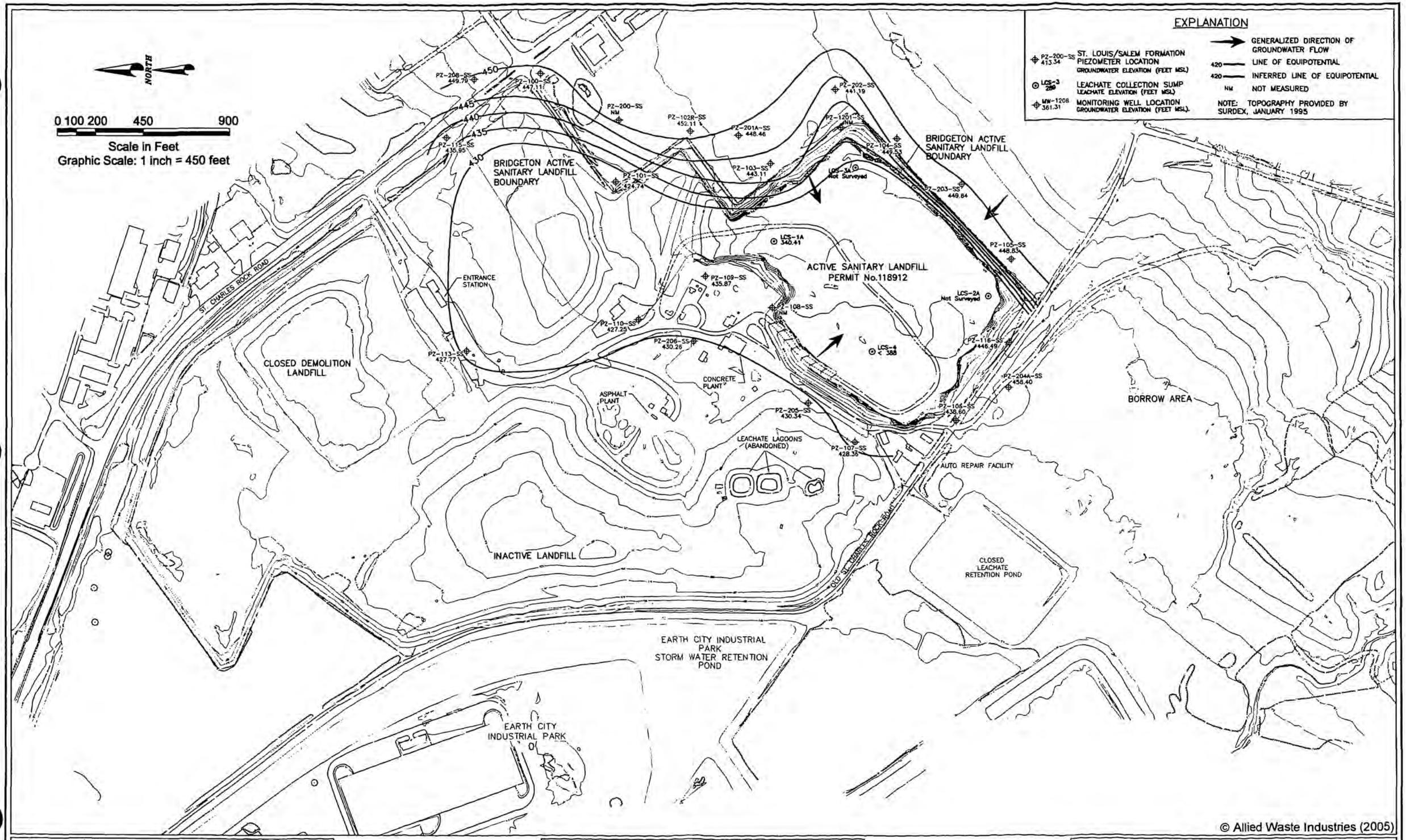
420 425 430

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-34
St. Louis/Upper Salem Hydrologic Unit
May 22, 2000
Potentiometric Surface Map

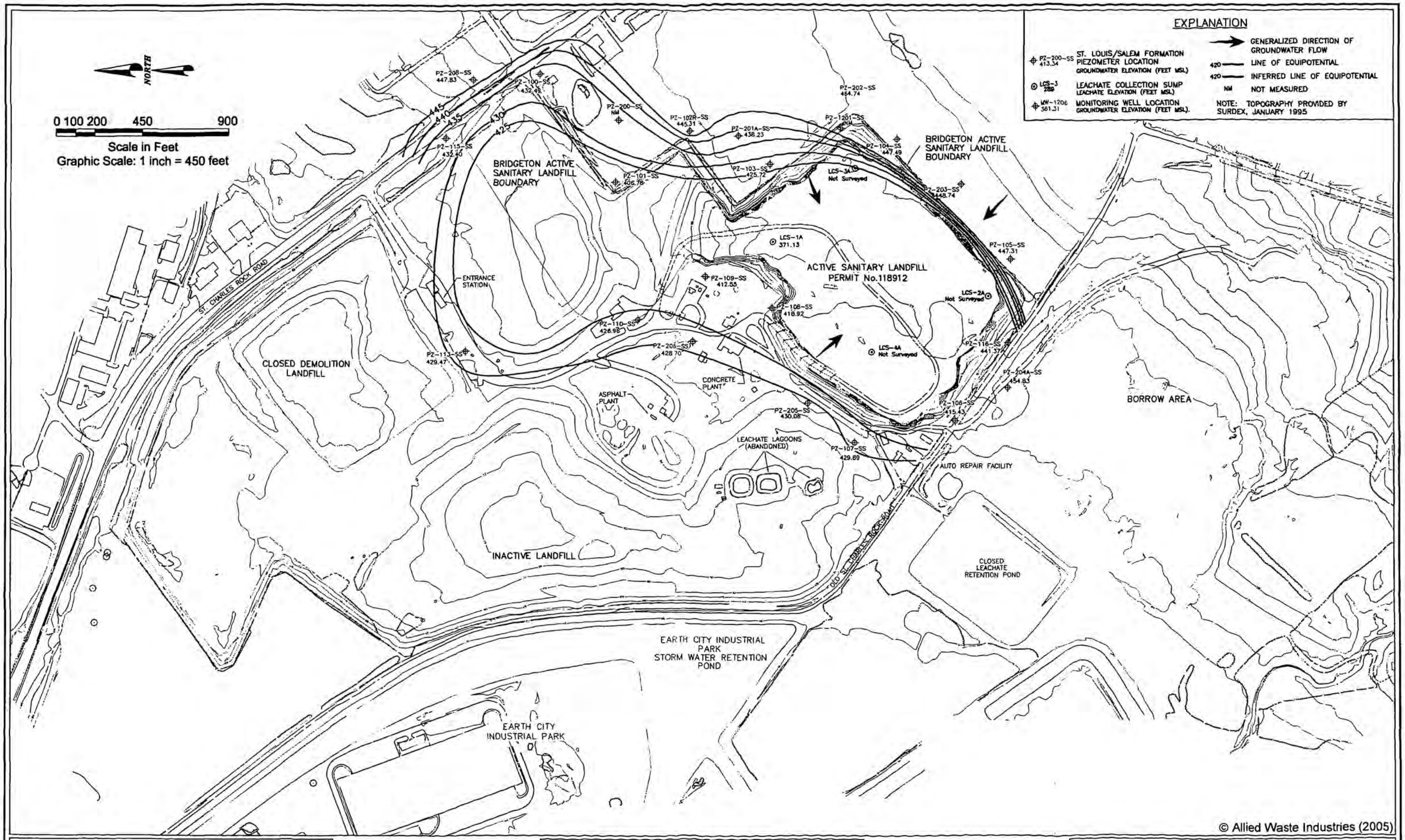


© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-35
St. Louis/Upper Salem Hydrologic Unit
November 19, 2003
Potentiometric Surface Map



© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-36
St. Louis/Upper Salem Hydrologic Unit
May 10, 2004
Potentiometric Surface Map

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- PZ-205-AS 431.90 — OU-2 ALLUVIAL PIEZOMETER, GROUNDWATER ELEVATION (FEET MSL)
  - AS = SHALLOW ALLUVIAL
  - AI = INTERMEDIATE ALLUVIAL
  - AD = DEEP ALLUVIAL
- LR-104 432.04 — OU-2 LEACHATE RISER LOCATION, GROUNDWATER ELEVATION (FEET MSL)
- MW-F3 432.21 — PREVIOUSLY EXISTING MONITORING WELL, GROUNDWATER ELEVATION (FEET MSL)
- D-13 432.16 — OU-1 MONITORING WELL, GROUNDWATER ELEVATION (FEET MSL)
  - S = SHALLOW ALLUVIAL
  - I = INTERMEDIATE ALLUVIAL
  - D = DEEP ALLUVIAL
- LCS-1 273 — ACTIVE LANDFILL LEACHATE COLLECTION SUMP, LEACHATE ELEVATION (FEET MSL)

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

NORTH

NOTE: GROUNDWATER ELEVATIONS IN "PZ" LOCATIONS AND SURFACE WATER ELEVATIONS AT SG-8 AND SG-9 MEASURED BY GOLDER ON OCTOBER 30, 1995. ALL OTHER ELEVATIONS MEASURED BY MCLAREN/HART ON OCTOBER 31, 1995. (NM = NOT MEASURED OR NO READING).

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

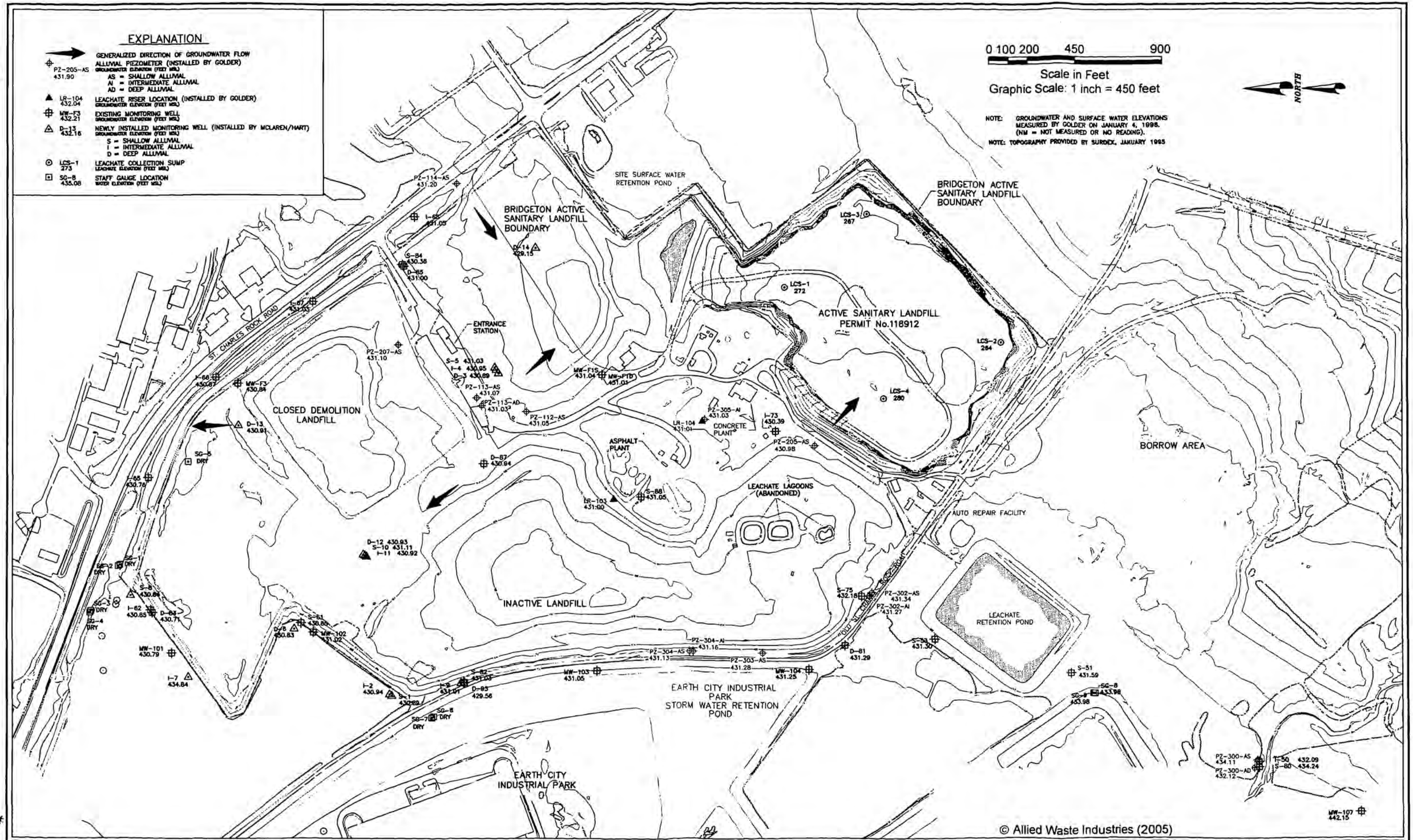
SITE SURFACE WATER RETENTION POND
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
D-14 DRY
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
LCS-3 289
LCS-1 273
LCS-2 259
LCS-4 294
ST. CHARLES ROCK ROAD
ENTRANCE STATION
CLOSED DEMOLITION LANDFILL
ASPHALT PLANT
PZ-305-AI 431.10 CONCRETE PLANT
BORROW AREA
LEACHATE LAGOONS (ABANDONED)
AUTO REPAIR FACILITY
INACTIVE LANDFILL
LEACHATE RETENTION POND
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-37
Unconsolidated Material
October 28, 1995
Water Table Map



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-38
Unconsolidated Material
January 4, 1996
Water Table Map

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- PZ-205-AS 431.90 — ALLUVIAL PIEZOMETER (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
  - AS = SHALLOW ALLUVIAL
  - AI = INTERMEDIATE ALLUVIAL
  - AD = DEEP ALLUVIAL
- LR-104 432.04 — LEACHATE RISER LOCATION (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
- MW-F3 432.21 — EXISTING MONITORING WELL GROUNDWATER ELEVATION (FEET MSL)
- D-13 432.16 — NEWLY INSTALLED MONITORING WELL (INSTALLED BY MCLAREN/HART) GROUNDWATER ELEVATION (FEET MSL)
  - S = SHALLOW ALLUVIAL
  - I = INTERMEDIATE ALLUVIAL
  - D = DEEP ALLUVIAL
- LCS-1 273 — LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
- SG-8 435.08 — STAFF GAUGE LOCATION WATER ELEVATION (FEET MSL)

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

NORTH

NOTE: GROUNDWATER AND SURFACE WATER ELEVATIONS AT SG-8 AND SG-9 MEASURED BY GOLDER ON APRIL 3, 1996. GROUNDWATER ELEVATIONS IN "S", "I", "D", "MW", AND SURFACE WATER ELEVATIONS AT SG-6 AND SG-7 LOCATIONS MEASURED BY MCLAREN/HART ON APRIL 3, 1996. (NM = NOT MEASURED OR NO READING).

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

SITE SURFACE WATER RETENTION POND
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
ACTIVE SANITARY LANDFILL PERMIT No.118912
ENTRANCE STATION
ST. CHARLES ROCK ROAD
CLOSED DEMOLITION LANDFILL
ASPHALT PLANT
CONCRETE PLANT
LEACHATE LAGOONS (ABANDONED)
BORROW AREA
AUTO REPAIR FACILITY
INACTIVE LANDFILL
LEACHATE RETENTION POND
OLD ST. CHARLES ROCK ROAD
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

PZ-114-AS 429.93; I-88 429.88; S-84 429.16; D-85 428.74; I-87 429.74; D-14 428.08; D-73 365.24; LCS-1 274; LCS-3 279; LCS-2 284; LCS-4 278; PZ-207-AS 429.86; I-86 429.63; MW-F3 429.63; S-5 429.59; I-4 429.65; D-3 429.82; MW-F1S 429.71; MW-F1D 429.70; PZ-113-AS 429.48; PZ-113-AD 429.62; PZ-112-AS 429.53; D-13 429.61; SG-5 DRY; I-85 429.51; D-87 429.51; PZ-305-AI 429.79; LR-104 429.82; I-73 429.04; PZ-205-AS 429.85; S-86 429.65; LR-103 429.71; D-12 429.49; S-10 429.42; I-11 429.52; SG-1 DRY; SG-2 DRY; SG-3 DRY; SG-4 DRY; I-8 429.53; I-82 429.50; D-86 429.47; S-81 429.49; D-16 429.44; MW-102 429.51; MW-101 429.48; I-7 433.47; PZ-304-AI 429.62; PZ-303-AS 429.77; PZ-304-AS 429.59; MW-103 429.70; S-82 429.52; I-9 429.51; I-10 429.56; S-1 429.57; D-83 428.11; SG-7 DRY; SG-6 DRY; PZ-302-AS 430.03; PZ-302-AI 426.75; S-75 432.19; S-53 429.91; D-81 429.89; MW-104 429.85; S-51 430.48; SG-9 433.97; SG-8 433.99; PZ-300-AS 434.02; I-89 430.61; PZ-300-AD 430.63; I-90 434.12; MW-107 442.46

© Allied Waste Industries (2005)

HERST & ASSOCIATES, INC.®
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-39
Unconsolidated Material
April 3, 1996
Water Table Map

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- PZ-205-AS 431.90 — ALLUVIAL PIEZOMETER (INSTALLED BY GOLDER) (GROUNDWATER ELEVATION (FEET MSL))
  - AS = SHALLOW ALLUVIAL
  - AI = INTERMEDIATE ALLUVIAL
  - AD = DEEP ALLUVIAL
- LR-104 432.04 — LEACHATE RISER LOCATION (INSTALLED BY GOLDER) (GROUNDWATER ELEVATION (FEET MSL))
- MW-F3 432.21 — EXISTING MONITORING WELL (GROUNDWATER ELEVATION (FEET MSL))
- D-13 432.16 — NEWLY INSTALLED MONITORING WELL (INSTALLED BY MCLAREN/HART) (GROUNDWATER ELEVATION (FEET MSL))
  - S = SHALLOW ALLUVIAL
  - I = INTERMEDIATE ALLUVIAL
  - D = DEEP ALLUVIAL
- LCS-1 273 — LEACHATE COLLECTION SUMP (LEACHATE ELEVATION (FEET MSL))
- SG-8 438.08 — STAFF GAUGE LOCATION (WATER ELEVATION (FEET MSL))

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

NORTH

NOTE: GROUNDWATER AND SURFACE WATER ELEVATIONS MEASURED BY GOLDER ON MAY 3, 1995. (NM = NOT MEASURED OR NO READING).

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

SITE SURFACE WATER RETENTION POND

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

ACTIVE SANITARY LANDFILL PERMIT No.118912

ENTRANCE STATION

ST. CHARLES ROCK ROAD

CLOSED DEMOLITION LANDFILL

ASPHALT PLANT

CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

BORROW AREA

INACTIVE LANDFILL

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-40
Unconsolidated Material
May 3, 1996
Water Table Map

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- PZ-205-AS 431.90 — ALLUVIAL PIEZOMETER (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
  - AS = SHALLOW ALLUVIAL
  - AI = INTERMEDIATE ALLUVIAL
  - AD = DEEP ALLUVIAL
- LR-104 432.04 — LEACHATE RISER LOCATION (INSTALLED BY GOLDER) GROUNDWATER ELEVATION (FEET MSL)
- MW-F3 432.21 — EXISTING MONITORING WELL GROUNDWATER ELEVATION (FEET MSL)
- D-13 432.16 — NEWLY INSTALLED MONITORING WELL (INSTALLED BY MCLAREN/HART) GROUNDWATER ELEVATION (FEET MSL)
  - S = SHALLOW ALLUVIAL
  - I = INTERMEDIATE ALLUVIAL
  - D = DEEP ALLUVIAL
- LCS-1 273 — LEACHATE COLLECTION SUMP LEACHATE ELEVATION (FEET MSL)
- SG-8 435.08 — STAFF GAUGE LOCATION WATER ELEVATION (FEET MSL)

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

NORTH

NOTE: GROUNDWATER AND SURFACE WATER ELEVATIONS MEASURED BY GOLDER ON JULY 12, 1996, EXCEPT FOR LCS-1, LCS-2 LCS-3, AND LCS-4 WHICH WERE MEASURED ON JULY 16, 1996. (NM = NOT MEASURED OR NO READING).

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

ACTIVE SANITARY LANDFILL PERMIT No.118912

SITE SURFACE WATER RETENTION POND

ENTRANCE STATION

ST. CHARLES ROCK ROAD

CLOSED DEMOLITION LANDFILL

ASPHALT PLANT

CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

BORROW AREA

INACTIVE LANDFILL

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

HERST & ASSOCIATES, INC.®
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-41
Unconsolidated Material
July 12, 1996
Water Table Map

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- PZ-205-AS 431.90 — OU-2 ALLUVIAL PIEZOMETER (GROUNDWATER ELEVATION (FEET MSL))
  - AS = SHALLOW ALLUVIAL
  - AI = INTERMEDIATE ALLUVIAL
  - AD = DEEP ALLUVIAL
- LR-104 432.04 — OU-2 LEACHATE RISER LOCATION (GROUNDWATER ELEVATION (FEET MSL))
- MW-03 432.31 — PREVIOUSLY EXISTING MONITORING WELL (GROUNDWATER ELEVATION (FEET MSL))
- D-13 432.16 — OU-1 MONITORING WELL (GROUNDWATER ELEVATION (FEET MSL))
  - S = SHALLOW ALLUVIAL
  - I = INTERMEDIATE ALLUVIAL
  - D = DEEP ALLUVIAL
- LCS-1 273 — ACTIVE LANDFILL LEACHATE COLLECTION SUMP (LEACHATE ELEVATION (FEET MSL))

LCS-1 and LCS-3 were not operational in May 2000.

NORTH

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

SITE SURFACE WATER RETENTION POND

ACTIVE SANITARY LANDFILL PERMIT No.118912

CLOSED DEMOLITION LANDFILL

ENTRANCE STATION

ST. CHARLES ROCK ROAD

ASPHALT PLANT

CONCRETE PLANT

LEACHATE LAGOONS (ABANDONED)

BORROW AREA

AUTO REPAIR FACILITY

INACTIVE LANDFILL

LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-42
Unconsolidated Material
May 22, 2000
Water Table Map

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- PZ-205-AS 431.90 — OU-2 ALLUVIAL PIEZOMETER (GROUNDWATER ELEVATION (FEET MSL)) AS = SHALLOW ALLUVIAL; AI = INTERMEDIATE ALLUVIAL; AD = DEEP ALLUVIAL
- LR-104 432.04 — LEACHATE/GROUNDWATER ELEVATION (SURVEYED BY GOLDER)
- MW-F3 432.21 — PREVIOUSLY EXISTING MONITORING WELL (GROUNDWATER ELEVATION (FEET MSL))
- D-13 432.16 — OU-1 MONITORING WELL (GROUNDWATER ELEVATION (FEET MSL)) S = SHALLOW ALLUVIAL; I = INTERMEDIATE ALLUVIAL; D = DEEP ALLUVIAL
- LCS-1 273 — ACTIVE LANDFILL LEACHATE COLLECTION SUMP (LEACHATE ELEVATION (FEET MSL))
- NM — NOT MEASURED

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

NORTH

NOTE: REPLACEMENT LEACHATE WELLS LCS-2A AND LCS-3A HAD NOT YET BEEN SURVEYED AS OF NOVEMBER 2003.

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

PZ-114-AS 428.30
I-66 425.73
S-84 428.00
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
LCS-3A Not Surveyed
BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY
LCS-1A 340.41
ACTIVE SANITARY LANDFILL PERMIT No.118912
LCS-2A Not Surveyed
LCS-4 < 385
ST. CHARLES ROCK ROAD
ENTRANCE STATION
PZ-207-AS 428.17
D-3 428.47
PZ-113-AS 427.75
PZ-113-AD 427.71
PZ-112-AS 428.45
CLOSED DEMOLITION LANDFILL
LR-104 427.95
PZ-305-AI 428.05
CONCRETE PLANT
I-73 450.59
PZ-205-AS 428.91
ASPHALT PLANT
BORROW AREA
LR-103 427.86
LEACHATE LAGOONS (ABANDONED)
AUTO REPAIR FACILITY
INACTIVE LANDFILL
PZ-302-AS 428.13
PZ-302-AI 428.05
OLD ST. CHARLES ROCK ROAD
CLOSED LEACHATE RETENTION POND
PZ-304-AI 427.93
PZ-303-AS 428.01
EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND
EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-43
Unconsolidated Material Unit
November 19, 2003
Water Table Map

EXPLANATION

- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- PZ-205-AS 431.90 — OU-2 ALLUVIAL PIEZOMETER (GROUNDWATER ELEVATION (FEET MSL))
  - AS = SHALLOW ALLUVIAL
  - AI = INTERMEDIATE ALLUVIAL
  - AD = DEEP ALLUVIAL
- LR-104 432.04 — (LONG-TERM MONITORING WELL) (GROUNDWATER ELEVATION (FEET MSL))
- MW-F3 432.21 — PREVIOUSLY EXISTING MONITORING WELL (GROUNDWATER ELEVATION (FEET MSL))
- D-13 432.18 — OU-1 MONITORING WELL (GROUNDWATER ELEVATION (FEET MSL))
  - S = SHALLOW ALLUVIAL
  - I = INTERMEDIATE ALLUVIAL
  - D = DEEP ALLUVIAL
- LCS-1 273 — ACTIVE LANDFILL LEACHATE COLLECTION SUMP (LEACHATE ELEVATION (FEET MSL))
- NM — NOT MEASURED

0 100 200 450 900

Scale in Feet

Graphic Scale: 1 inch = 450 feet

NORTH

NOTE: REPLACEMENT LEACHATE WELLS LCS-2A AND LCS-3A HAD NOT YET BEEN SURVEYED AS OF NOVEMBER 2003.

NOTE: TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

PZ-114-AS 429.55

I-68 427.28

S-84 427.84

D-85 427.91

ENTRANCE STATION

ST. CHARLES ROCK ROAD

PZ-207-AS 463.57

S-5 431.23

I-4 430.33

D-3 430.13

PZ-113-AS 429.38

PZ-113-AD 429.26

PZ-112-AS 430.09

CLOSED DEMOLITION LANDFILL

ASPHALT PLANT

LR-103 429.65

LR-104 429.40

PZ-305-AI 429.48

CONCRETE PLANT

I-73 455.23

PZ-205-AS 430.04

LCS-3A Not Surveyed

LCS-1A 371.13

ACTIVE SANITARY LANDFILL PERMIT No.118912

LCS-2A Not Surveyed

LCS-4A Not Surveyed

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

BORROW AREA

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

INACTIVE LANDFILL

PZ-302-AS 429.86

PZ-302-AI 429.76

CLOSED LEACHATE RETENTION POND

PZ-304-AI 429.89

PZ-303-AS 429.76

PZ-304-AS 429.65

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

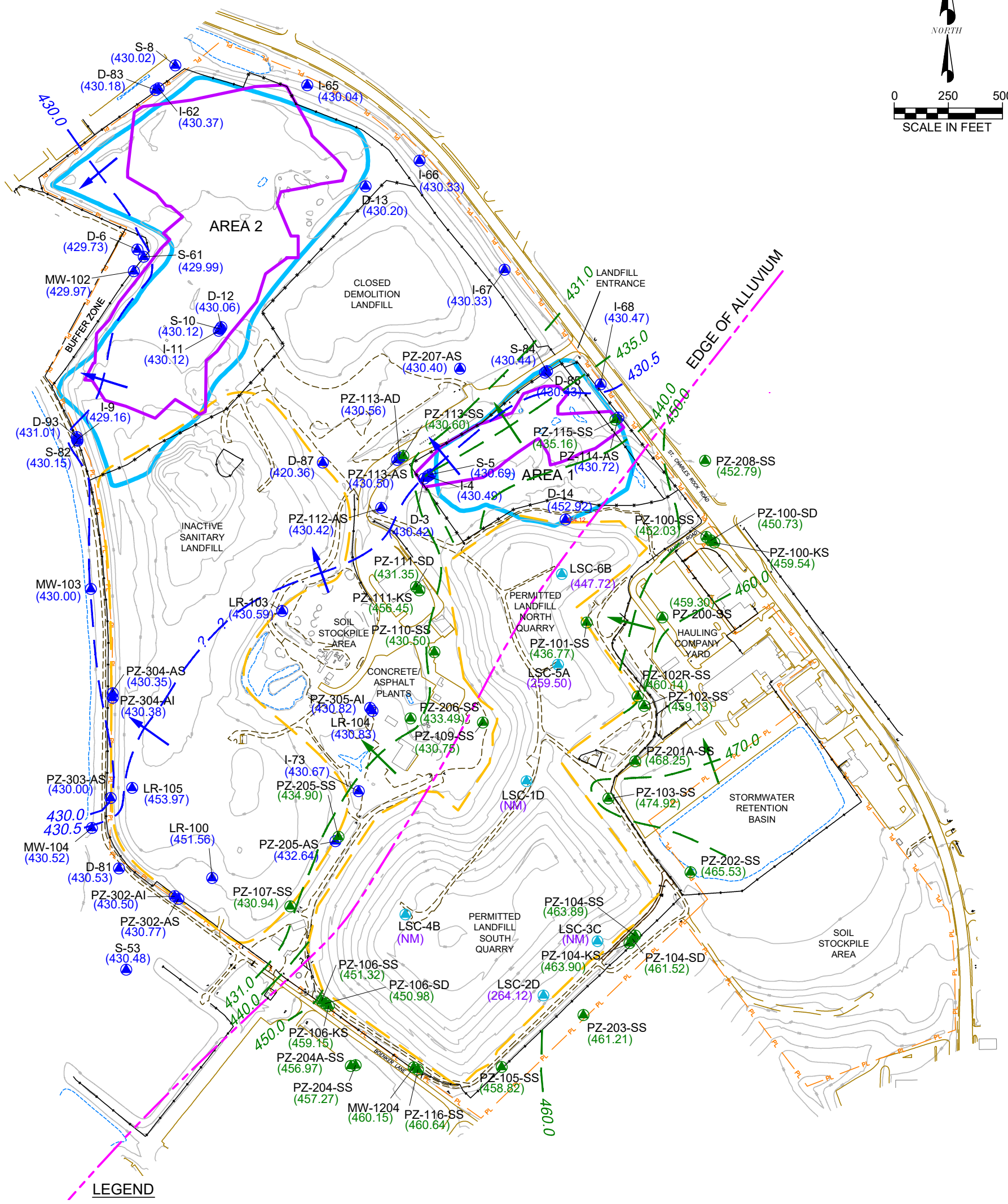
4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 3-44
Unconsolidated Material Unit
May 10, 2004
Water Table Map

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG2-WL-G913.DWG-WO-TOPO 01/30/2014 4:58PM



LEGEND

- Leachate Collection Sump
- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

- 440 — Groundwater Elevation Contour (FAMSL) - Alluvium
- 440 — Groundwater Elevation Contour (FAMSL) - St. Louis Fm
- (279.02) Leachate Groundwater Elevation (FAMSL)
- (429.82) Alluvium Groundwater Elevation (FAMSL)
- (458.64) St. Louis Fm Groundwater Elevation (FAMSL)
- * Groundwater Elevation not used for contouring
- Groundwater Flow Direction - Alluvium
- Groundwater Flow Direction - St. Louis Fm
- (FAMSL) Feet above mean sea level

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

Figure 2

Alluvial Groundwater Table and St. Louis FM. Potentiometric Elevation Map September 30, 2013

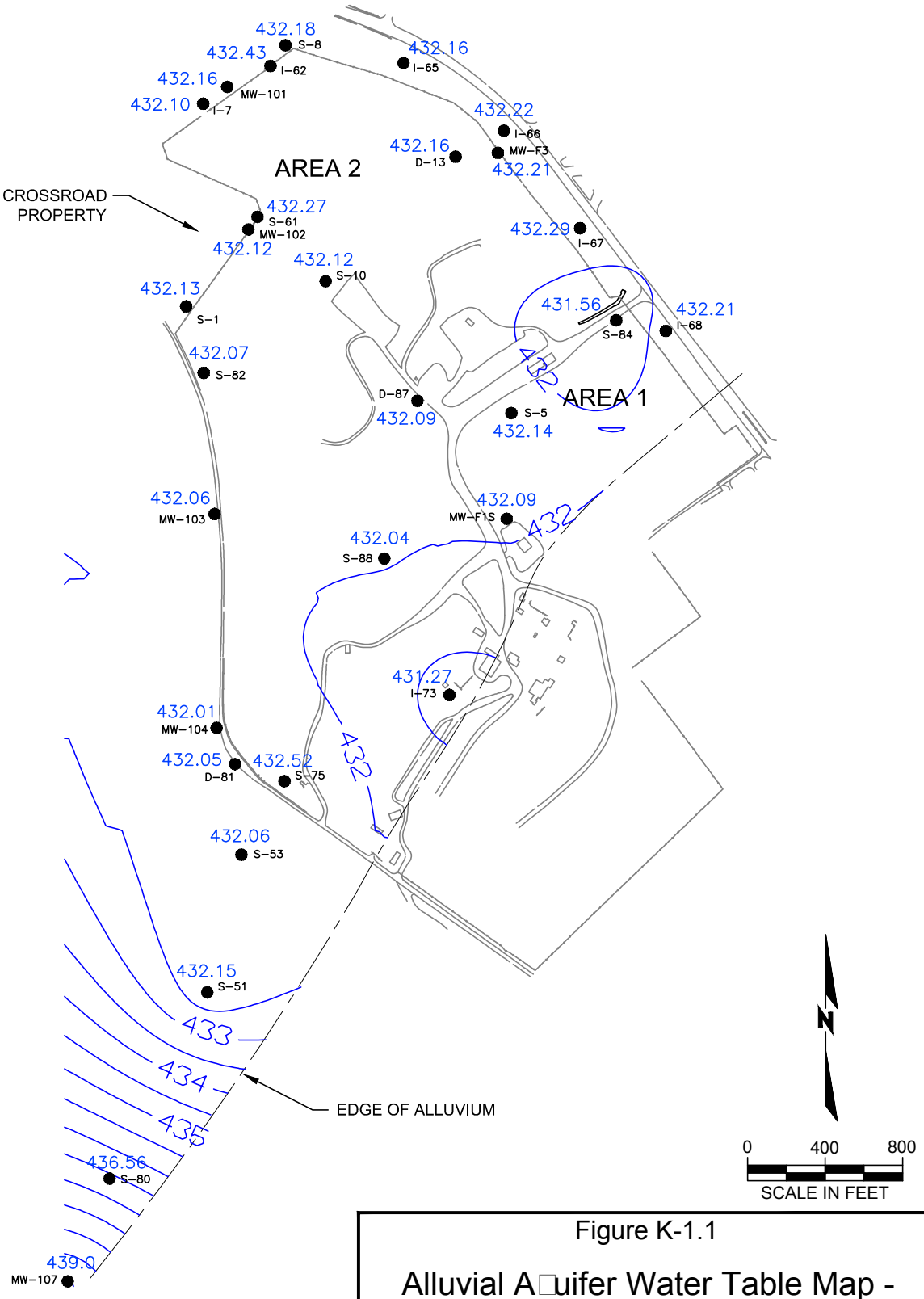
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

Appendix K: Water Level and Potentiometric Surface Maps

KK-1: Alluvial Water Table Maps from the OU-1 RI

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-K\Fig-K1.1-Alluvial AWT-10-95.dwg 1/22/18



LEGEND

441.97 Water table elevation

MW-107 Well number

435 Groundwater Elevation Contour

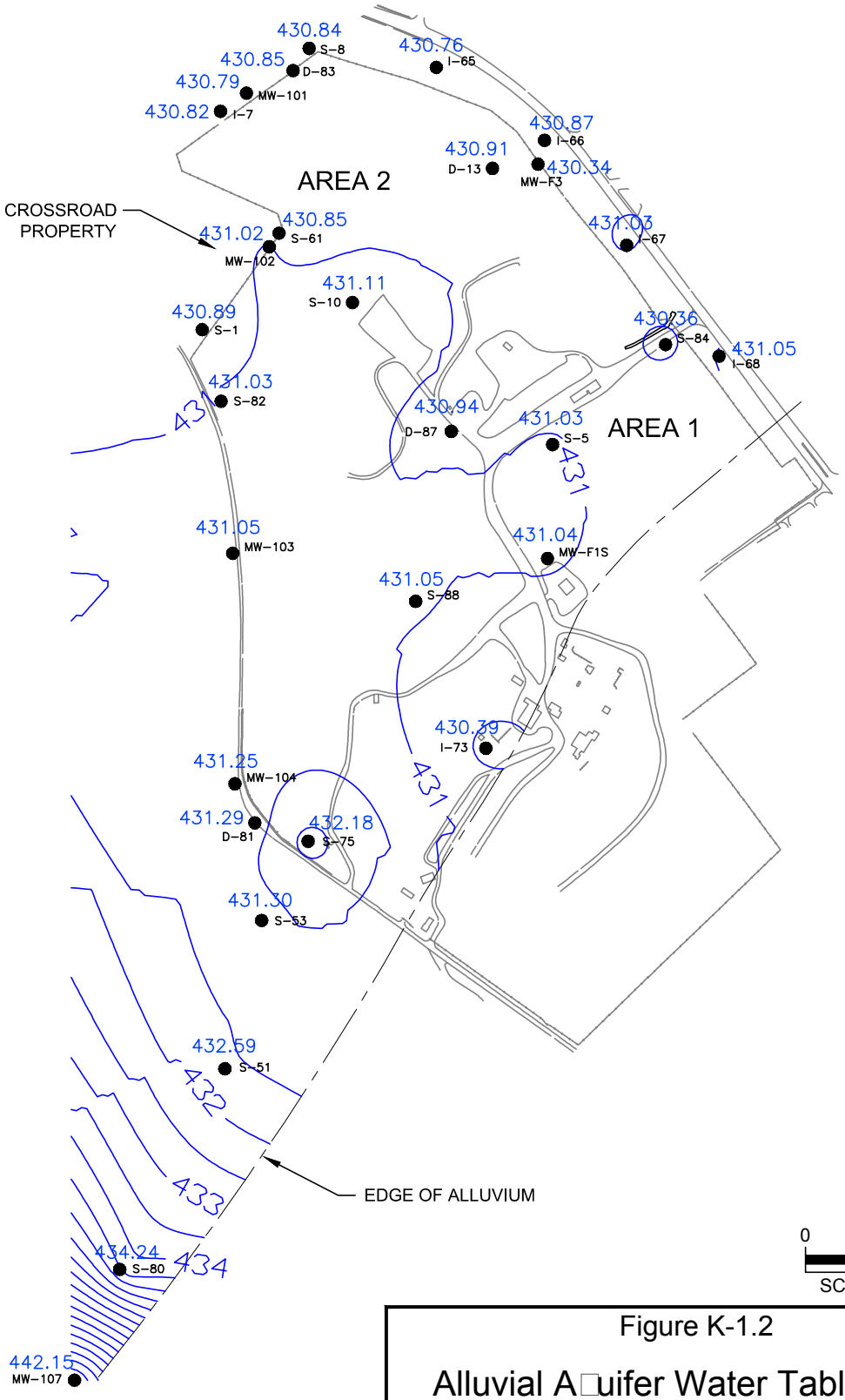
Figure K-1.1

Alluvial Aquifer Water Table Map - October, 1995

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-K\Fig-K1.2-Alluvial AWT-01-96.dwg 1/22/18



LEGEND

441.97 Water table elevation

MW-107 Well number

435 Groundwater Elevation Contour

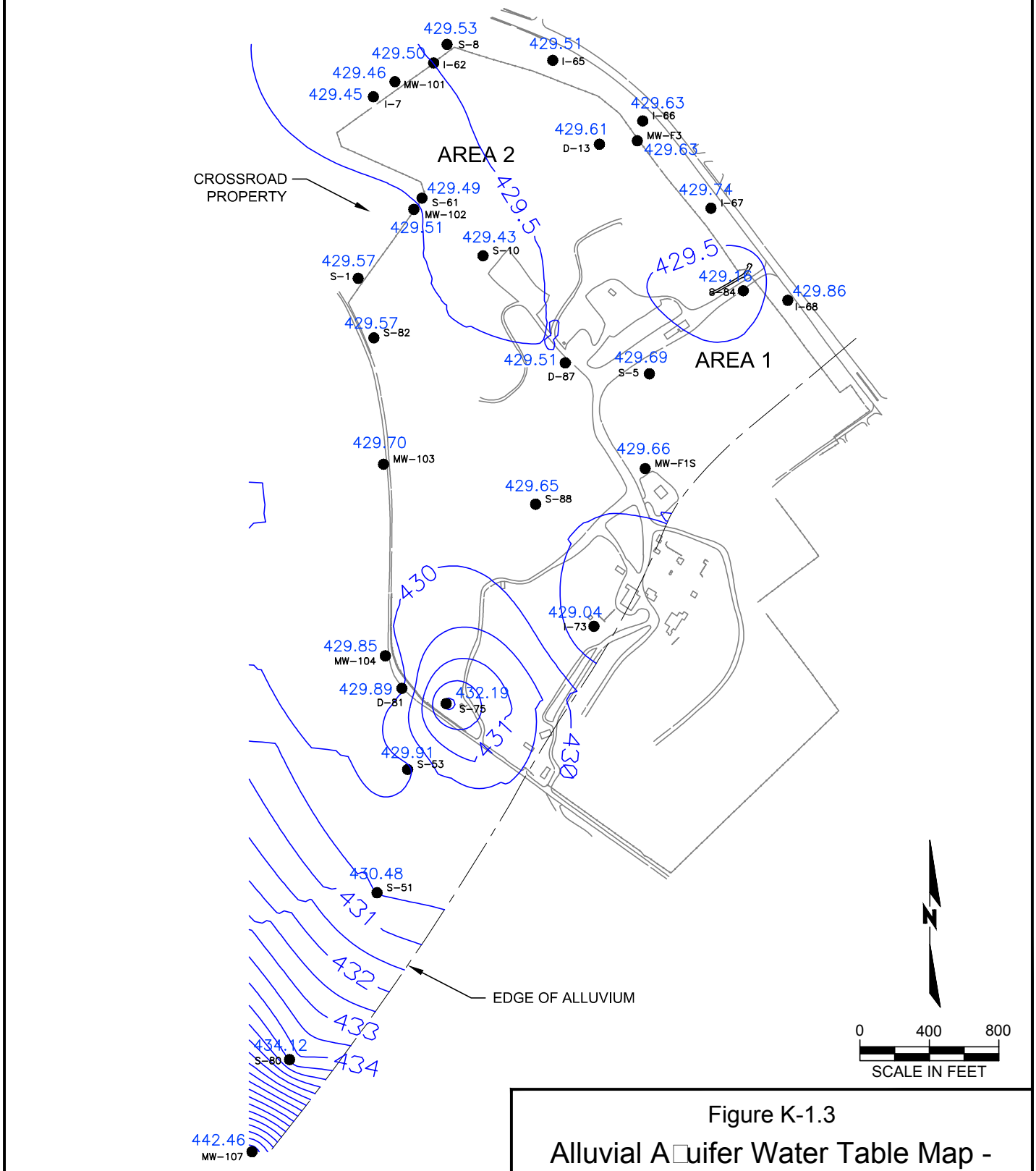
Figure K-1.2

Alluvial Aquifer Water Table Map - January, 1996

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-K\Fig-K1.3-Alluvial AWT-4-96.dwg 1/22/18



LEGEND

441.97 Water table elevation

MW-107 Well number

435 Groundwater Elevation Contour

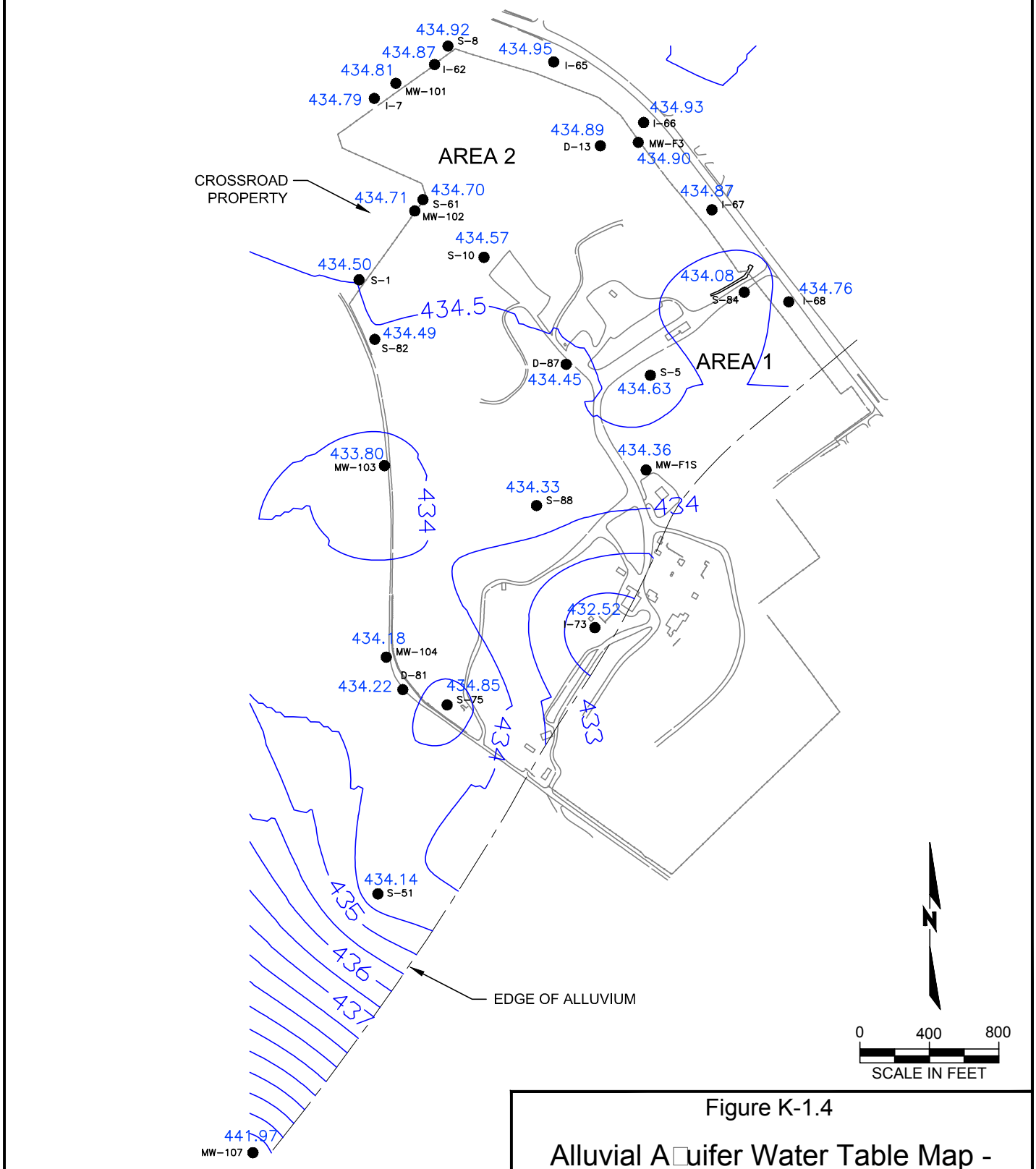
Figure K-1.3

Alluvial Aquifer Water Table Map - April, 1996

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-K\Fig-K1.4-Alluvial AWT-7-96.dwg 1/22/18



LEGEND

441.97 Water table elevation

MW-107 Well number

435 Groundwater Elevation Contour

Figure K-1.4

Alluvial Aquifer Water Table Map - July, 1996

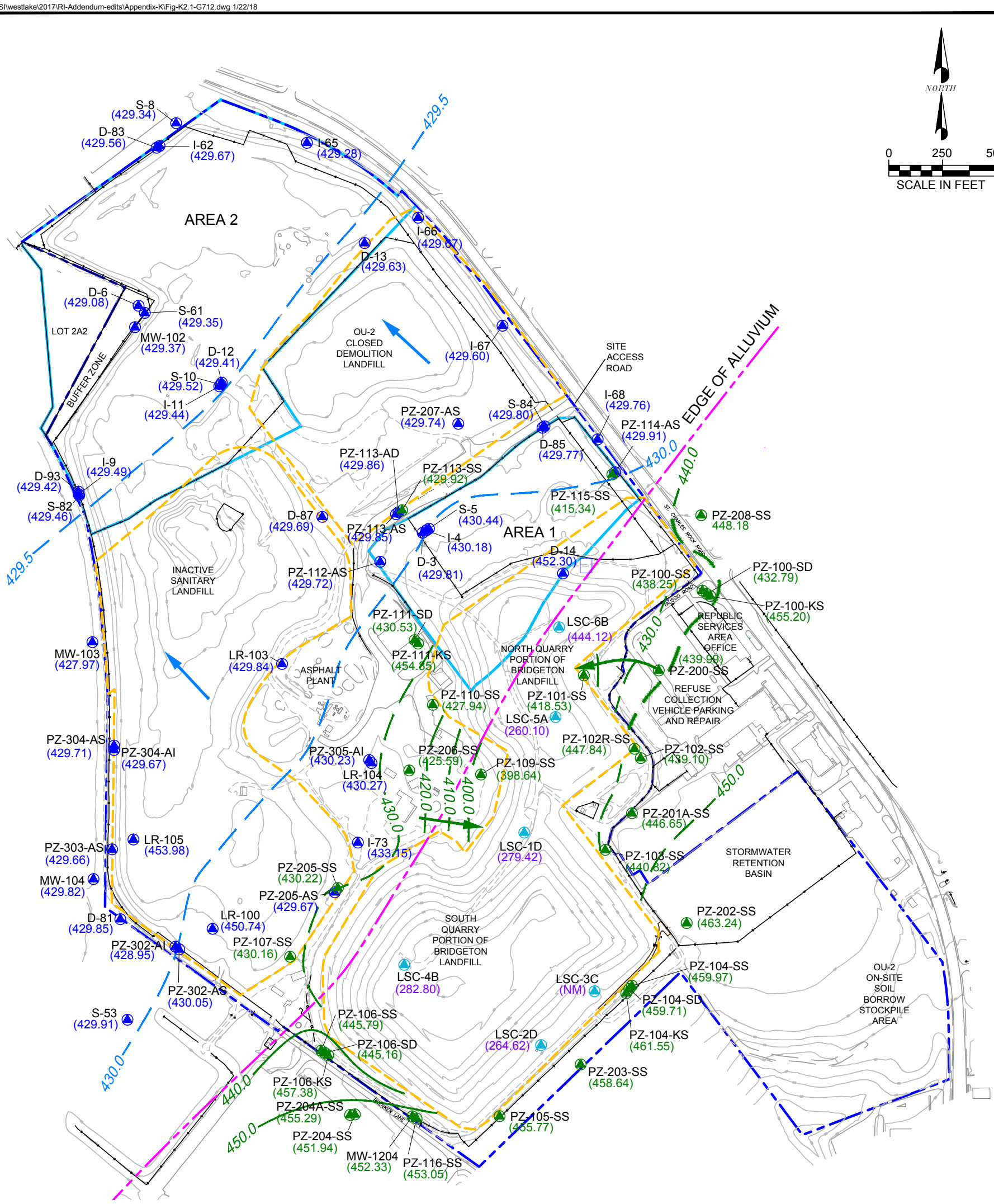
West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

KK-2: Water Table Contour and Potentiometric Maps

2012-2013 Monitoring Events

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-K\Fig-K2.1-G712.dwg 1/22/18



LEGEND

- Leachate Collection Sump
- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

- 440 — Groundwater Elevation Contour (FAMSL) - Alluvium
- 440 — Groundwater Elevation Contour (FAMSL) - St. Louis Fm
- (279.02) Leachate Groundwater Elevation (FAMSL)
- (429.82) Alluvium Groundwater Elevation (FAMSL)
- (458.64) St. Louis Fm Groundwater Elevation (FAMSL)
- Groundwater Elevation not used for contouring
- Groundwater Flow Direction - Alluvium
- Groundwater Flow Direction - St. Louis Fm
- (FAMSL) Feet above mean sea level

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Hori□ontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by A□uaterra Environmental Solutions, Inc.

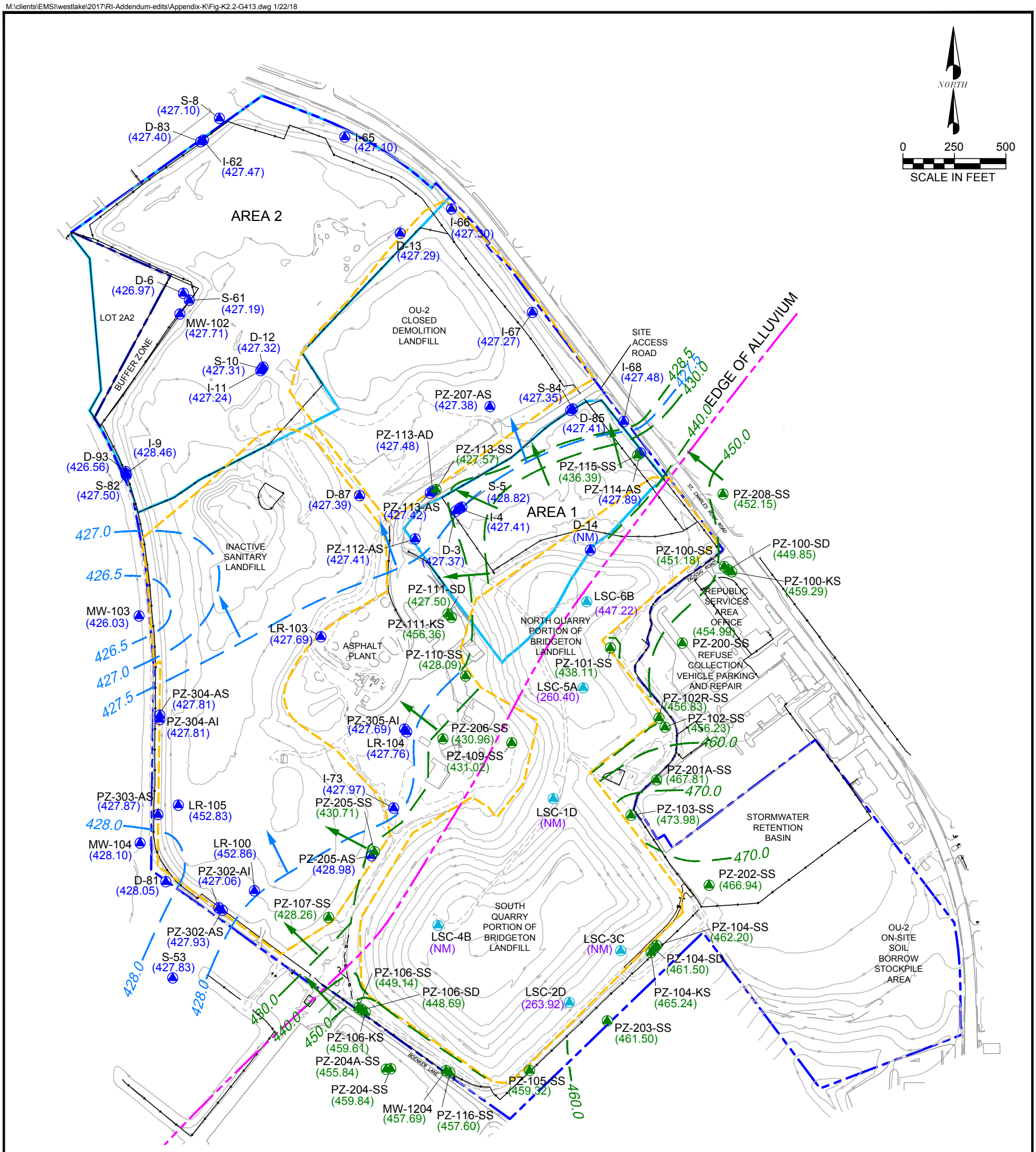
Figure K-2.1

Alluvial Groundwater Table and St. Louis FM. Potentiometric Elevation Map - July 30, 2012

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-K\Fig-K2.2-G413.dwg 1/22/18



LEGEND

- Leachate Collection Sump
- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

- 440 — Groundwater Elevation Contour (FAMSL) - Alluvium
- 440 — Groundwater Elevation Contour (FAMSL) - St. Louis Fm
- (279.02) Leachate Groundwater Elevation (FAMSL)
- (429.82) Alluvium Groundwater Elevation (FAMSL)
- (458.64) St. Louis Fm Groundwater Elevation (FAMSL)
- Groundwater Elevation not used for contouring
- Groundwater Flow Direction - Alluvium
- Groundwater Flow Direction - St. Louis Fm
- (FAMSL) Feet above mean sea level

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Hori□ontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by A□uaterra Environmental Solutions, Inc.

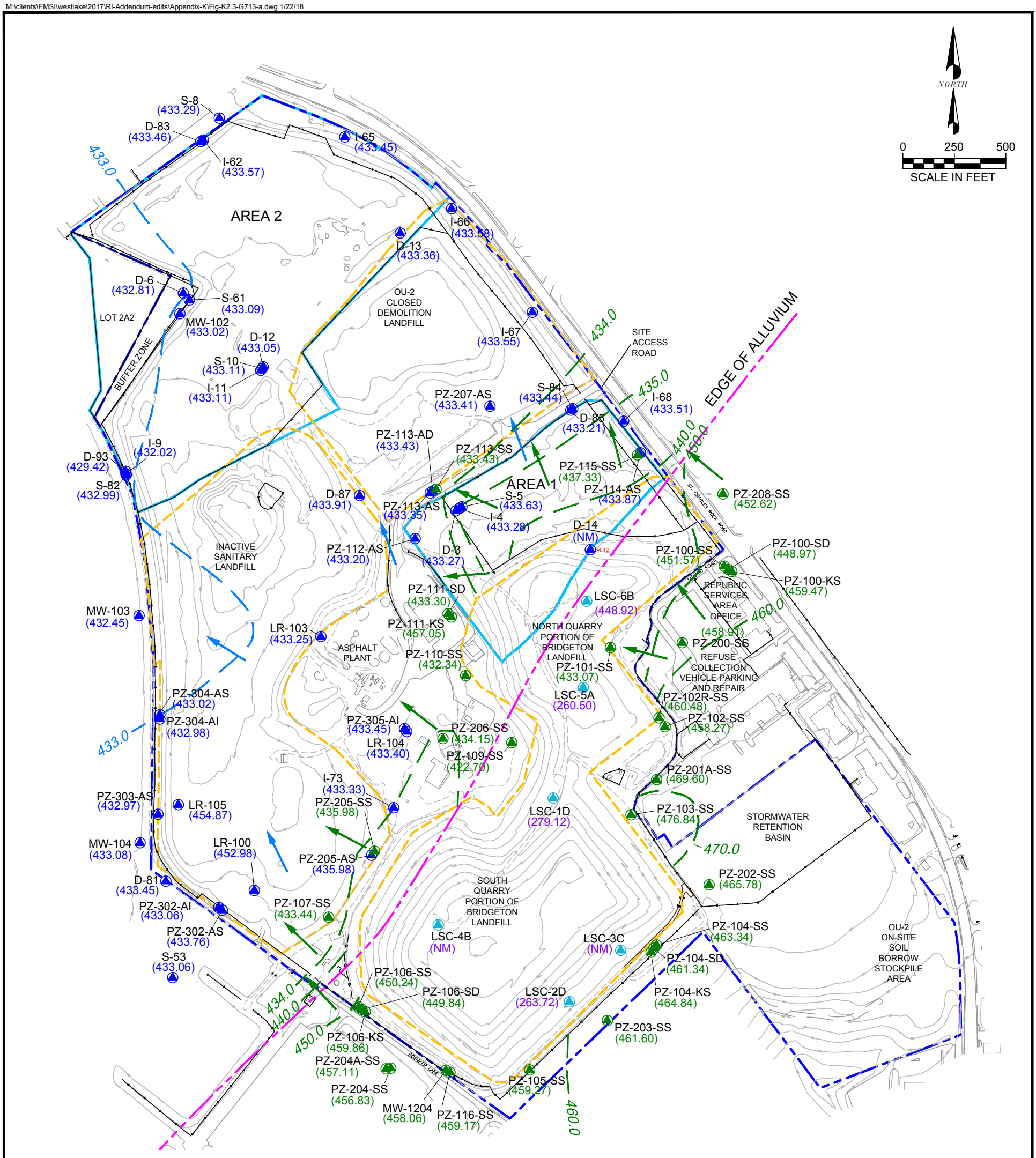
Figure K-2.2

Alluvial Groundwater Table and St. Louis FM. Potentiometric Elevation Map - April 2, 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-K\Fig-K2.3-G713-a.dwg 1/22/18



LEGEND

- Leachate Collection Sump
- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

- 440 Groundwater Elevation Contour (FAMSL) - Alluvium
- 440 Groundwater Elevation Contour (FAMSL) - St. Louis Fm
- (279.02) Leachate Groundwater Elevation (FAMSL)
- (429.82) Alluvium Groundwater Elevation (FAMSL)
- (458.64) St. Louis Fm Groundwater Elevation (FAMSL)
- Groundwater Elevation not used for contouring
- Groundwater Flow Direction - Alluvium
- Groundwater Flow Direction - St. Louis Fm
- (FAMSL) Feet above mean sea level

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Hori□ontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by A□uaterra Environmental Solutions, Inc.

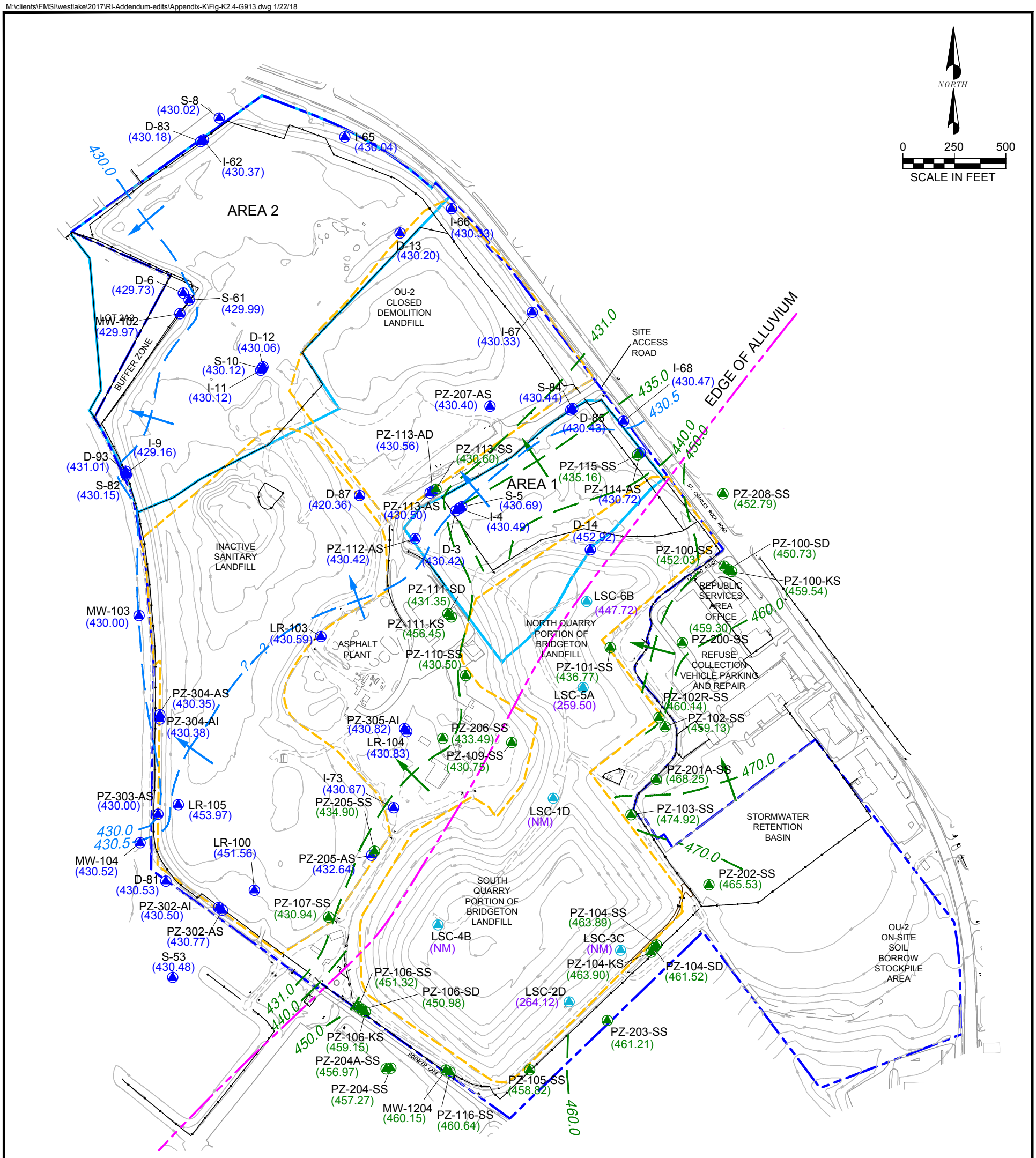
Figure K-2.3

Alluvial Groundwater Table and St. Louis FM. Potentiometric Elevation Map - July 8, 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-K\Fig-K2.4-G913.dwg 1/22/18



LEGEND

- Leachate Collection Sump
- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

- 440 — Groundwater Elevation Contour (FAMSL) - Alluvium
- 440 — Groundwater Elevation Contour (FAMSL) - St. Louis Fm
- (279.02) Leachate Groundwater Elevation (FAMSL)
- (429.82) Alluvium Groundwater Elevation (FAMSL)
- (458.64) St. Louis Fm Groundwater Elevation (FAMSL)
- Groundwater Elevation not used for contouring
- Groundwater Flow Direction - Alluvium
- Groundwater Flow Direction - St. Louis Fm
- (FAMSL) Feet above mean sea level

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Hori□ontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by A□uaterra Environmental Solutions, Inc.

Figure K-2.4

Alluvial Groundwater Table and St. Louis FM. Potentiometric Elevation Map - September 30, 2013

West Lake Landfill OU-1 RI Addedum

EMSI Engineering Management Support, Inc.

APPENDIX O

HYDROGRAPHS

1983 1984

NOV. DEC. JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.

ELEVATION IN FEET

PIEZOMETER NO. I-50

436 434 432 430

PIEZOMETER NO. I-59

436 434 432 430

PIEZOMETEF NO. D-83

434 432 430 428

PIEZOMETER NO. I-62

438 436 434 432 430 428

PIEZOMETER NO. I-68

436 434 432 430 428

Missouri River Stage
At St. Charles

444 442 440 438 436 434 432 430 428

ELEVATION IN FEET

444 442 440 438 436 434 432 430 428

Burns & McDonnell
ENGINEERS · ARCHITECTS · CONSULTANTS

Figure III- 2
PIEZOMETER AND RIVER
HYDROGRAPHS
NOV. 1983-DEC. 1984

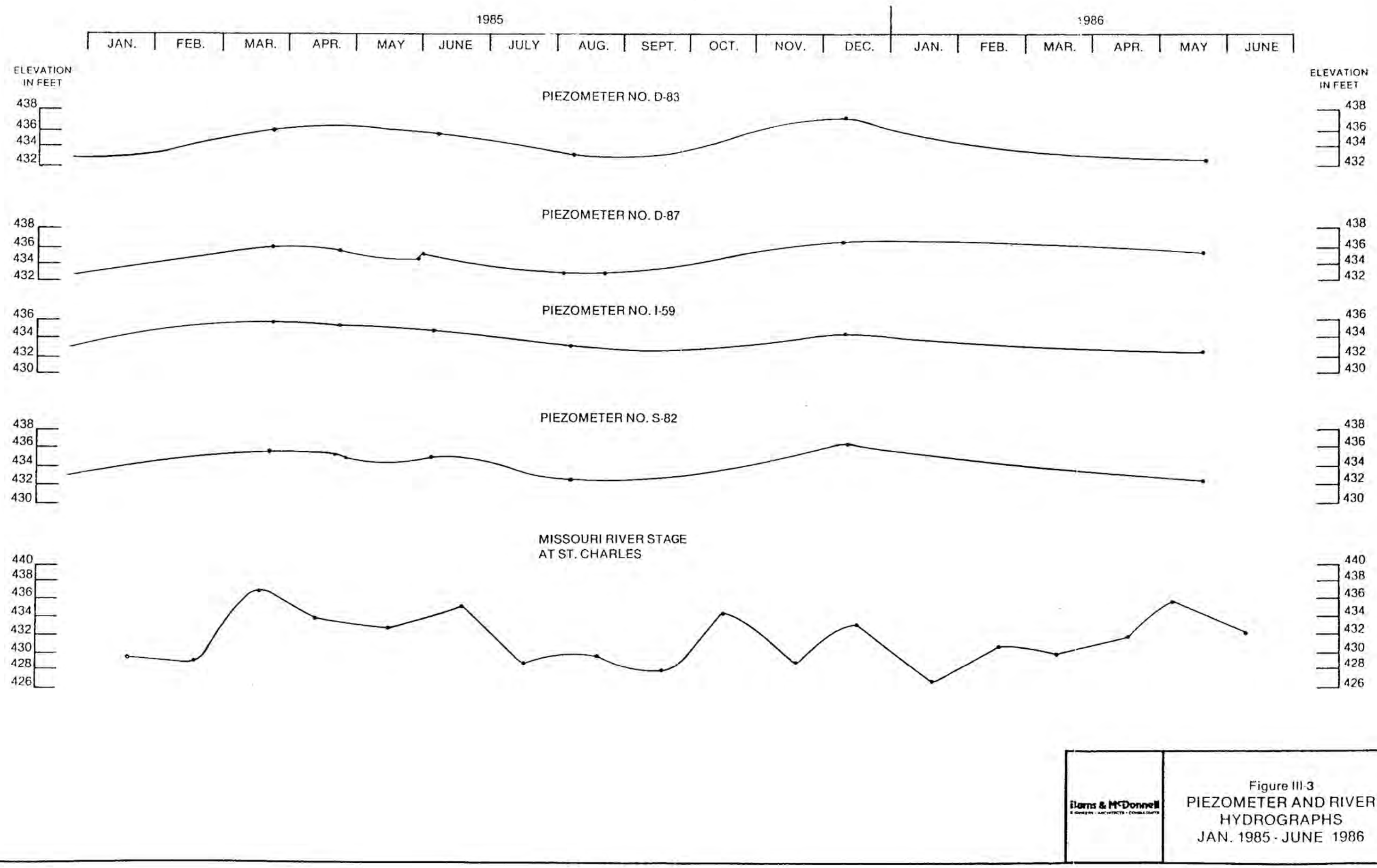


Figure III-3
PIEZOMETER AND RIVER HYDROGRAPHS
JAN. 1985 - JUNE 1986

APPENDIX P

LOCATIONS OF PERCHED WATER

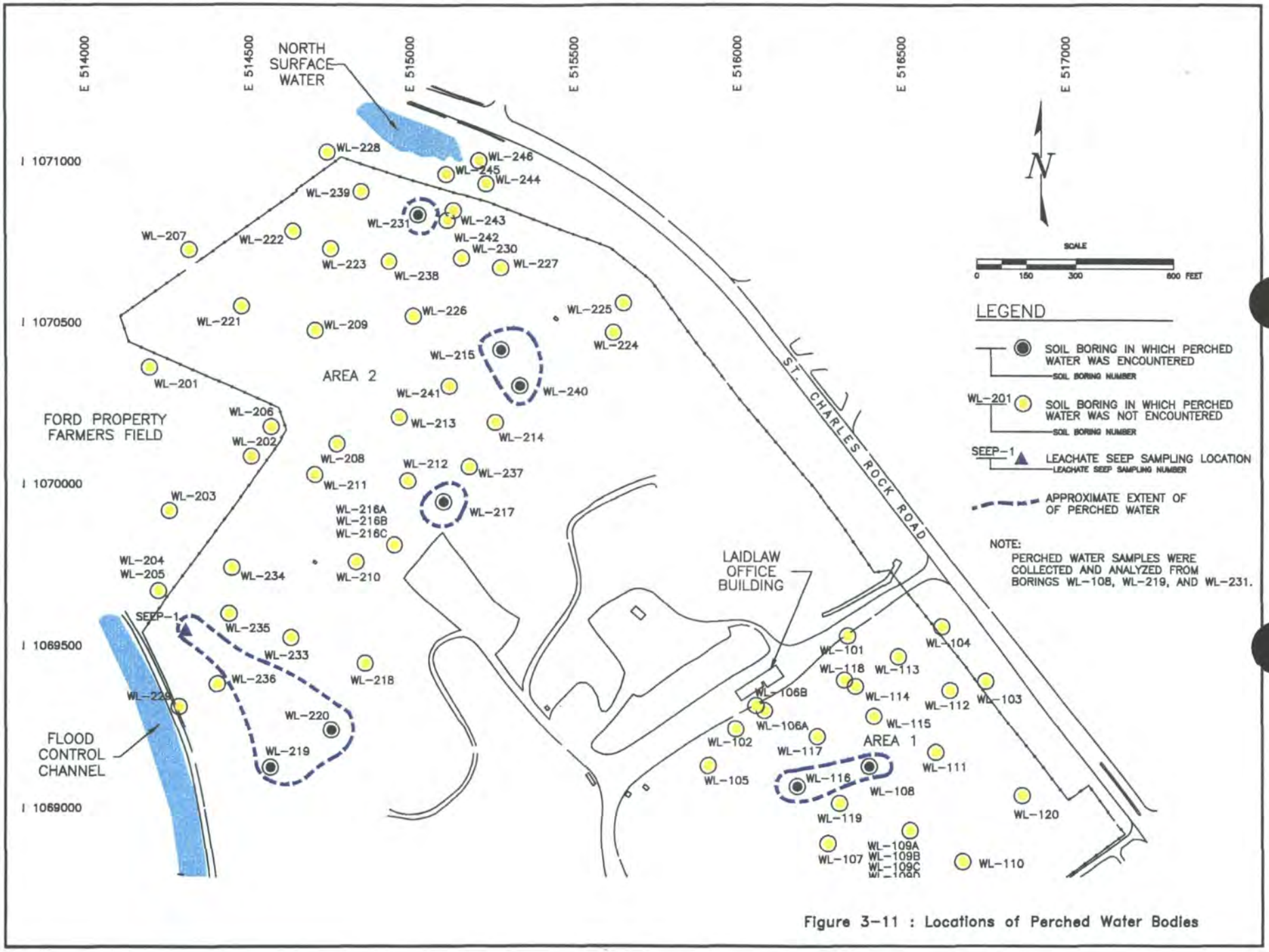


Figure 3-11 : Locations of Perched Water Bodies

APPENDIX Q

VERTICAL GRADIENTS

Table 3-12. Vertical Hydraulic Gradient - October 28, 1995
West Lake Landfill

Interval Monitored	Piezometer Pair	Δ H	Δ L	i_v
Shallow Alluvium to Intermediate Alluvium	PZ-302-AS / PZ-302-AI	432.34-432.16	432.40-412.50	0.009
Shallow Alluvium to Intermediate Alluvium	PZ-304-AS / PZ-304-AI	432.19-432.19	429.40-407.70	0
Shallow Alluvium to Deep Alluvium	PZ-113-AS / PZ-113-AD	432.19-432.28	425.92-356.36	-0.0013
Shallow Alluvium to Deep Alluvium	PZ-300-AS / PZ-300-AD	436.41-432.89	433.70-408.60	0.14
Shallow Alluvium to St. Louis/Salem	PZ-114-AS / PZ-115-SS	432.11-413.09	424.78-370.03	0.34
Shallow Alluvium to St. Louis/Salem	PZ-205-AS / PZ-205-SS	431.90-421.69	416.88-367.56	0.21
Deep Alluvium to St. Louis/Salem	PZ-113-AD / PZ-113-SS	432.28-432.29	356.36-306.36	-0.0002
Deep Alluvium to St. Louis/Salem	PZ-300-AD / PZ-300-SS	432.89-428.62	408.60-359.61	0.09
St. Louis/Salem to Deep Salem	PZ-100-SS / PZ-100-SD	414.04-363.78	400.57-244.65	0.32
St. Louis/Salem to Deep Salem	PZ-104-SS / PZ-104-SD	360.34-341.68	342.16-241.25	0.18
St. Louis/Salem to Deep Salem	PZ-106-SS / PZ-106-SD	350.41-346.40	300.75-265.75	0.11
Deep Salem to Keokuk	PZ-100-SD / PZ-100-KS	363.78-433.90	244.65-104.86	-0.50
Deep Salem to Keokuk	PZ-104-SD / PZ-104-KS	341.68-440.99	241.25-80.05	-0.62
Deep Salem to Keokuk	PZ-106-SD / PZ-106-KS	346.40-439.47	265.75-93.07	-0.53
Deep Salem to Keokuk	PZ-111-SD / PZ-111-KS	431.90-439.68	254.92-97.18	-0.05

Δ H = Head differential
Δ L = Distance differential
i_v = vertical gradient
(-) The negative sign is used in the contect of this table to represent an upward gradient (i_v). Thus, a positive value represent a downward gradient.

Table 3-13. Vertical Hydraulic Gradient - January 4, 1996
West Lake Landfill

Interval Monitored	Piezometer Pair	Δ H	Δ L	i_v
Shallow Alluvium to Intermediate Alluvium	PZ-302-AS / PZ-302-AI	431.34-431.27	432.40-412.50	0.004
Shallow Alluvium to Intermediate Alluvium	PZ-304-AS / PZ-304-AI	431.13-431.16	429.40-407.70	-0.008
Shallow Alluvium to Deep Alluvium	PZ-113-AS / PZ-113-AD	431.07-431.03	425.92-356.36	0.006
Shallow Alluvium to Deep Alluvium	PZ-300-AS / PZ-300-AD	434.11-432.12	433.70-408.60	0.08
Shallow Alluvium to St. Louis/Salem	PZ-114-AS / PZ-115-SS	431.20-414.34	424.78-370.03	0.31
Shallow Alluvium to St. Louis/Salem	PZ-205-AS / PZ-205-SS	430.98-420.28	416.88-367.56	0.22
Deep Alluvium to St. Louis/Salem	PZ-113-AD / PZ-113-SS	431.03-431.16	356.36-306.36	-0.003
Deep Alluvium to St. Louis/Salem	PZ-300-AD / PZ-300-SS	432.12-427.50	408.60-359.61	0.09
St. Louis/Salem to Deep Salem	PZ-100-SS / PZ-100-SD	413.63-355.04	400.57-244.65	0.38
St. Louis/Salem to Deep Salem	PZ-104-SS / PZ-104-SD	361.53-343.15	342.16-241.25	0.18
St. Louis/Salem to Deep Salem	PZ-106-SS / PZ-106-SD	343.70-341.52	300.75-265.75	0.06
Deep Salem to Keokuk	PZ-100-SD / PZ-100-KS	355.04-432.69	244.65-104.86	-0.56
Deep Salem to Keokuk	PZ-104-SD / PZ-104-KS	343.15-440.22	241.25-80.05	-0.6
Deep Salem to Keokuk	PZ-106-SD / PZ-106-KS	341.52-438.61	265.75-93.07	-0.56
Deep Salem to Keokuk	PZ-111-SD / PZ-111-KS	430.63-438.77	254.92-97.18	-0.05

Δ H = Head differential
Δ L = Distance differential
i_v = vertical gradient
(-) The negative sign is used in the contect of this table to represent an upward gradient (i_v). Thus, a positive value represent a downward gradient.

Table 3-14. Vertical Hydraulic Gradient - April 3, 1996
West Lake Landfill

Interval Monitored	Piezometer Pair	Δ H	Δ L	i_v
Shallow Alluvium to Intermediate Alluvium	PZ-302-AS / PZ-302-AI	430.03-426.75	432.40-412.50	0.16
Shallow Alluvium to Intermediate Alluvium	PZ-304-AS / PZ-304-AI	429.59-429.62	429.40-407.70	-0.0014
Shallow Alluvium to Deep Alluvium	PZ-113-AS / PZ-113-AD	429.48-429.62	425.92-356.36	-0.002
Shallow Alluvium to Deep Alluvium	PZ-300-AS / PZ-300-AD	434.02-430.63	433.70-408.60	0.14
Shallow Alluvium to St. Louis/Salem	PZ-114-AS / PZ-115-SS	429.93-414.31	424.78-370.03	0.28
Shallow Alluvium to St. Louis/Salem	PZ-205-AS / PZ-205-SS	429.85-419.11	416.88-367.56	0.22
Deep Alluvium to St. Louis/Salem	PZ-113-AD / PZ-113-SS	429.62-429.65	356.36-306.36	-0.0006
Deep Alluvium to St. Louis/Salem	PZ-300-AD / PZ-300-SS	430.63-426.58	408.60-359.61	0.08
St. Louis/Salem to Deep Salem	PZ-100-SS / PZ-100-SD	412.87-372.88	400.57-244.65	0.26
St. Louis/Salem to Deep Salem	PZ-104-SS / PZ-104-SD	362.99-360.25	342.16-241.25	0.03
St. Louis/Salem to Deep Salem	PZ-106-SS / PZ-106-SD	357.55-350.17	300.75-265.75	0.21
Deep Salem to Keokuk	PZ-100-SD / PZ-100-KS	372.88-435.71	244.65-104.86	-0.45
Deep Salem to Keokuk	PZ-104-SD / PZ-104-KS	360.25-442.94	241.25-80.05	-0.51
Deep Salem to Keokuk	PZ-106-SD / PZ-106-KS	350.17-440.50	265.75-93.07	-0.52
Deep Salem to Keokuk	PZ-111-SD / PZ-111-KS	428.90-440.13	254.92-97.18	-0.07

Δ H = Head differential
Δ L = Distance differential
i_v = vertical gradient
(-) The negative sign is used in the contect of this table to represent an upward gradient (i_v). Thus, a positive value represent a downward gradient.

Table 3-15. Vertical Hydraulic Gradient - May 3, 1996
West Lake Landfill

Interval Monitored	Piezometer Pair	Δ H	Δ L	i_v
Shallow Alluvium to Intermediate Alluvium	PZ-302-AS / PZ-302-AI	431.26-431.10	432.40-412.50	0.008
Shallow Alluvium to Intermediate Alluvium	PZ-304-AS / PZ-304-AI	431.07-431.13	429.40-407.70	-0.003
Shallow Alluvium to Deep Alluvium	PZ-113-AS / PZ-113-AD	430.79-430.81	425.92-356.36	-0.003
Shallow Alluvium to St. Louis/Salem	PZ-114-AS / PZ-115-SS	431.60-423.51	424.78-370.03	0.15
Shallow Alluvium to St. Louis/Salem	PZ-205-AS / PZ-205-SS	430.68-420.13	416.88-367.56	0.21
Deep Alluvium to St. Louis/Salem	PZ-113-AD / PZ-113-SS	430.81-430.89	356.36-306.36	-0.002
St. Louis/Salem to Deep Salem	PZ-100-SS / PZ-100-SD	412.83-367.82	400.57-244.65	0.29
St. Louis/Salem to Deep Salem	PZ-104-SS / PZ-104-SD	376.44-370.88	342.16-241.25	0.06
St. Louis/Salem to Deep Salem	PZ-106-SS / PZ-106-SD	371.56-364.81	300.75-265.75	0.19
Deep Salem to Keokuk	PZ-100-SD / PZ-100-KS	367.82-435.56	244.65-104.86	-0.48
Deep Salem to Keokuk	PZ-104-SD / PZ-104-KS	370.88-443.35	241.25-80.05	-0.45
Deep Salem to Keokuk	PZ-106-SD / PZ-106-KS	364.81-440.68	365.75-93.07	-0.43
Deep Salem to Keokuk	PZ-111-SD / PZ-111-KS	429.00-440.16	254.92-97.18	-0.07

Δ H = Head differential
Δ L = Distance differential
i_v = vertical gradient
(-) The negative sign is used in the contect of this table to represent an upward gradient (i_v). Thus, a positive value represent a downward gradient.

Table 3-16. Vertical Hydraulic Gradient - July 12, 1996
West Lake Landfill

Interval Monitored	Piezometer Pair	Δ H	Δ L	i_v
Shallow Alluvium to Intermediate Alluvium	PZ-302-AS / PZ-302-AI	434.12-434.05	432.40-412.50	0.0035
Shallow Alluvium to Intermediate Alluvium	PZ-304-AS / PZ-304-AI	434.14-434.20	429.40-407.70	-0.003
Shallow Alluvium to Deep Alluvium	PZ-113-AS / PZ-113-AD	434.39-434.35	425.92-356.36	0.0006
Shallow Alluvium to St. Louis/Salem	PZ-114-AS / PZ-115-SS	434.46-421.85	424.78-370.03	0.23
Shallow Alluvium to St. Louis/Salem	PZ-205-AS / PZ-205-SS	433.71-422.97	416.88-367.56	0.22
Deep Alluvium to St. Louis/Salem	PZ-113-AD / PZ-113-SS	434.35-434.46	356.36-306.36	-0.002
St. Louis/Salem to Deep Salem	PZ-100-SS / PZ-100-SD	412.94-367.04	400.57-244.65	0.29
St. Louis/Salem to Deep Salem	PZ-104-SS / PZ-104-SD	371.10-367.77	342.16-241.25	0.03
St. Louis/Salem to Deep Salem	PZ-106-SS / PZ-106-SD	368.46-367.31	300.75-265.75	0.03
Deep Salem to Keokuk	PZ-100-SD / PZ-100-KS	367.04-439.35	244.65-104.86	-0.52
Deep Salem to Keokuk	PZ-104-SD / PZ-104-KS	367.77-447.40	241.25-80.05	-0.49
Deep Salem to Keokuk	PZ-106-SD / PZ-106-KS	367.31-444.46	265.75-93.07	-0.45
Deep Salem to Keokuk	PZ-111-SD / PZ-111-KS	433.46-443.66	254.92-97.18	-0.06

Δ H = Head differential
Δ L = Distance differential
i_v = vertical gradient
(-) The negative sign is used in the contect of this table to represent an upward gradient (i_v). Thus, a positive value represent a downward gradient.

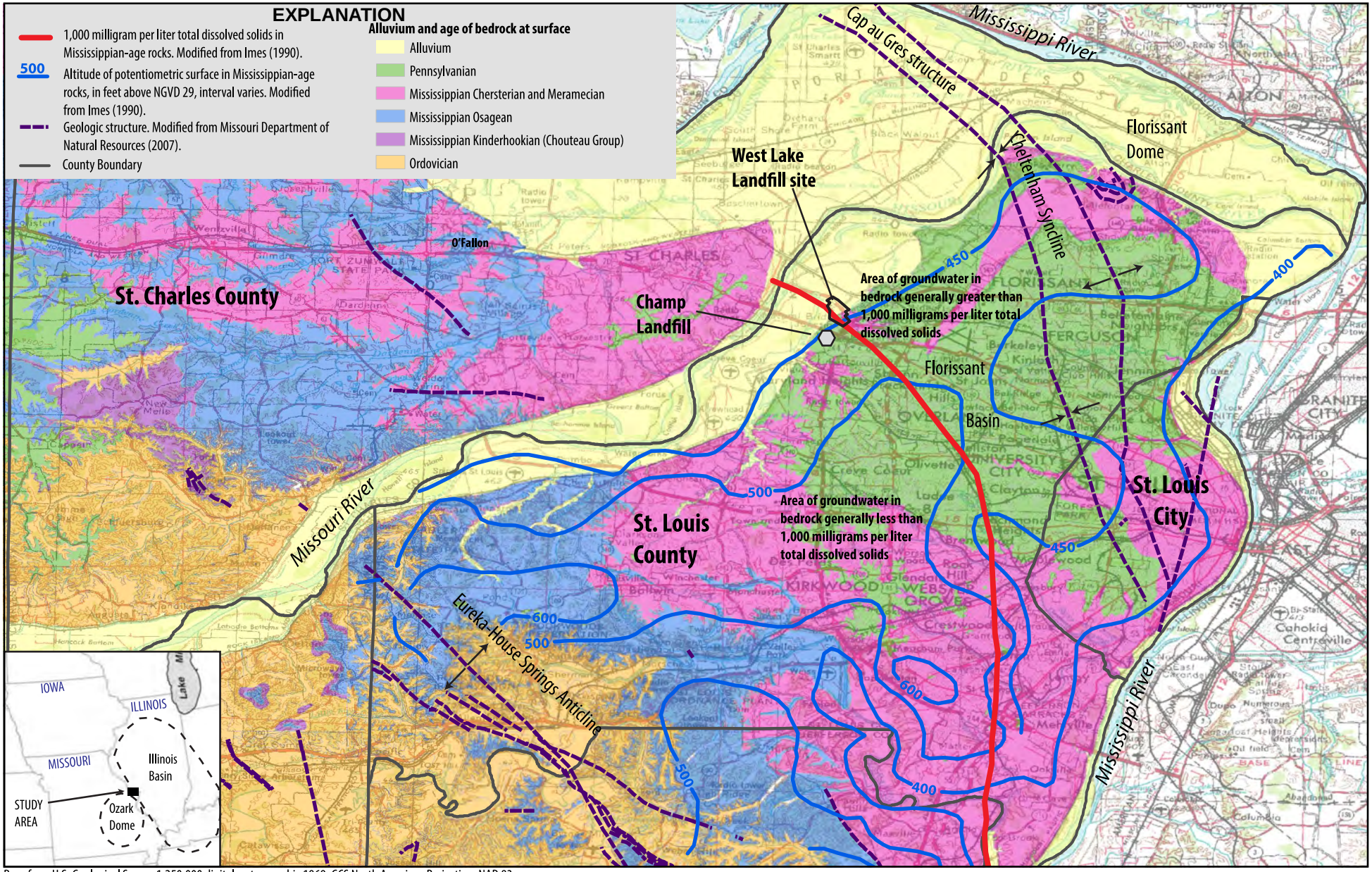
Table 3: Vertical Groundwater Gradients, September 30, 2013

Well	Water Level Elevation (ft amsl)	Original Top of Screen Elevation (ft amsl)	Original Bottom of Screen Elevation (ft amsl)	Midpoint Elevation of Screen Interval (ft amsl)	Head Difference (ft)	Difference in Screen Midpoint Elevations (ft)	Vertical Gradient (ft/ft)
Alluvial Well Clusters							
S-5	430.69	435.70	425.70	430.70	0.20	36.20	0.0055
I-4	430.49	399.50	389.50	394.50	0.07	28.80	0.0024
D-3	430.42	370.70	360.70	365.70	0.27	65.00	0.0042
MW-102	429.97	432.18	422.18	427.18	0.24	84.28	0.0028
D-6	429.73	347.90	337.90	342.90			
S-10	430.12	445.50	425.50	435.50	0.00	43.40	0.0000
I-11	430.12	397.10	387.10	392.10	0.06	53.40	0.0011
D-12	430.06	343.70	333.70	338.70	0.06	96.80	0.0006
S-8	430.02	434.80	414.80	424.80	-0.35	19.70	-0.0178
I-62	430.37	410.10	400.10	405.10	0.19	47.70	0.0040
D-83	430.18	367.40	347.40	357.40	-0.16	67.40	-0.0024
S-84	430.44	432.00	422.00	427.00	0.01	45.90	0.0002
D-85	430.43	391.10	371.10	381.10			
S-82	430.15	432.20	422.20	427.20	0.99	26.80	0.0369
I-9	429.16	405.40	395.40	400.40	-1.85	29.70	-0.0623
D-93	431.01	380.70	360.70	370.70	-0.86	56.50	-0.0152
PZ-302-AS	430.77	437.30	427.50	432.40	0.27	19.90	0.0136
PZ-302-AI	430.50	417.40	407.60	412.50			
PZ-304-AS	430.35	434.30	424.50	429.40	-0.03	21.70	-0.0014
PZ-304-AI	430.38	412.60	402.80	407.70			
Alluvial and Bedrock Well Clusters							
PZ-113-AS	430.50	431.00	421.20	426.10	-0.06	69.70	-0.0009
PZ-113-AD	430.56	361.30	351.50	356.40	-0.04	49.87	-0.0008
PZ-113-SS	430.60	311.43	301.63	306.53	-0.10	119.57	-0.0008
PZ-205-AS	432.64	420.75	410.95	415.85	-2.26	49.82	-0.0454
PZ-205-SS	434.90	370.93	361.13	366.03			

Notes: Positive values for vertical gradient indicate a downward gradient whereas negative values indicate an upward gradient

APPENDIX R

GEOCHEMICAL DIAGRAMS



Base from U.S. Geological Survey 1:250,000 digital raster graphic,1969, GCS North American Projection, NAD 83
Geologic structure, bedrock, and alluvium from Missouri Department of Natural Resources, Missouri Environmental Geology Atlas 2007
Insert map modified from Higley and others (2003)

Figure 1. Geologic structure, age of bedrock units, and generalized potentiometric surface within the Mississippian-age bedrock in St. Louis County and St. Louis City.

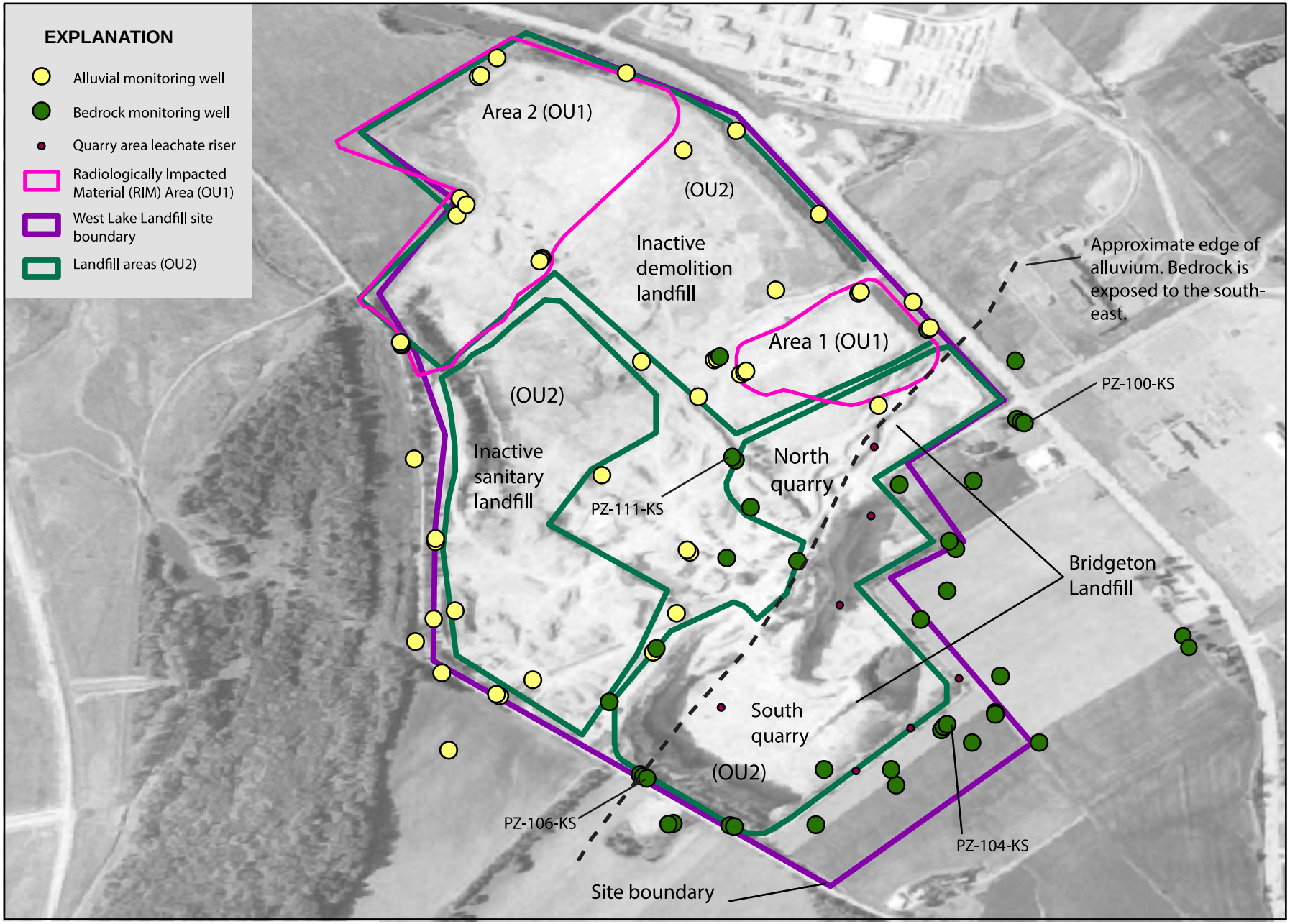


Figure 2. 1974 aerial photograph of the West Lake Landfill site, former landfill areas, areas containing radiologically impacted material (RIM), and monitoring wells at the West Lake Landfill site.

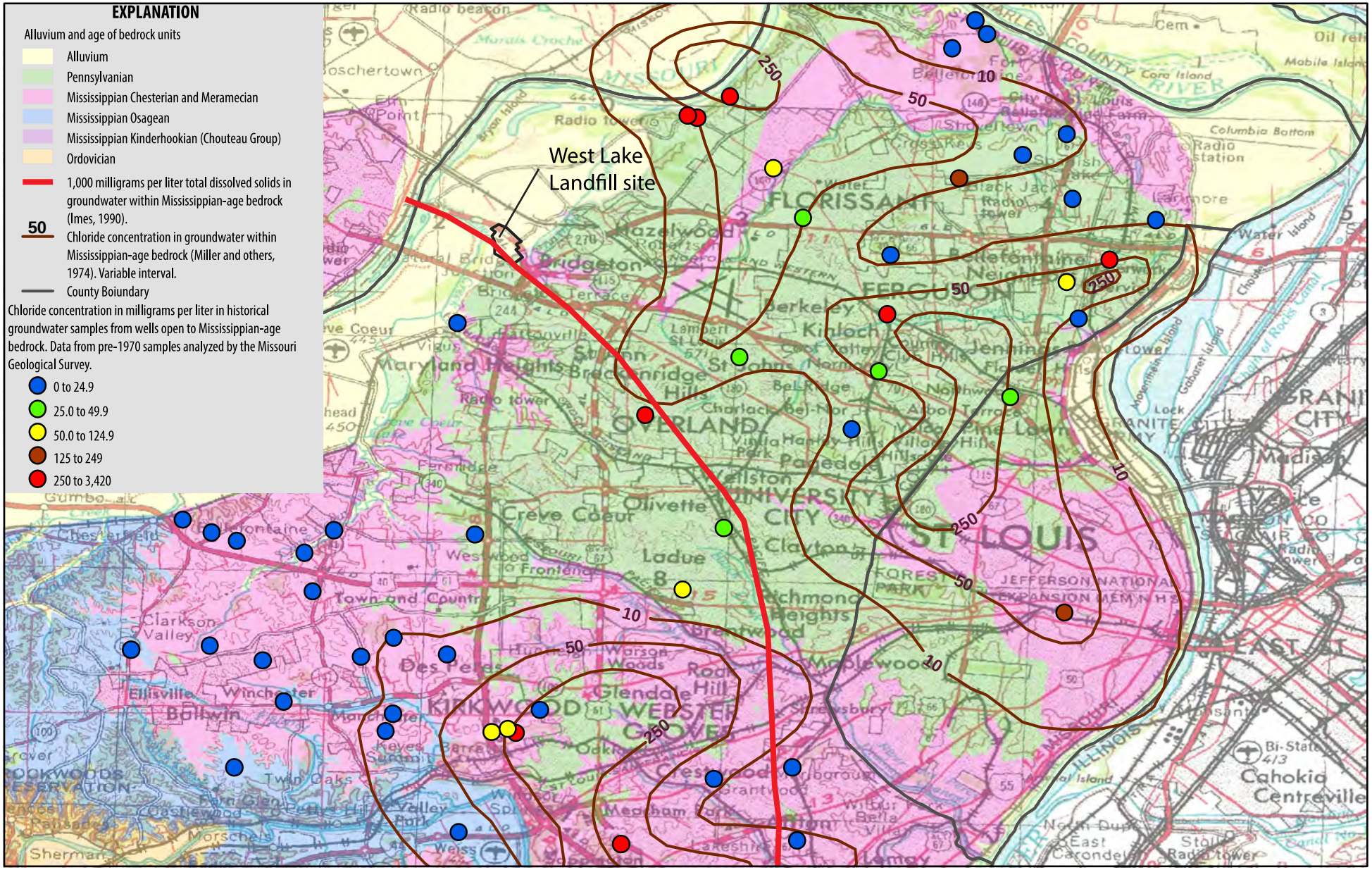


Figure 3. Contours of chloride concentration in the Mississippian-age bedrock from Miller and others (1974) and chloride concentration in historical (1934–70) water samples from water wells analyzed by the Missouri Geological Survey (MGS). Historical MGS sample data pulled from the USGS National Water Information System (http://waterdata.usgs.gov/nwis). Note chloride contours and data values are from different sources and may not directly correspond to each other.

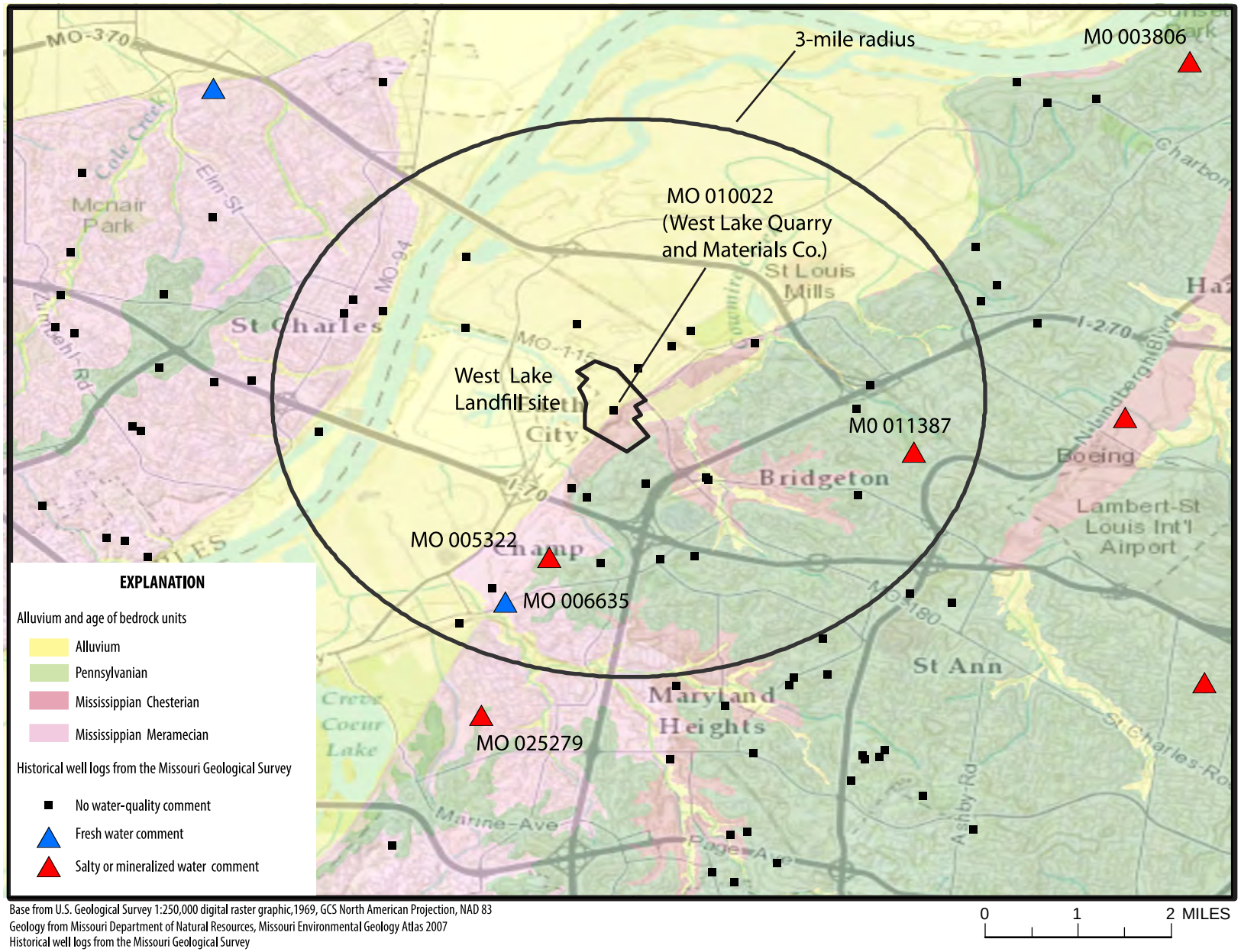


Figure 4. Water wells with historical geologic logs drilled within a 3-mile radius of the West Lake Landfill site and geologic logs with water-quality comments.

Figure 5. Location of background groundwater samples within 5 miles of the West Lake Landfill site.

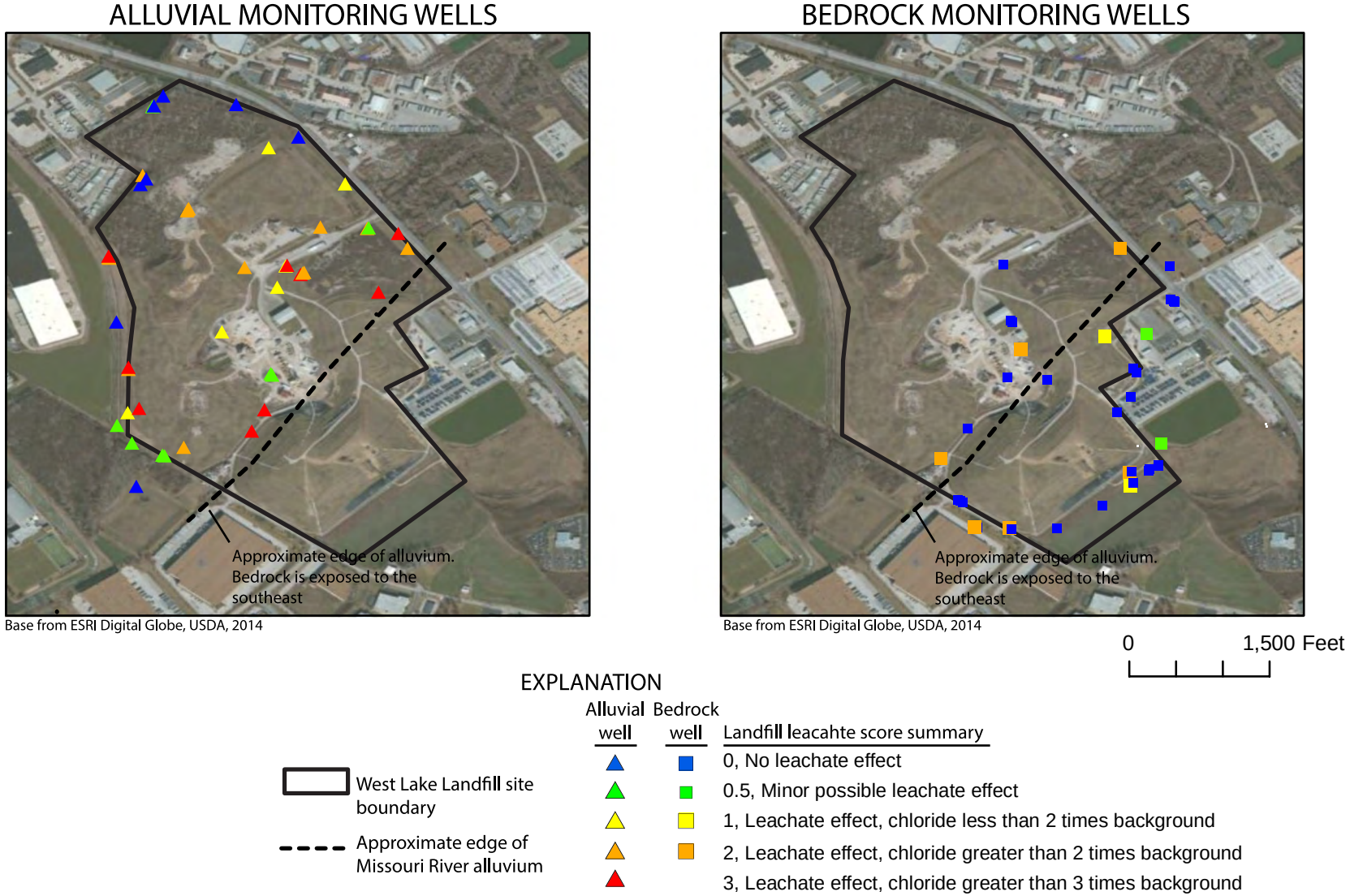


Figure 6. Monitoring wells at the West Lake Landfill site with landfill leachate effects. The presence of landfill leachate identified using concentrations of bromide (Br), chloride (Cl) and iodide (I).

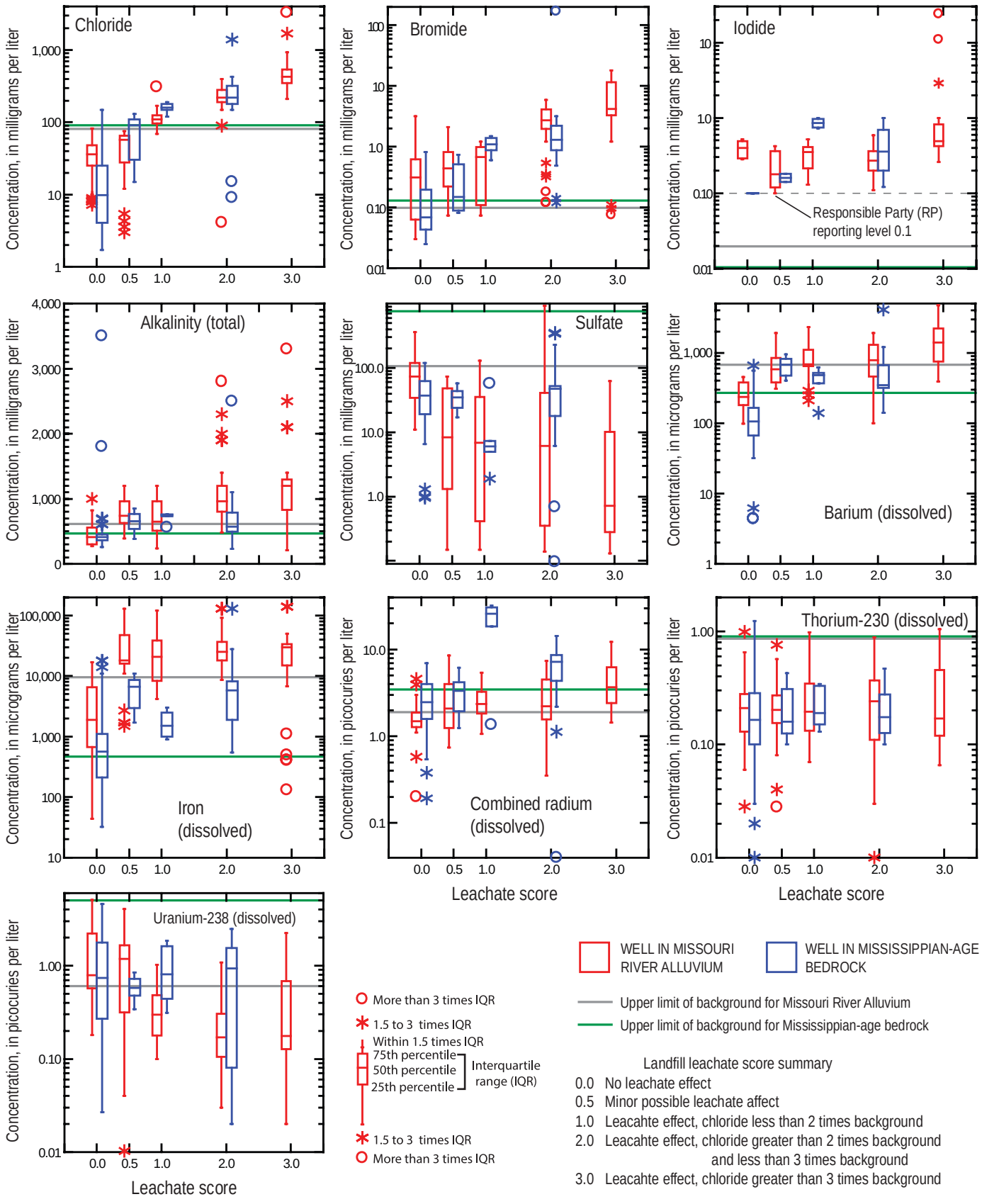


Figure 7. Boxplots of constituents in samples from monitoring wells at the West Lake Landfill site in relation to landfill leachate effects.

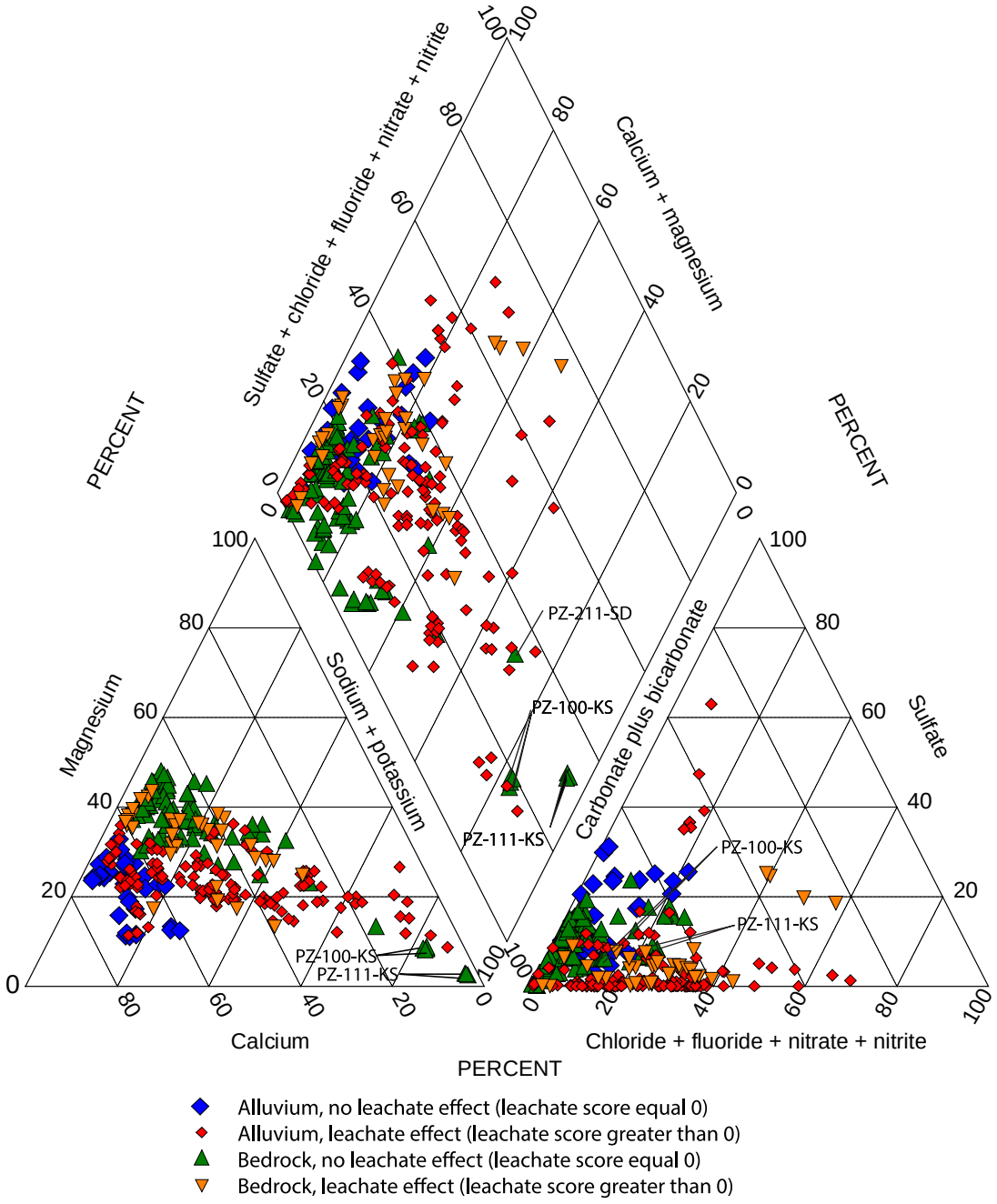


Figure 8. Trilinear diagram of major ions in groundwater samples from the West Lake Landfill site.

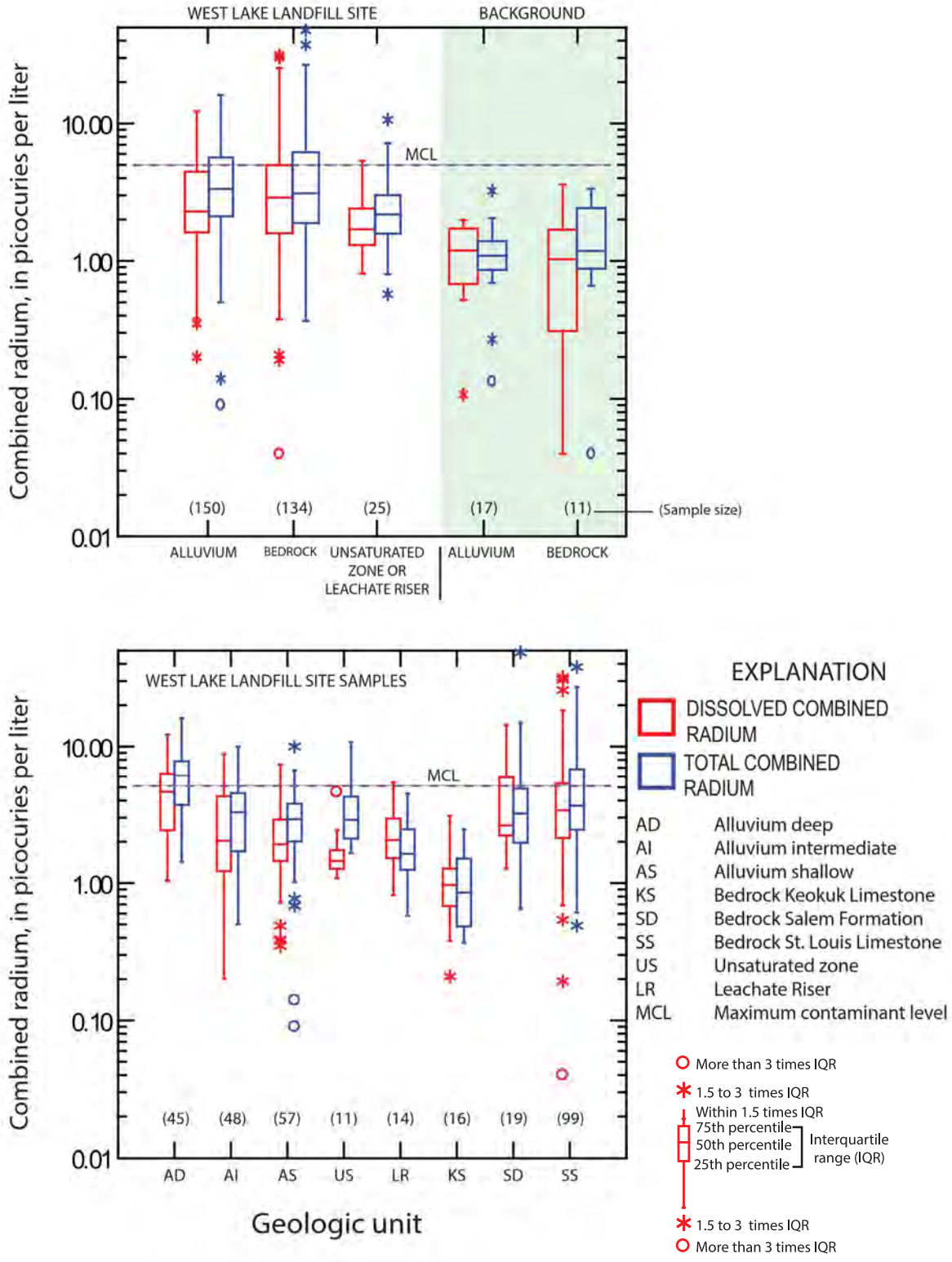


Figure 9. Box plots showing concentrations of dissolved and total combined radium in groundwater samples from monitoring wells in various geologic units at the West Lake Landfill site. Data from 2012-14.

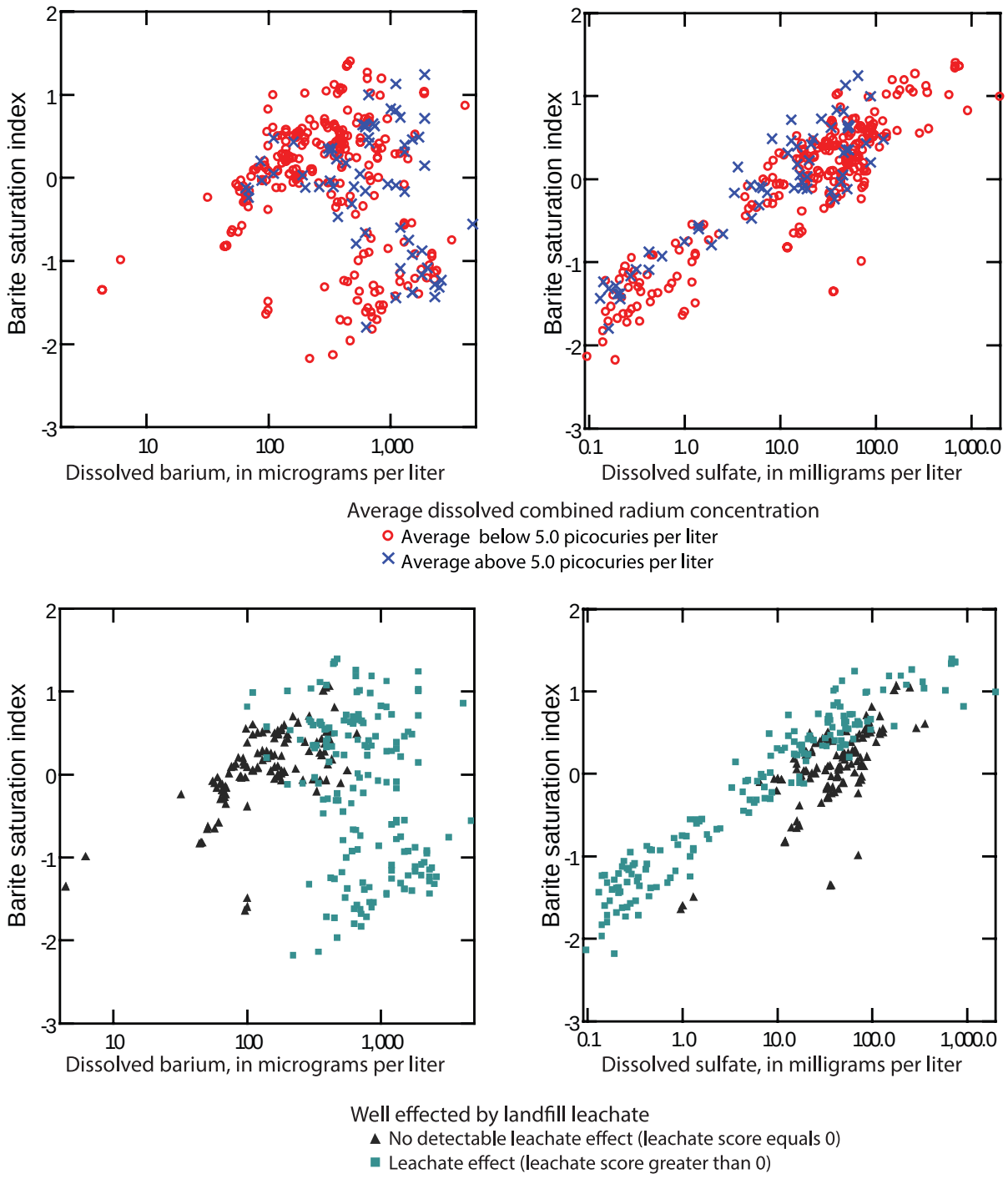


Figure 10. Barite saturation index in relation to dissolved barium (Ba) or sulfate (SO4) concentrations, the presence of dissolved combined radium above the maximum contaminant level (MCL), and the effects from landfill leachate in groundwater samples from the West Lake Landfill site (2012–14).

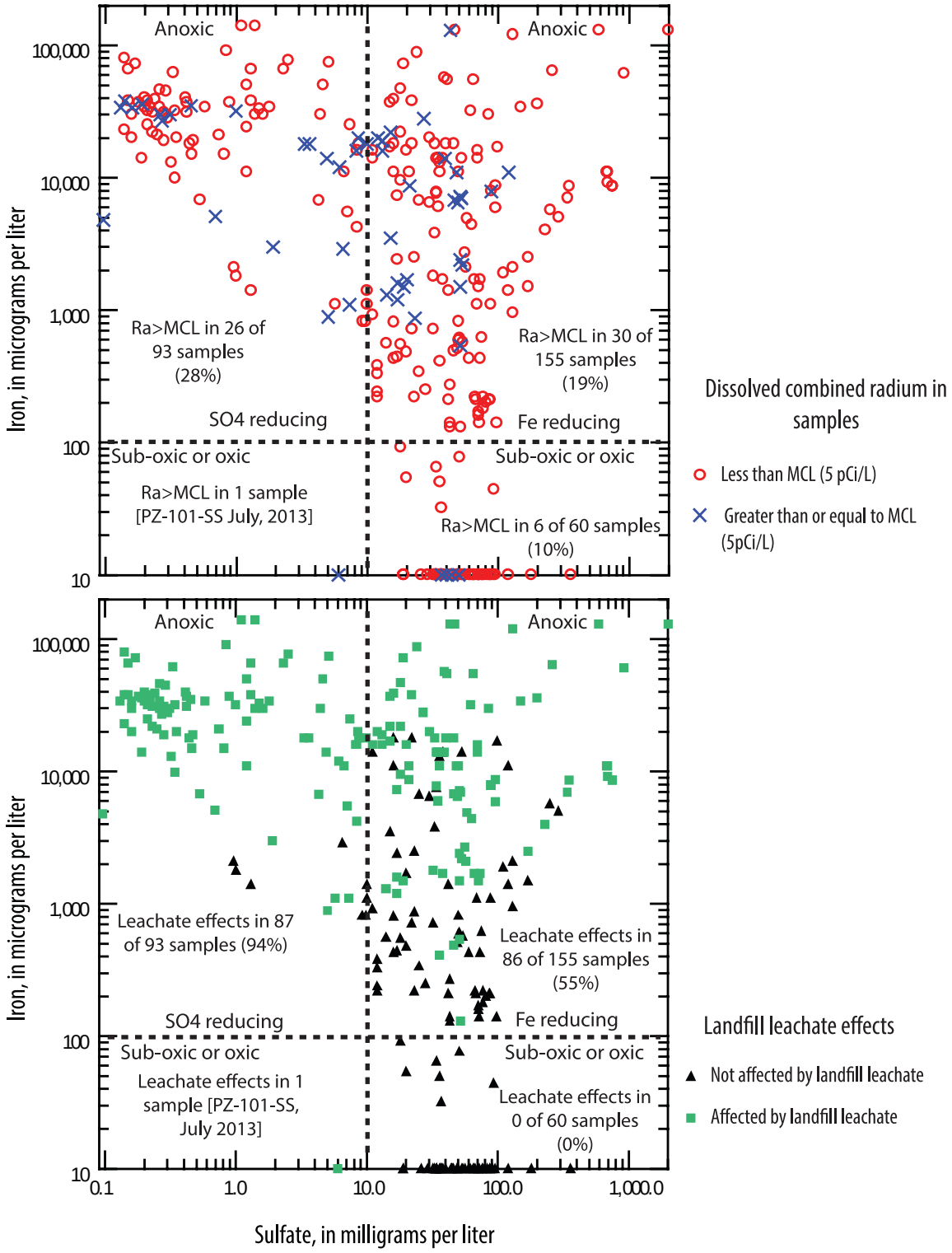


Figure 11. Relation between dissolved concentrations of sulfate (SO_4), iron (Fe), and dissolved combined radium above the maximum contaminant level (MCL) in groundwater samples from the West Lake Landfill site.

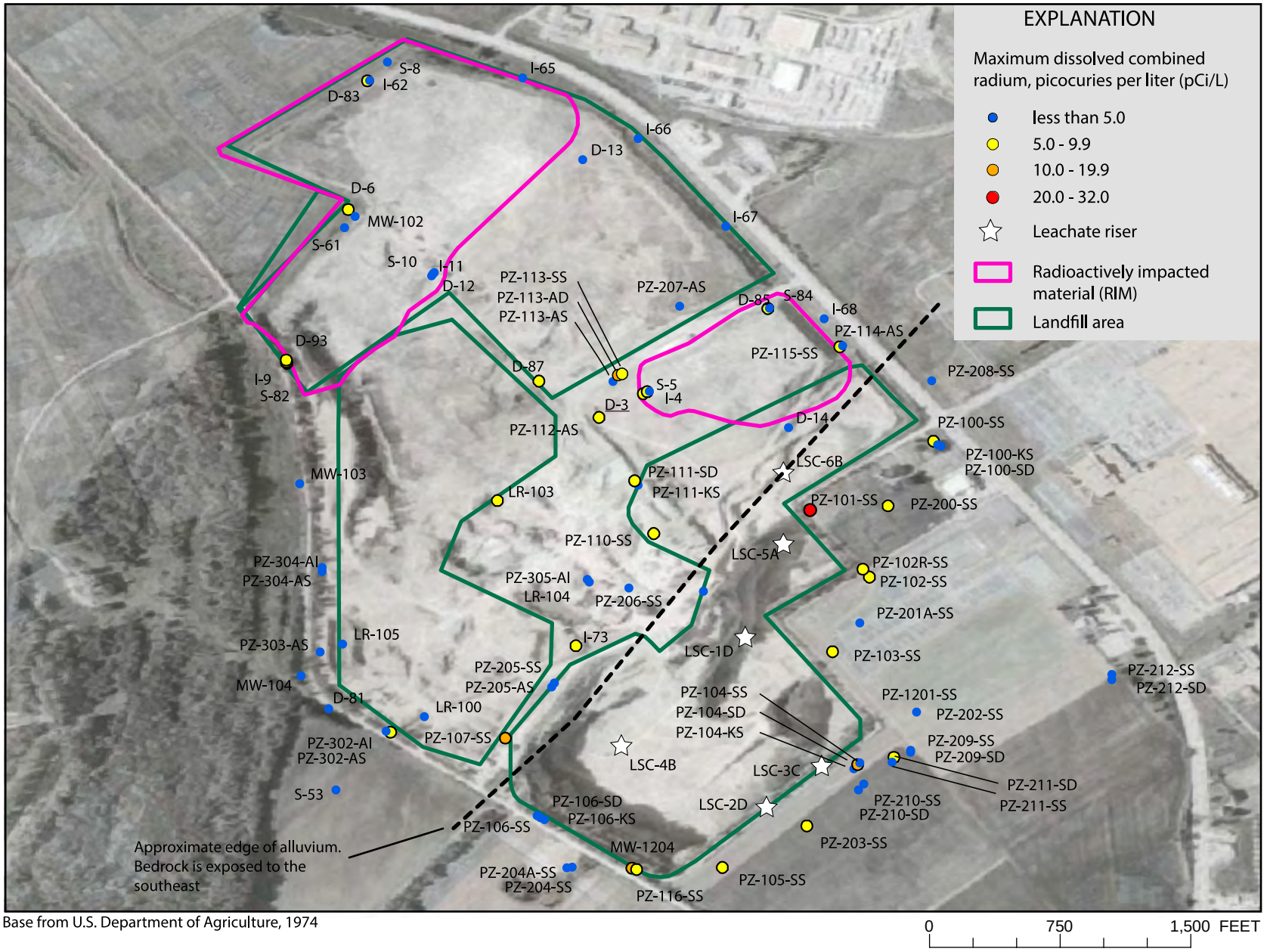


Figure 12. Maximum concentration of dissolved combined radium detected in groundwater samples from the West Lake Landfill site (2012–14).

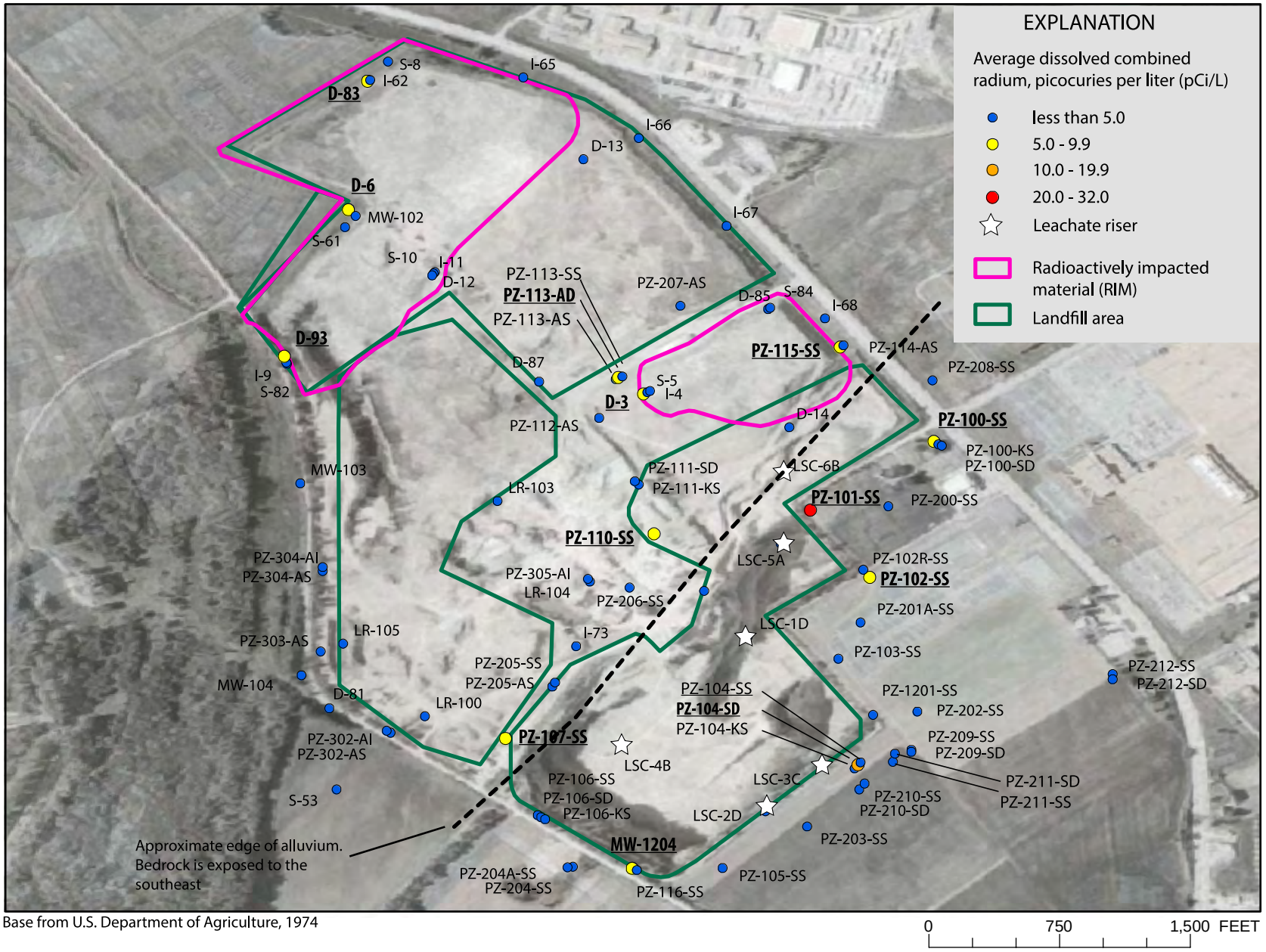
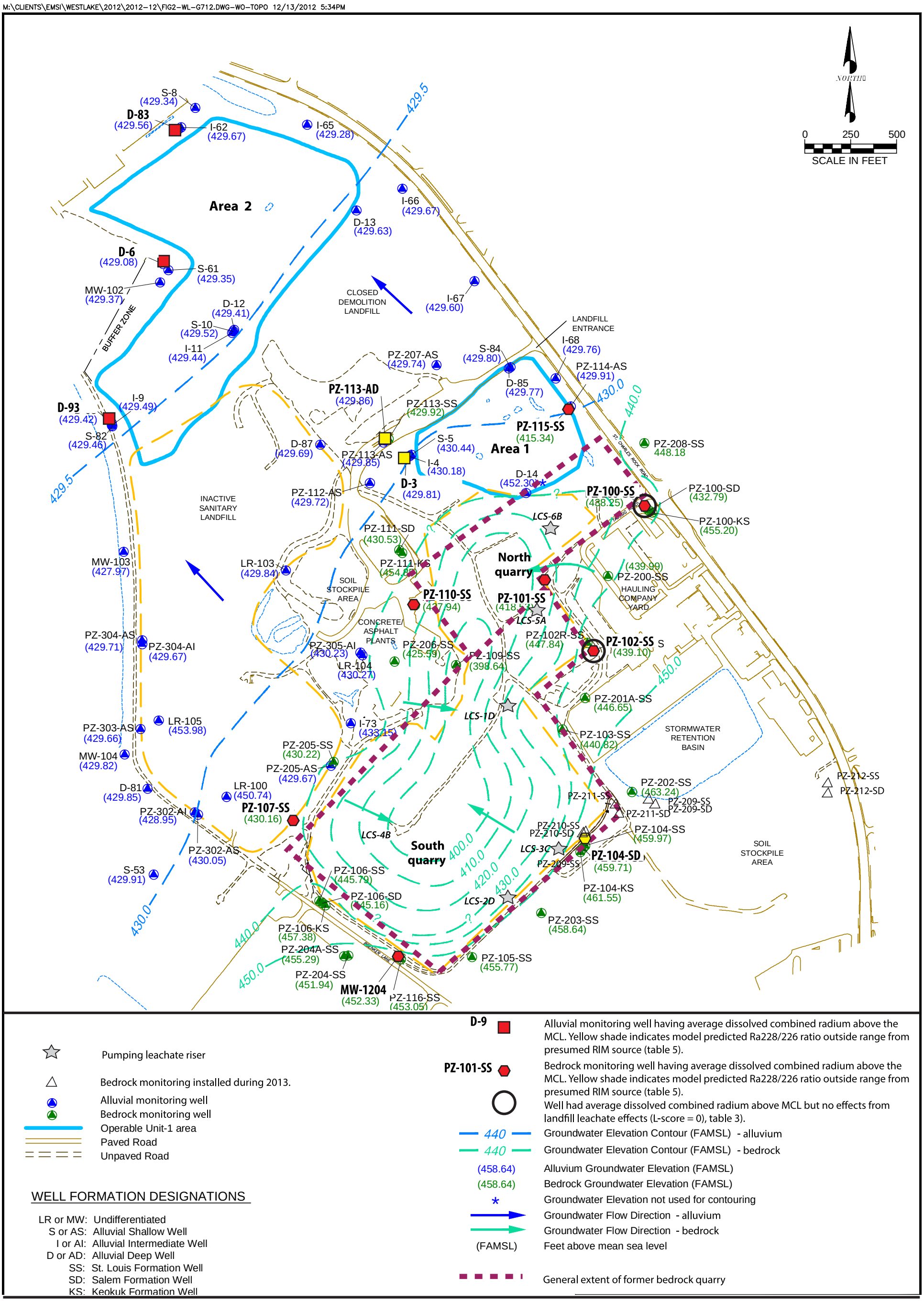


Figure 13. Average concentration of dissolved combined radium in groundwater samples from the West Lake Landfill site (2012-14). Wells with average dissolved combined radium values above the MCL underlined and bold-face.

M:\CLIENTS\EMSI\WESTLAKE\2012\2012-12\FIG2-WL-G712.DWG-WO-TOPO 12/13/2012 5:34PM



D-9 — Alluvial monitoring well having average dissolved combined radium above the MCL. Yellow shade indicates model predicted Ra228/226 ratio outside range from presumed RIM source (table 5).

PZ-101-SS — Bedrock monitoring well having average dissolved combined radium above the MCL. Yellow shade indicates model predicted Ra228/226 ratio outside range from presumed RIM source (table 5).

Well had average dissolved combined radium above MCL but no effects from landfill leachate effects (L-score = 0), table 3).

Pumping leachate riser

Bedrock monitoring installed during 2013.

Alluvial monitoring well

Bedrock monitoring well

Operable Unit-1 area

Paved Road

Unpaved Road

440 — Groundwater Elevation Contour (FAMSL) - alluvium

440 — Groundwater Elevation Contour (FAMSL) - bedrock

(458.64) Alluvium Groundwater Elevation (FAMSL)

(458.64) Bedrock Groundwater Elevation (FAMSL)

* Groundwater Elevation not used for contouring

Groundwater Flow Direction - alluvium

Groundwater Flow Direction - bedrock

(FAMSL) Feet above mean sea level

General extent of former bedrock quarry

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

Base map and potentiometric contours from Engineering Management Solutions Inc., 2012

Figure 14. Monitoring wells with average dissolved combined radium above the maximum contaminant level (MCL) and degree of landfill leachate effects in those wells, and results of radium isotope mass balance in relation to water levels measured during July 2012.

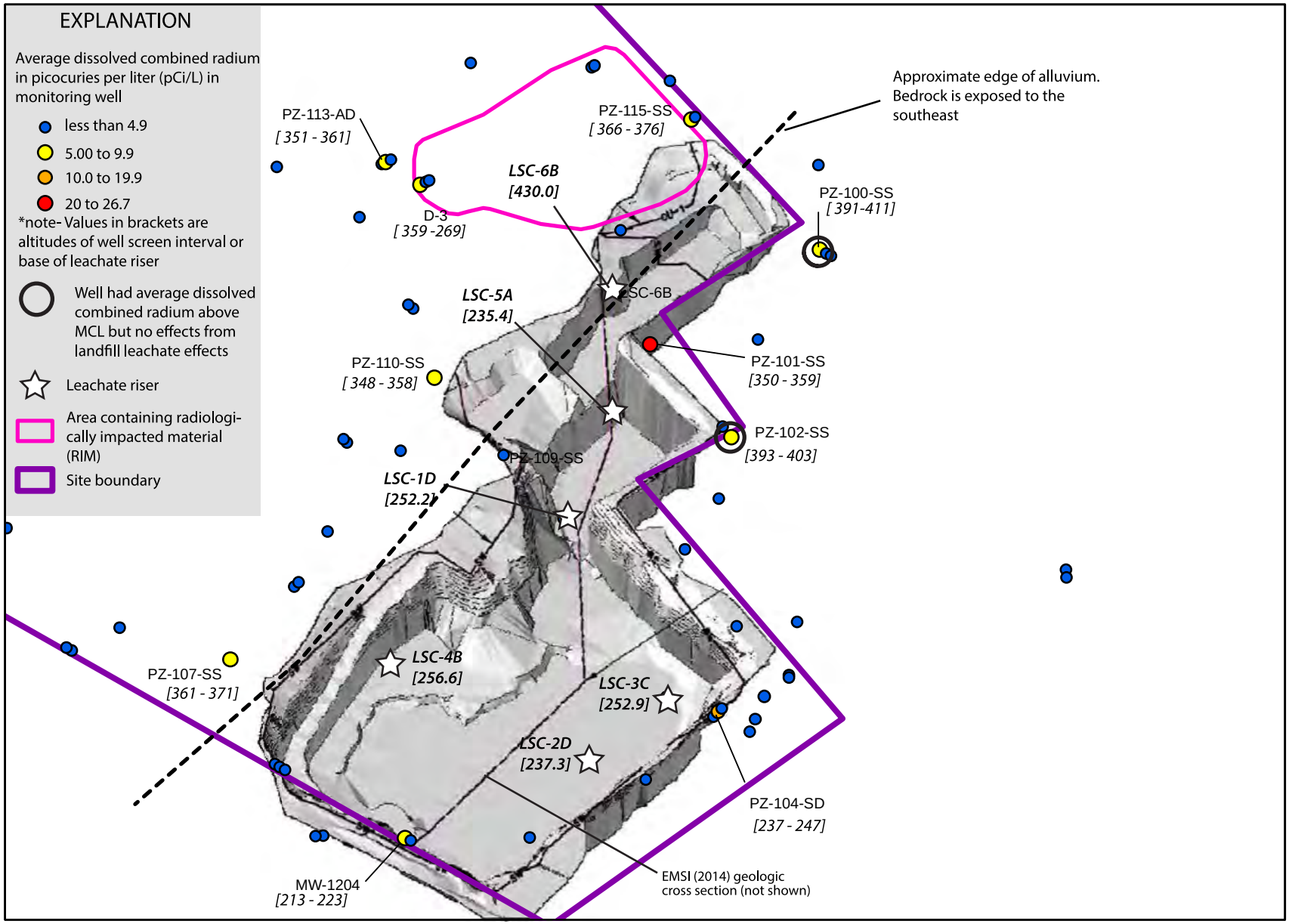


Figure 15. Approximate location of monitoring wells and leachate risers in the vicinity of the South and North quarry that have dissolved combined radium above the maximum contaminant level, and elevation of quarry floor and well screen intervals.

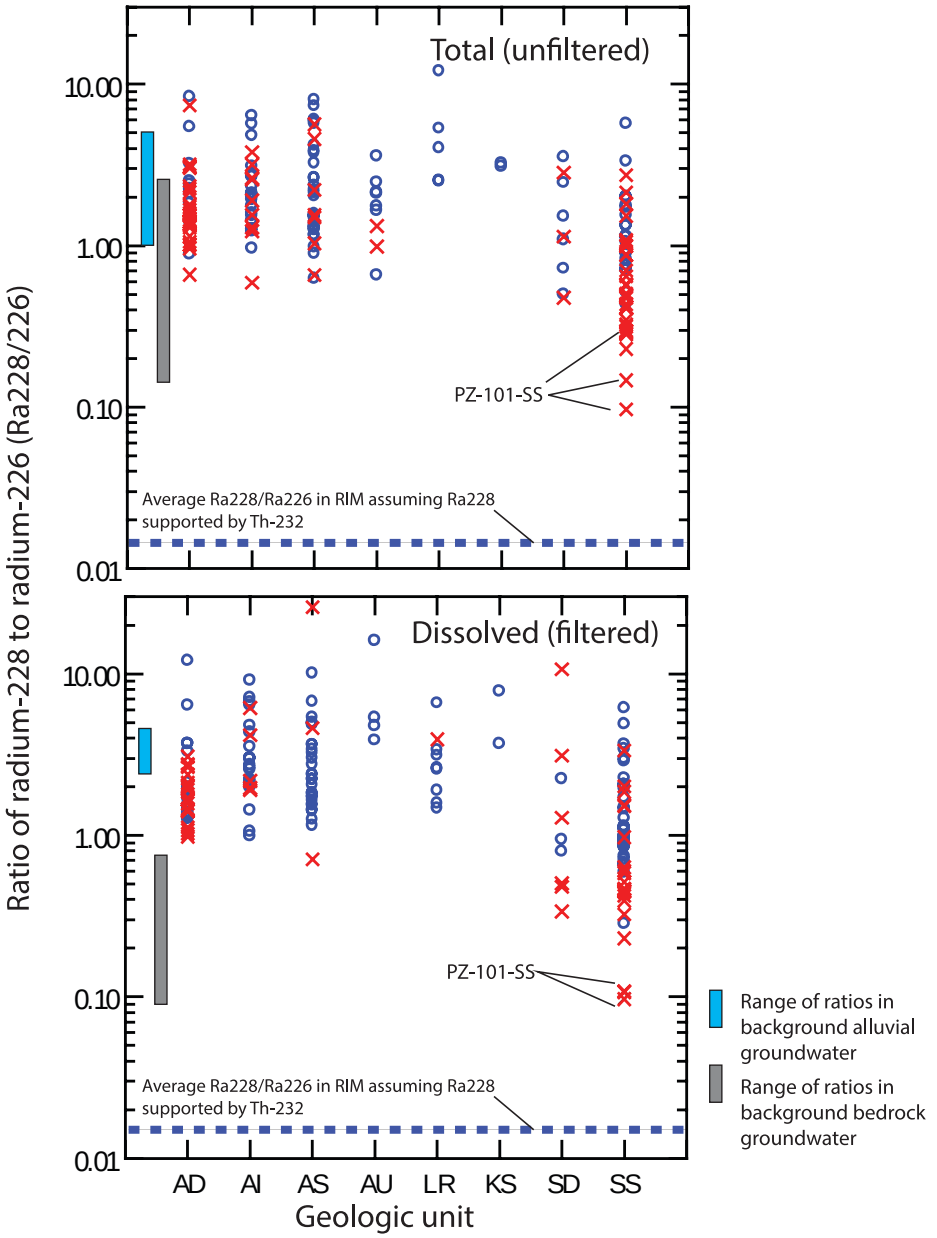


Figure 16. Plots showing ratio of radium-228 to radium-226 (Ra228/226) in groundwater samples from monitoring wells completed in various geologic units at the West Lake Landfill site in relation to ratios in background groundwater samples and radiologically impacted material (RIM). Ratio of Ra228/226 in radiologically impacted material (RIM) based on sample data contained in McLaren and Hart Inc. (1996).

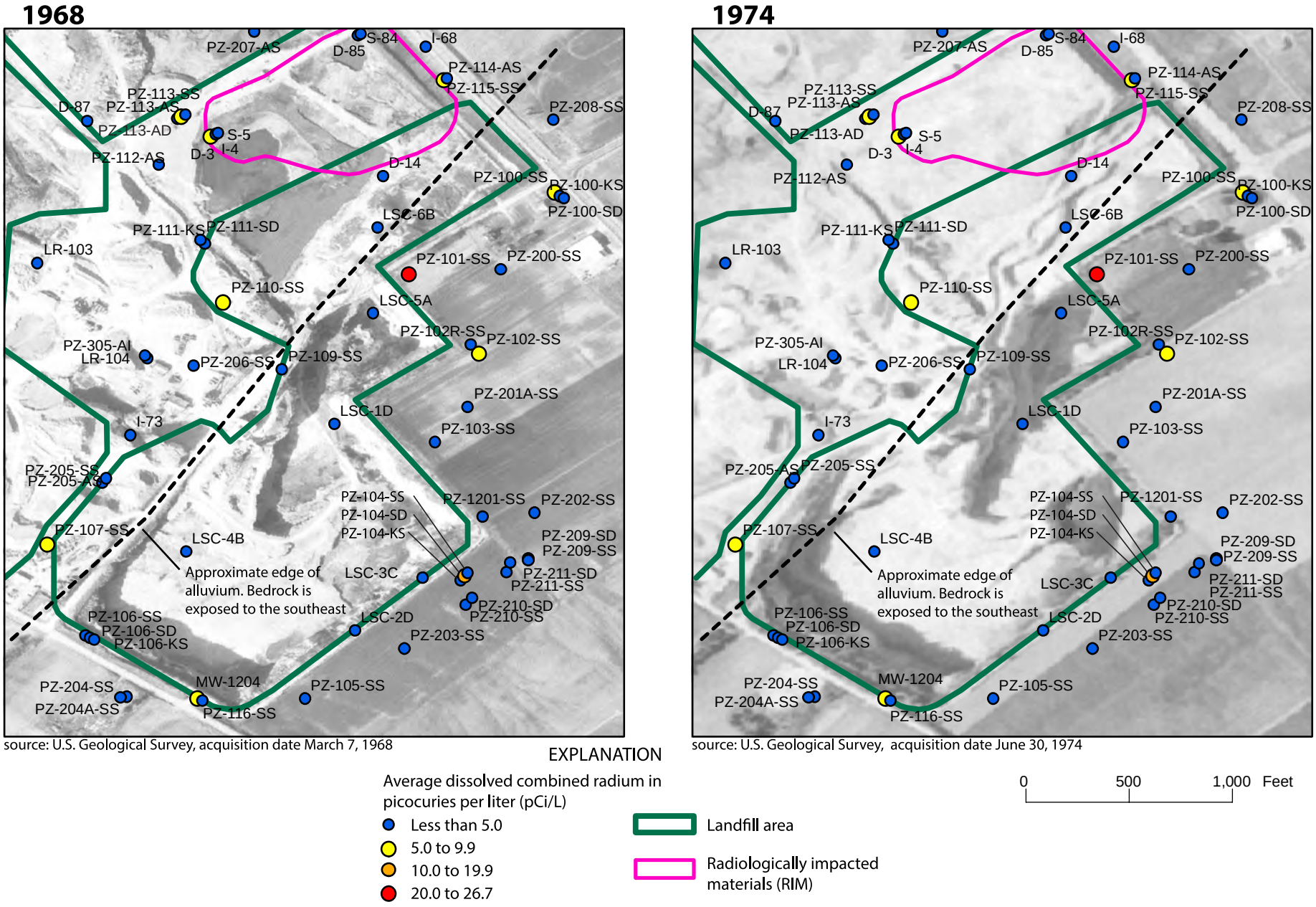


Figure 17. Average dissolved combined radium in monitoring wells near the North and South quarry areas at the West Lake Landfill site in relation to site features shown on 1968 and 1974 aerial photographs. Imagery obtained from U.S. Geological Survey (2014).

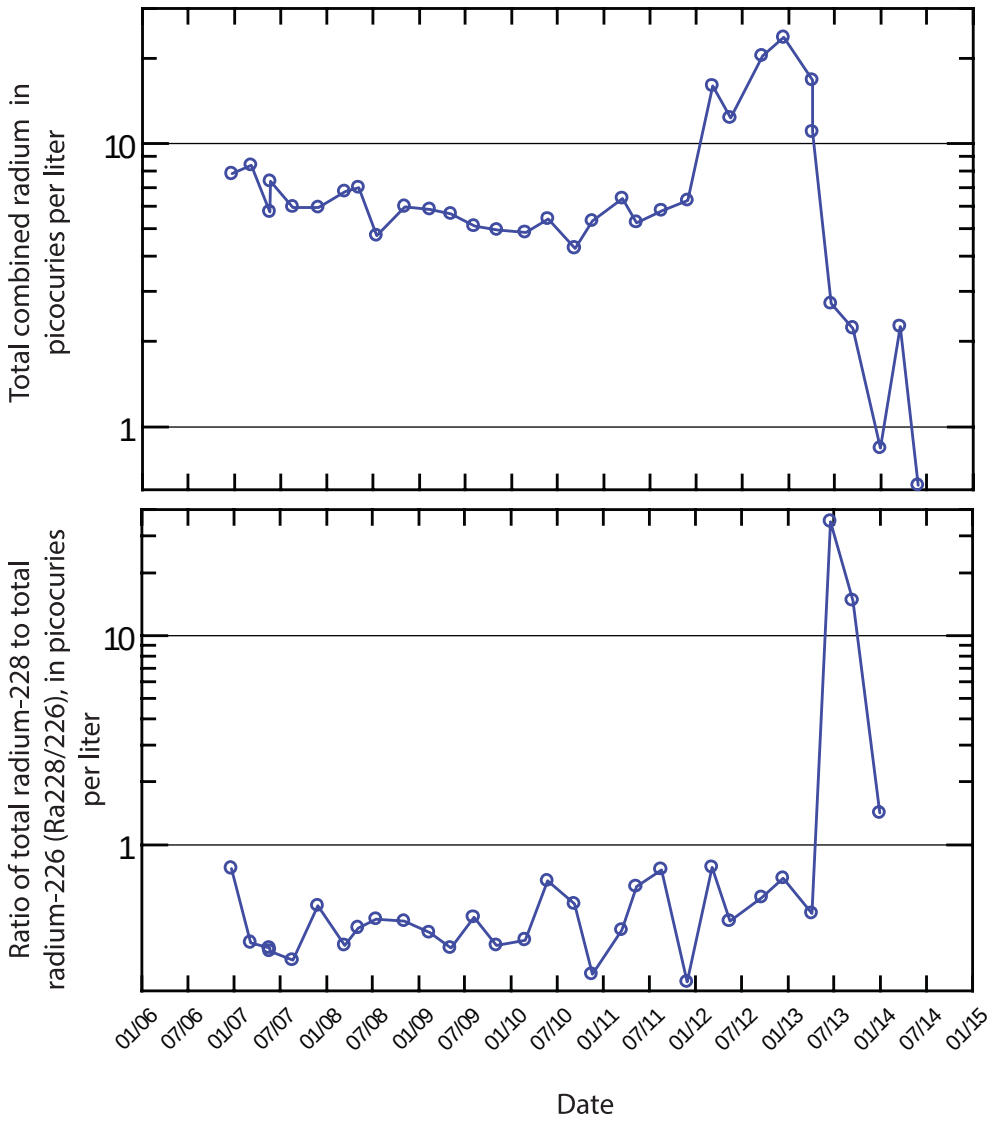


Figure 18. Concentrations of total combined radium and ratio of total radium-228 to radium-226 (Ra228/226) in samples from leachate discharged from the Bridgeton Landfill (2006–14).

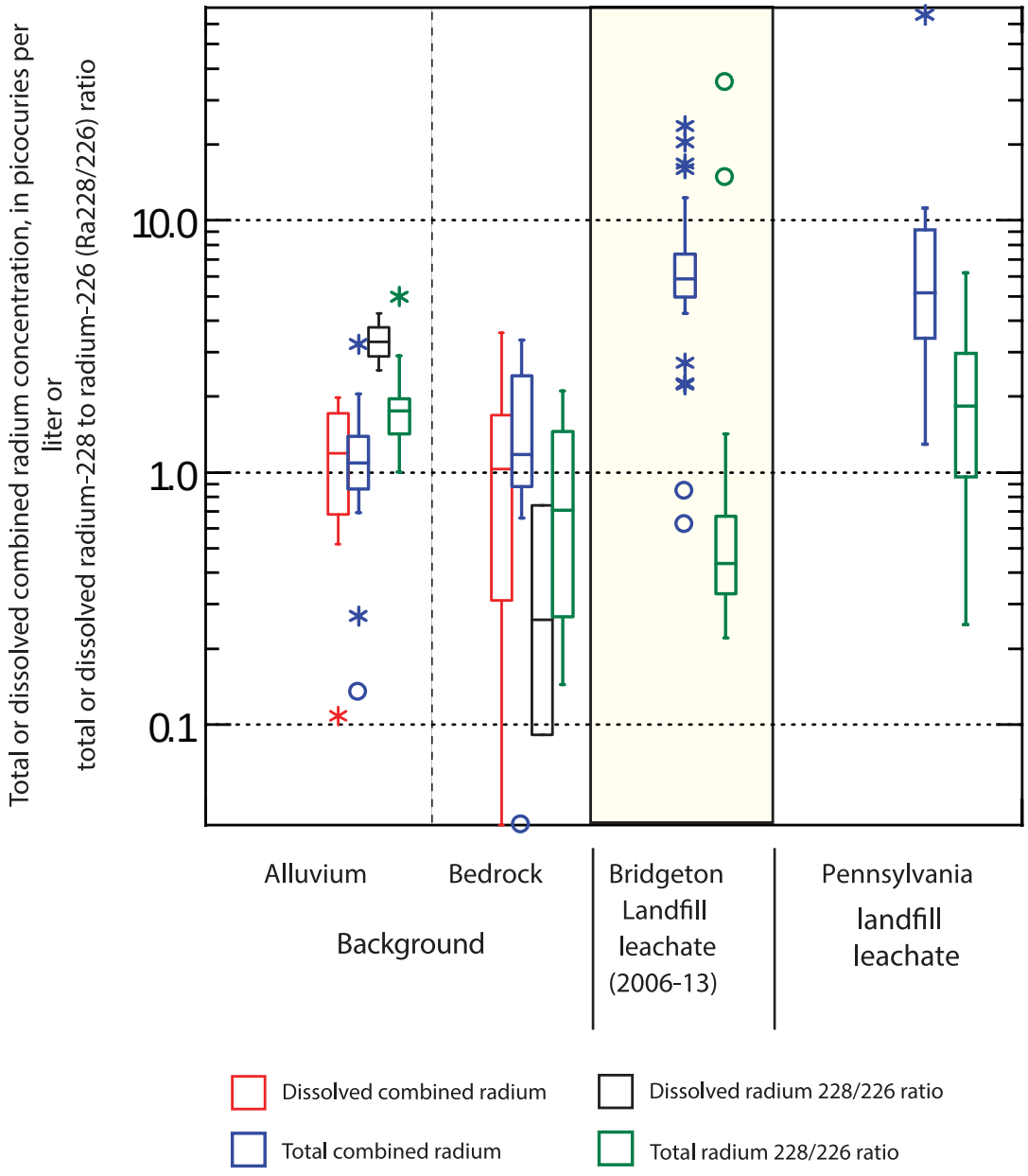


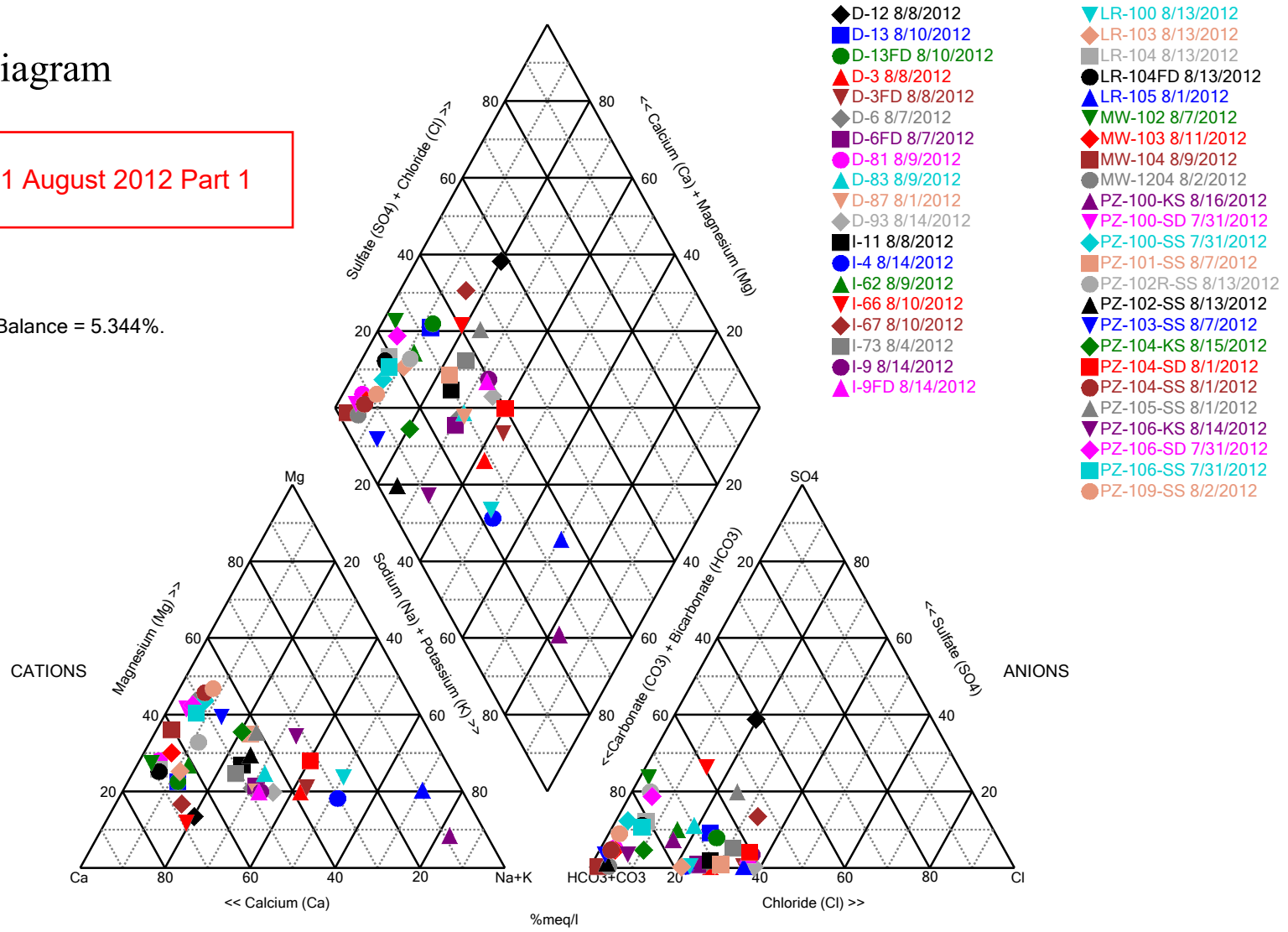
Figure 19. Comparison of dissolved and total combined radium and ratio of total and dissolved radium-228 to radium-226 (Ra228/226) in background groundwater samples to leachate pumped from the Bridgeton Landfill (2006–13) and selected Pennsylvania landfills. Pennsylvania leachate data from Civil and Environmental Consultants, Inc. (2005).

Sanitas™ v.9.4.34 Sanitas software licensed to Herst Associates. UG

Piper Diagram

Figure E-1 August 2012 Part 1

Cation-Anion Balance = 5.344%.



Analysis Run 5/5/2014 3:26 PM

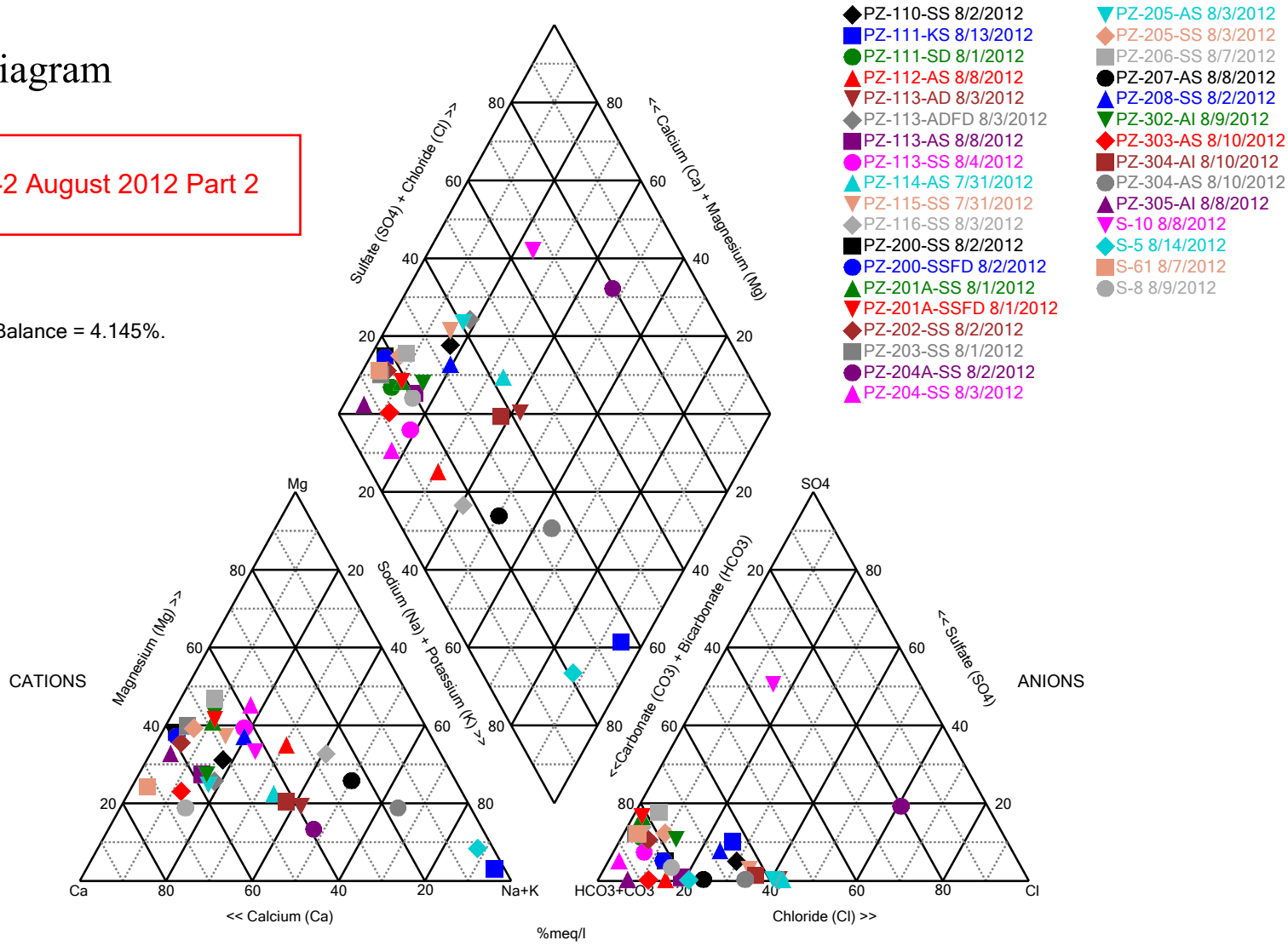
Facility: Bridgeton LF Client: Bridgeton LF Data File: Bridgeton OU-1 Additional Monitoring Geochemistry Data for Piper+Stiff

Sanitas™ v.9.4.34 Sanitas software licensed to Herst Associates. UG

Piper Diagram

Figure E-2 August 2012 Part 2

Cation-Anion Balance = 4.145%.



Analysis Run 5/5/2014 3:31 PM

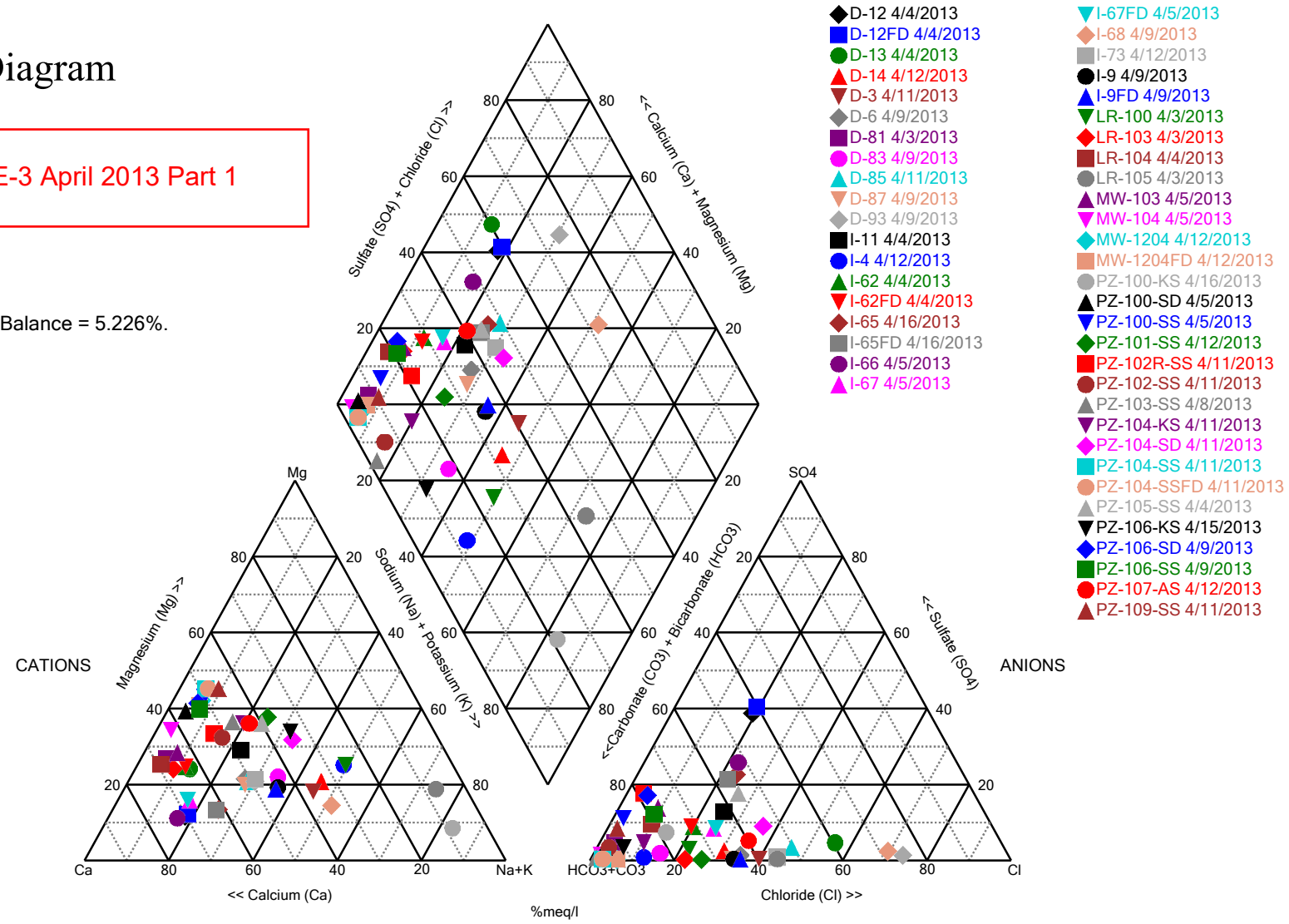
Facility: Bridgeton LF Client: Bridgeton LF Data File: Bridgeton OU-1 Additional Monitoring Geochemistry Data for Piper+Stiff

Sanitas™ v.9.4.34 Sanitas software licensed to Herst Associates. UG

Piper Diagram

Figure E-3 April 2013 Part 1

Cation-Anion Balance = 5.226%.



Analysis Run 5/5/2014 3:24 PM

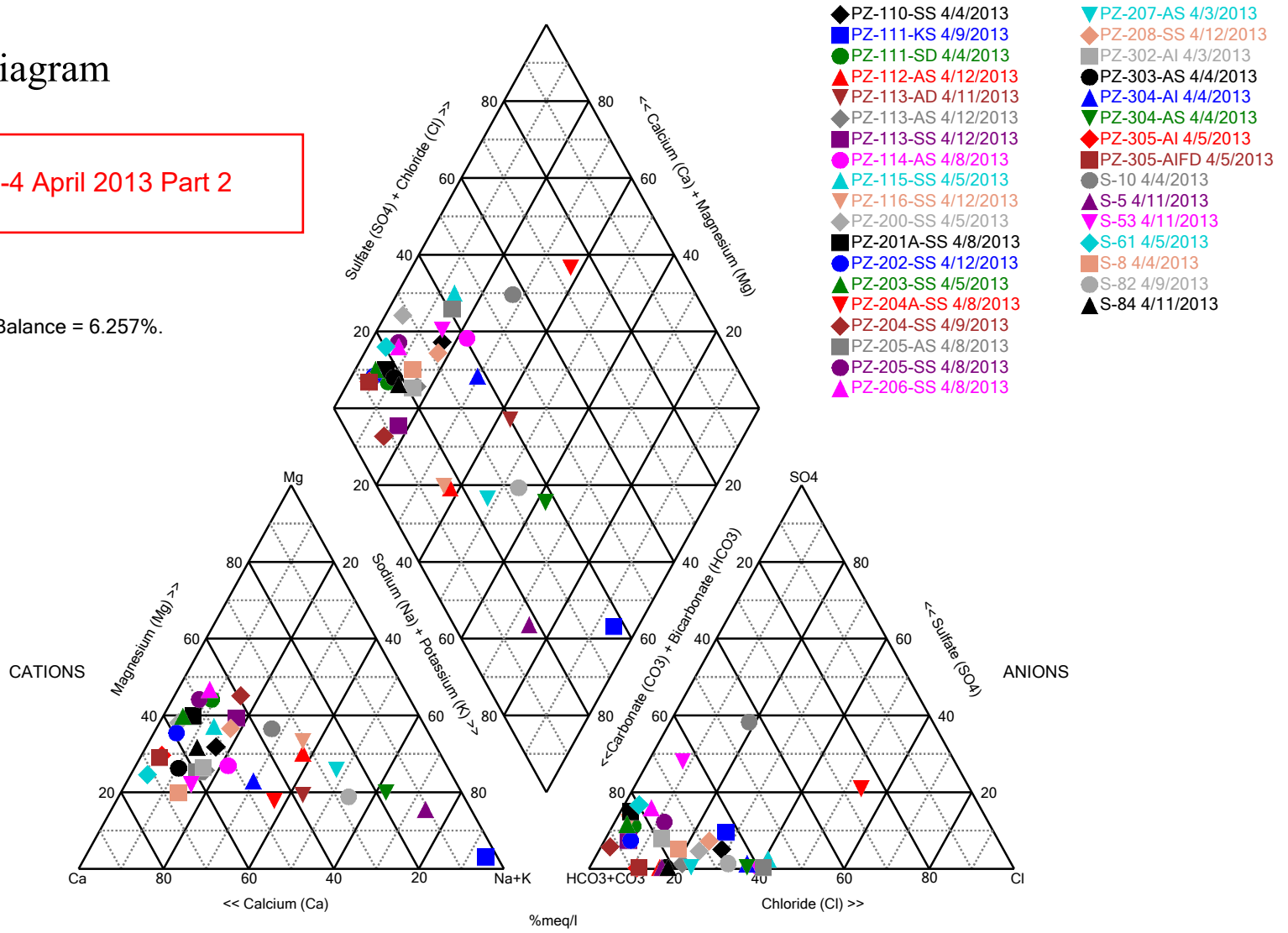
Facility: Bridgeton LF Client: Bridgeton LF Data File: Bridgeton OU-1 Additional Monitoring Geochemistry Data for Piper+Stiff

Sanitas™ v.9.4.34 Sanitas software licensed to Herst Associates. UG

Piper Diagram

Figure E-4 April 2013 Part 2

Cation-Anion Balance = 6.257%.



Analysis Run 5/5/2014 3:38 PM

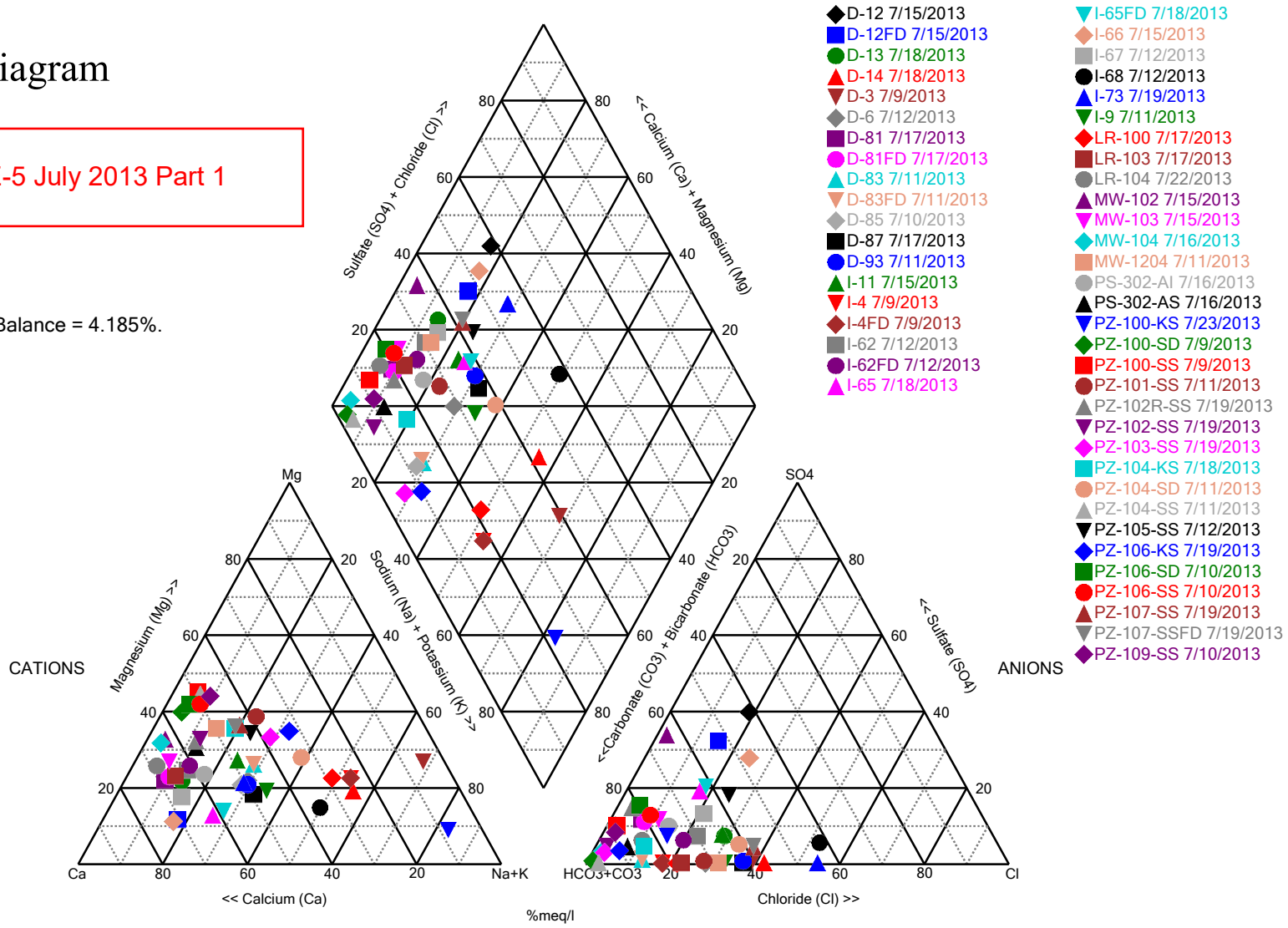
Facility: Bridgeton LF Client: Bridgeton LF Data File: Bridgeton OU-1 Additional Monitoring Geochemistry Data for Piper+Stiff

Sanitas™ v.9.4.34 Sanitas software licensed to Herst Associates. UG

Piper Diagram

Figure E-5 July 2013 Part 1

Cation-Anion Balance = 4.185%.



Analysis Run 5/5/2014 3:25 PM

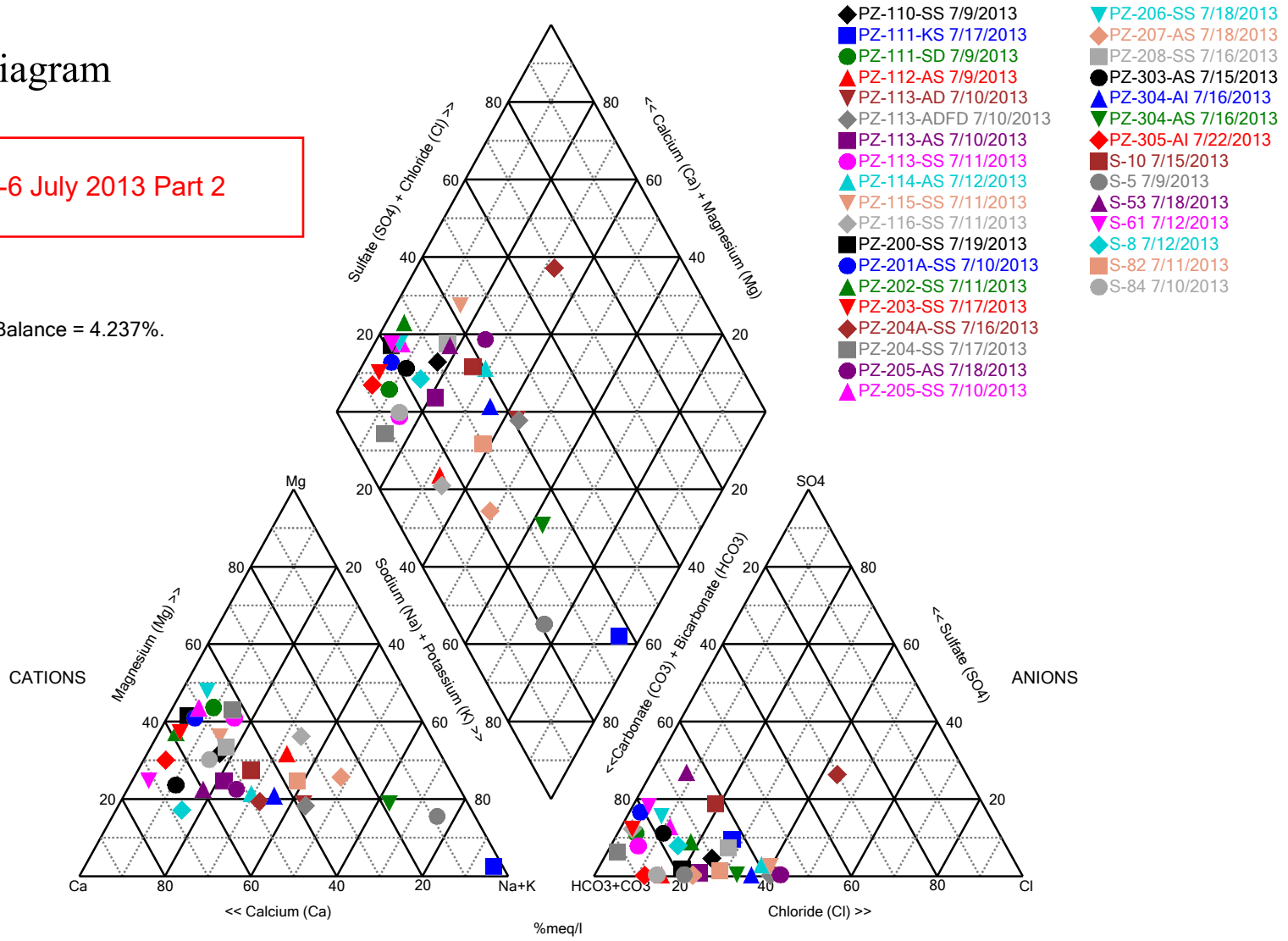
Facility: Bridgeton LF Client: Bridgeton LF Data File: Bridgeton OU-1 Additional Monitoring Geochemistry Data for Piper+Stiff

Sanitas™ v.9.4.34 Sanitas software licensed to Herst Associates. UG

Piper Diagram

Figure E-6 July 2013 Part 2

Cation-Anion Balance = 4.237%.



Analysis Run 5/5/2014 3:30 PM

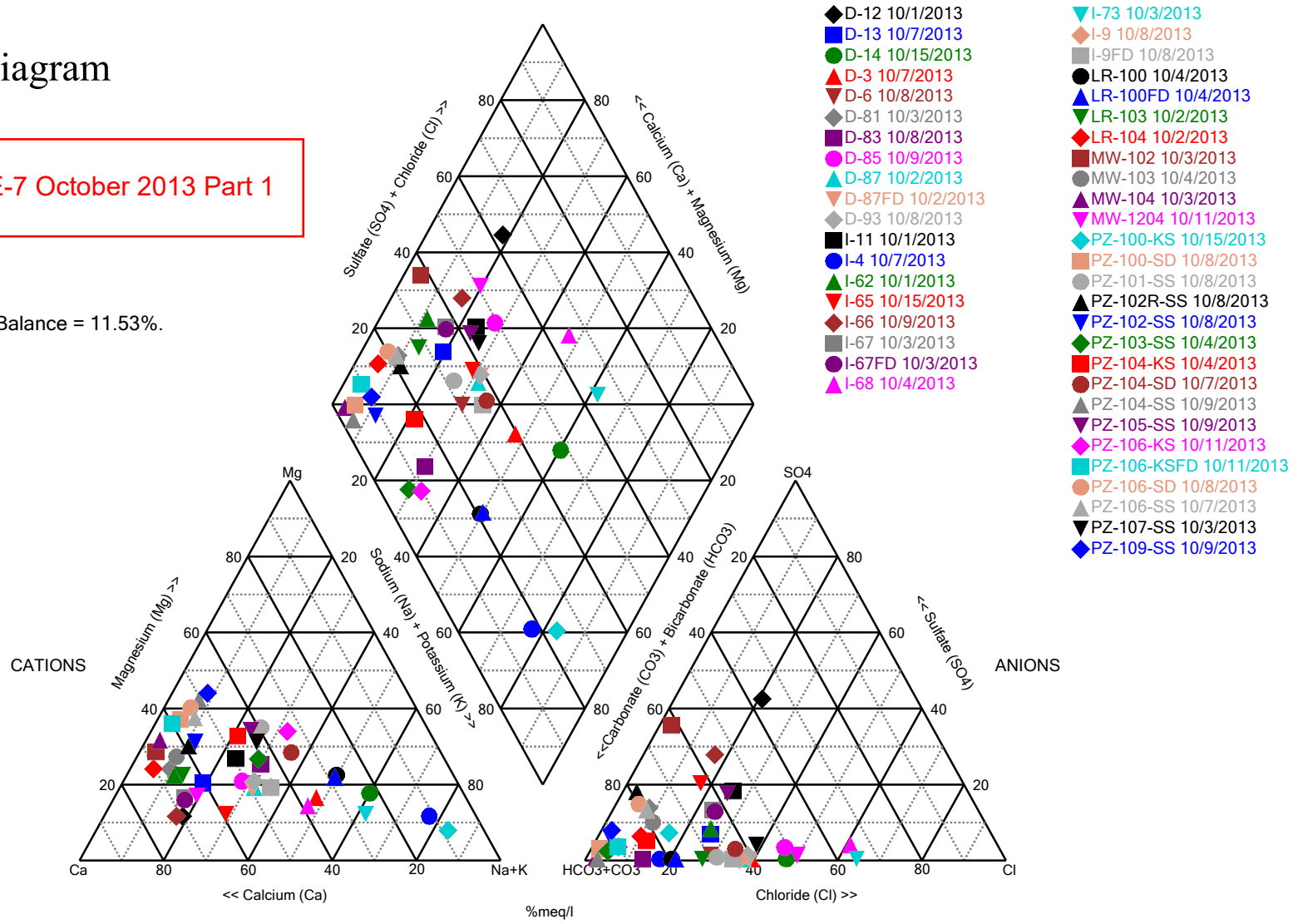
Facility: Bridgeton LF Client: Bridgeton LF Data File: Bridgeton OU-1 Additional Monitoring Geochemistry Data for Piper+Stiff

Sanitas™ v.9.4.34 Sanitas software licensed to Herst Associates. UG

Piper Diagram

Figure E-7 October 2013 Part 1

Cation-Anion Balance = 11.53%.



Analysis Run 5/5/2014 3:27 PM

Facility: Bridgeton LF Client: Bridgeton LF Data File: Bridgeton OU-1 Additional Monitoring Geochemistry Data for Piper+Stiff

APPENDIX S

LEACHATE COLLECTION SYSTEM DATA

REV.	DATE	DESCRIPTION	DR. BY	APP. BY
0	9/14/95	ISSUED TO MINAR	JMJ	CER

CLIENT/PROJECT
LAIDLAW WASTE SYSTEMS INC.
WEST LAKE LANDFILL

TITLE
LEACHATE COLLECTION SYSTEM

Denver, Colorado
Golder Associates

DRAWN	TMC	DATE	AUGUST 1996
CHECKED	MK	SCALE	AS SHOWN
REVIEWED	CER	JOB NO.	943-2848
APPROVED	WEH	DWG. NO.	D011
FILE NO.	2848D011	FIGURE	1-6

NORTH

0 100 200 350 500 700

Scale in Feet
Graphic Scale: 1 inch = 350 feet

EXPLANATION

⊙ LCS-3B LEACHATE SUMP LOCATION

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

LCS-3B

LCS-1B

LCS-1A

ACTIVE SANITARY LANDFILL
PERMIT No.118912

LCS-2B

LCS-4A

LCS-12BK

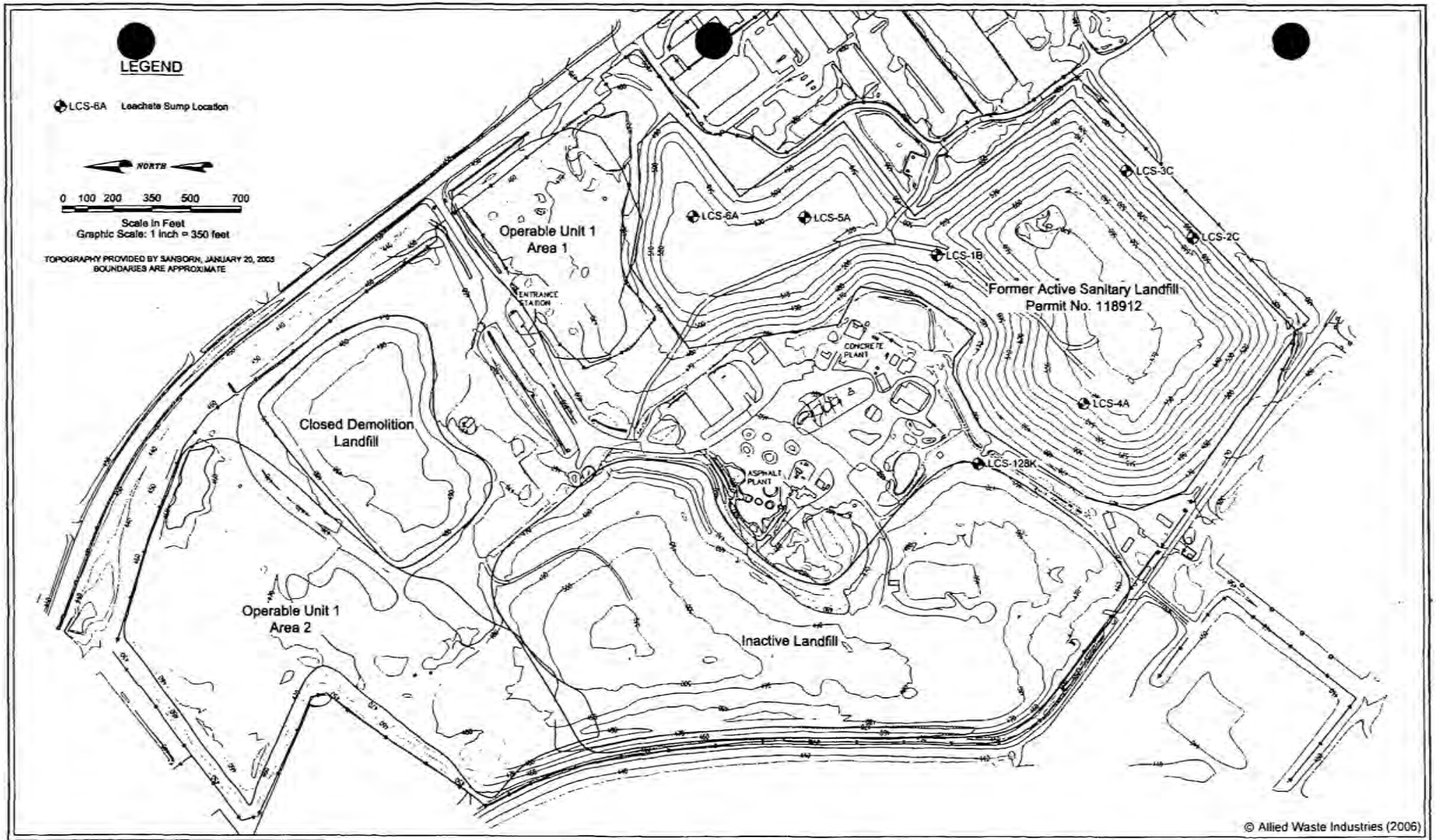
© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 1-3
Leachate Riser Locations



4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 1-3
Leachate Risers - Former Active Sanitary Landfill

Table 6.1 Organic compounds detected in leachate

	Active Sanitary Landfill Leachate				Inactive Landfill Leachate			
Compound	LCS-1	LCS-2	LCS-3	LCS-4	LR-100	LR-103	LR-104	LR-105
Acetone	***1.2***	***0.65***	***0.038***	***0.61***	<0.010	<0.010	<0.010	***0.04***
Benzene	<0.5	***0.009***	<0.005	<0.005	<0.005	<0.005	<0.005	***0.007***
Chlorobenzene	<0.5	***0.035***	***0.029***	***0.011***	***0.044***	<0.005	<0.005	***0.74***
1,4-Dichlorobenzene	<0.5	***0.081***	***0.009***	***0.056***	***0.01***	<0.005	<0.005	***0.068***
Ethylbenzene	<0.5	***0.049***	***0.023***	***0.07***	***0.012***	<0.005	<0.005	***0.089***
2-Hexanone	<1	***0.1***	<0.010	***0.18***	<0.010	<0.010	<0.010	<0.010
Methyl Ethyl Ketone	***3***	***1.3***	***0.11***	***2.6***	<0.010	<0.010	<0.010	<0.010
Methyl iso-butyl Ketone	<1	***0.08***	<0.010	***0.076***	<0.010	<0.010	<0.010	<0.010
Styrene	<0.5	***0.005***	<0.005	***0.006***	<0.005	<0.005	<0.005	<0.005
Toluene	<0.5	***0.097***	***0.015***	***0.12***	<0.005	<0.005	<0.005	***0.007***
Total Xylenes	<0.5	***0.14***	***0.035***	***0.17***	***0.057***	<0.005	<0.005	***0.43***
m+p Cresol	***1.9***	***0.95***	***0.077***	***0.26***	<0.010	<0.010	<0.010	R
2,4-Dimethylphenol	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	***0.082***
bis(2-ethylhexyl)phthalate	***0.019***	***0.022***	***0.017***	<0.010	***0.12***	<0.006	<0.006	***0.036***
Diethyl phthalate	***0.033***	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dimethyl phthalate	***0.012***	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phenol	***0.29***	***0.16***	<0.010	***0.017***	<0.010	<0.010	<0.010	R
Naphthalene	<0.010	<0.010	<0.010	<0.010	***0.011***	<0.010	<0.010	<0.010
Volatile Petroleum Hydrocarbons	***0.41***	***0.4***	***0.12***	***0.48***	***0.17***	<0.05	<0.05	***0.95***
Diesel-range Petroleum Hydrocarbons	***79***	***6.9***	***2.2***	***0.22***	***2.2***	***0.63***	***0.08***	***4.4***

Notes:

All results in mg/l

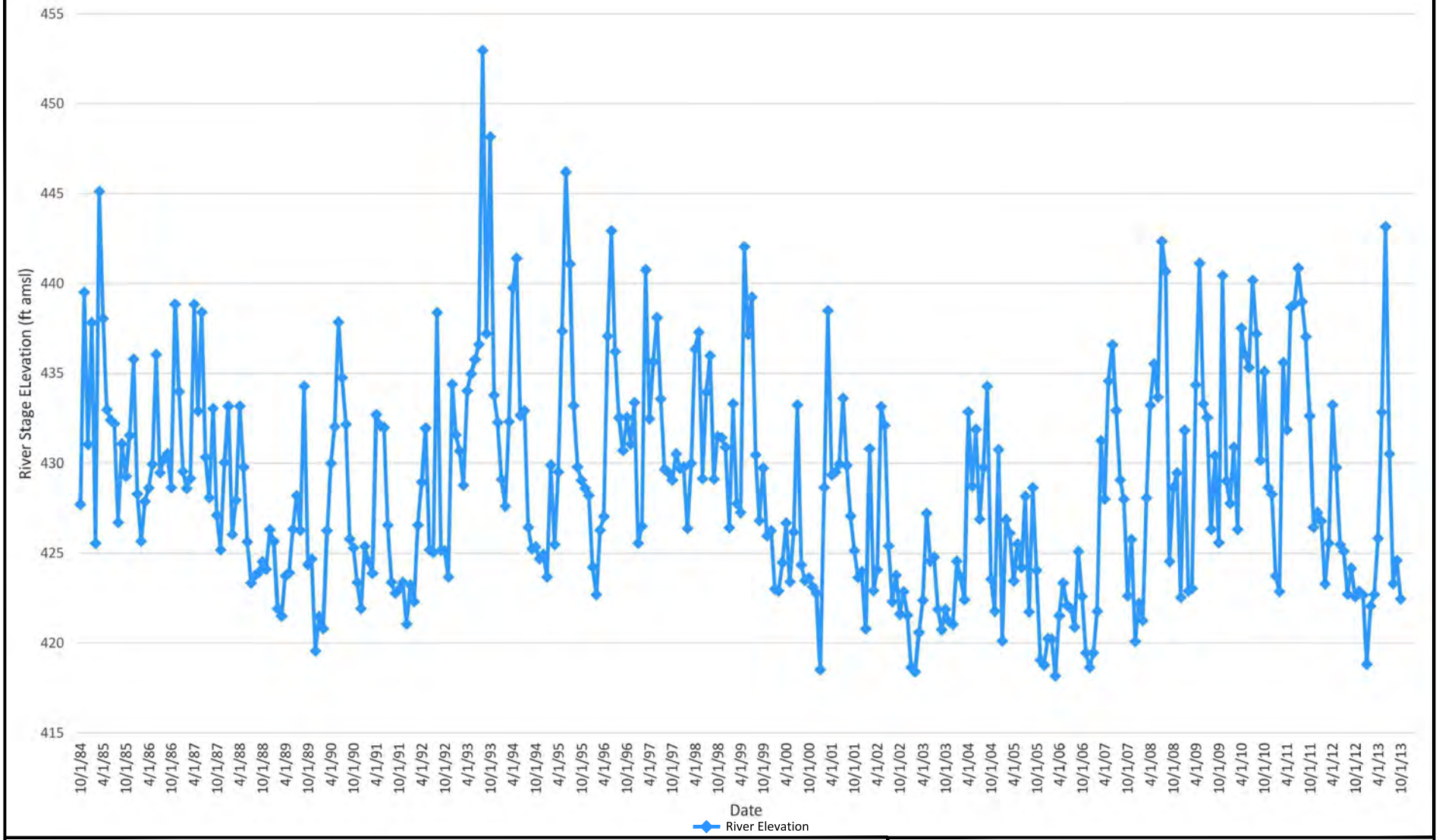
R: Data point rejected during data validation

Results above the reporting limit are shown in ***boldface/italic*** type

Inactive landfill leachate riser LR-101 was not installed due to the absence of leachate at this location.

Inactive landfill leachate riser LR-102 was not sampled due to minimal (<6 inches) liquid thickness.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-5\FIG-5-18-Mo-River.dwg 1/22/18



Measurements taken at USGS Gaging Station 06935965 - Missouri River at St. Charles

Figure 5-18

Missouri River Stage

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

APPENDIX T

SOIL RADIONUCLIDE IMPACTS

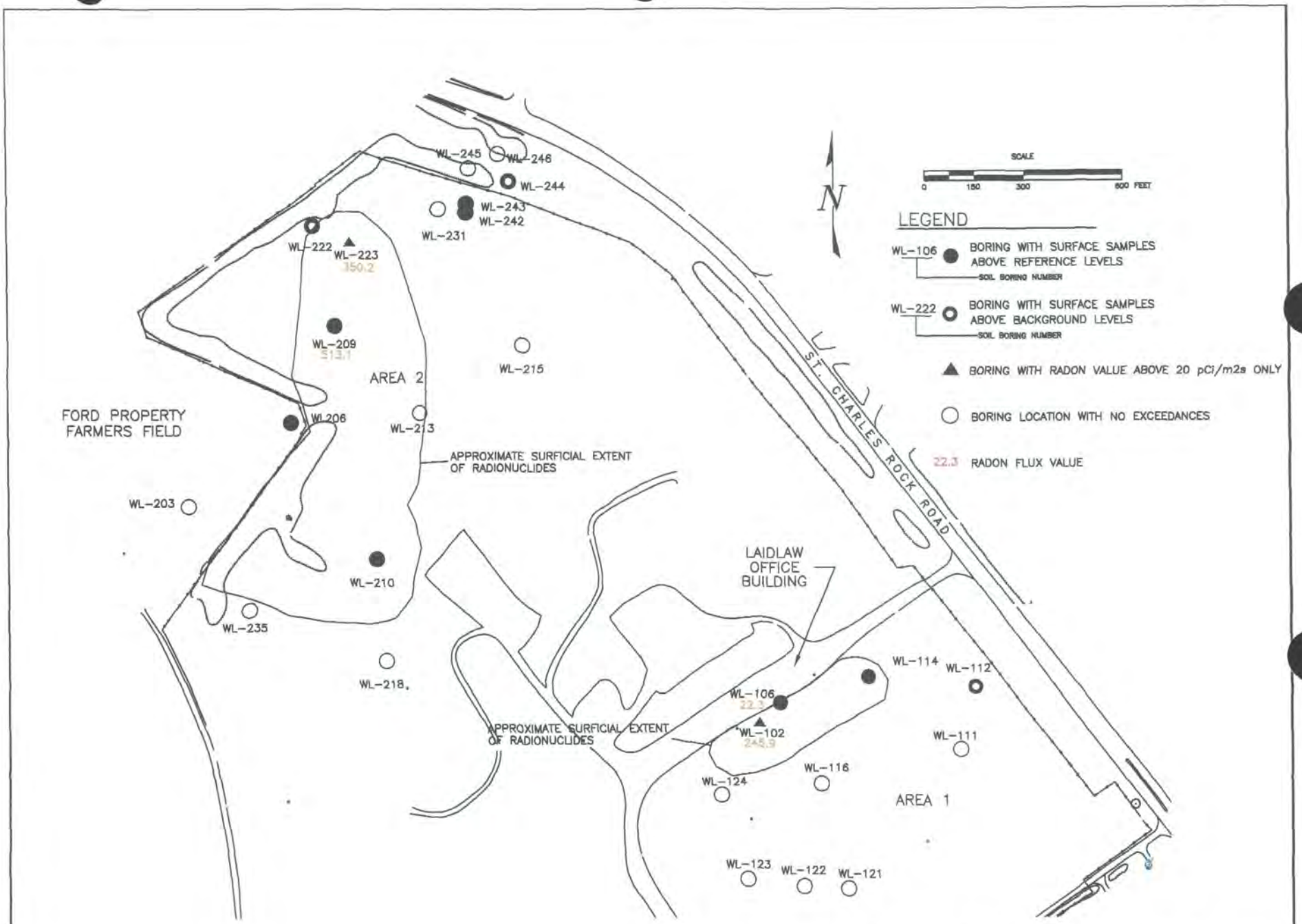


Figure 4-1 : Summary of Radiological Results for Surface Samples in Area 1

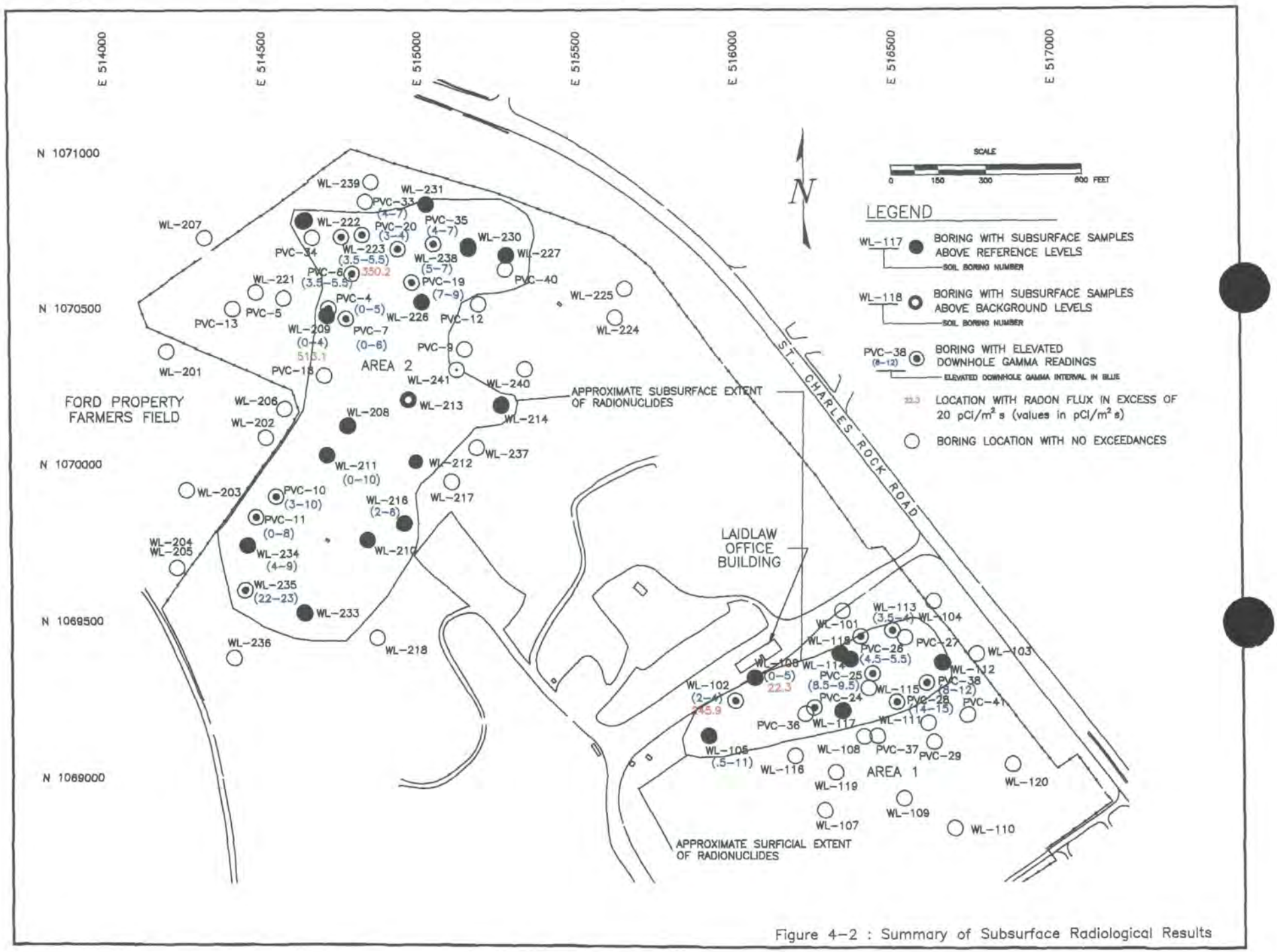


Figure 4-2 : Summary of Subsurface Radiological Results

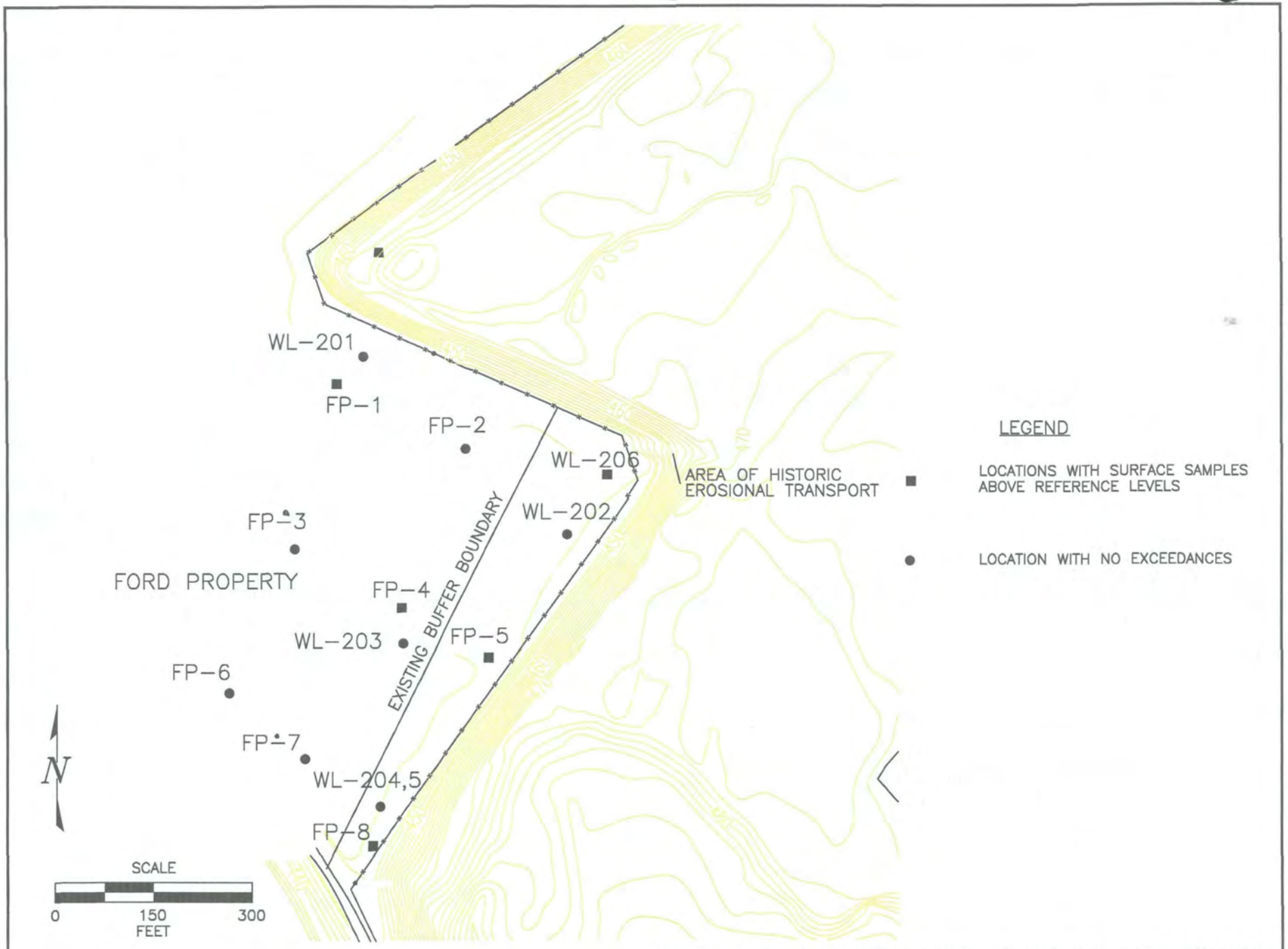
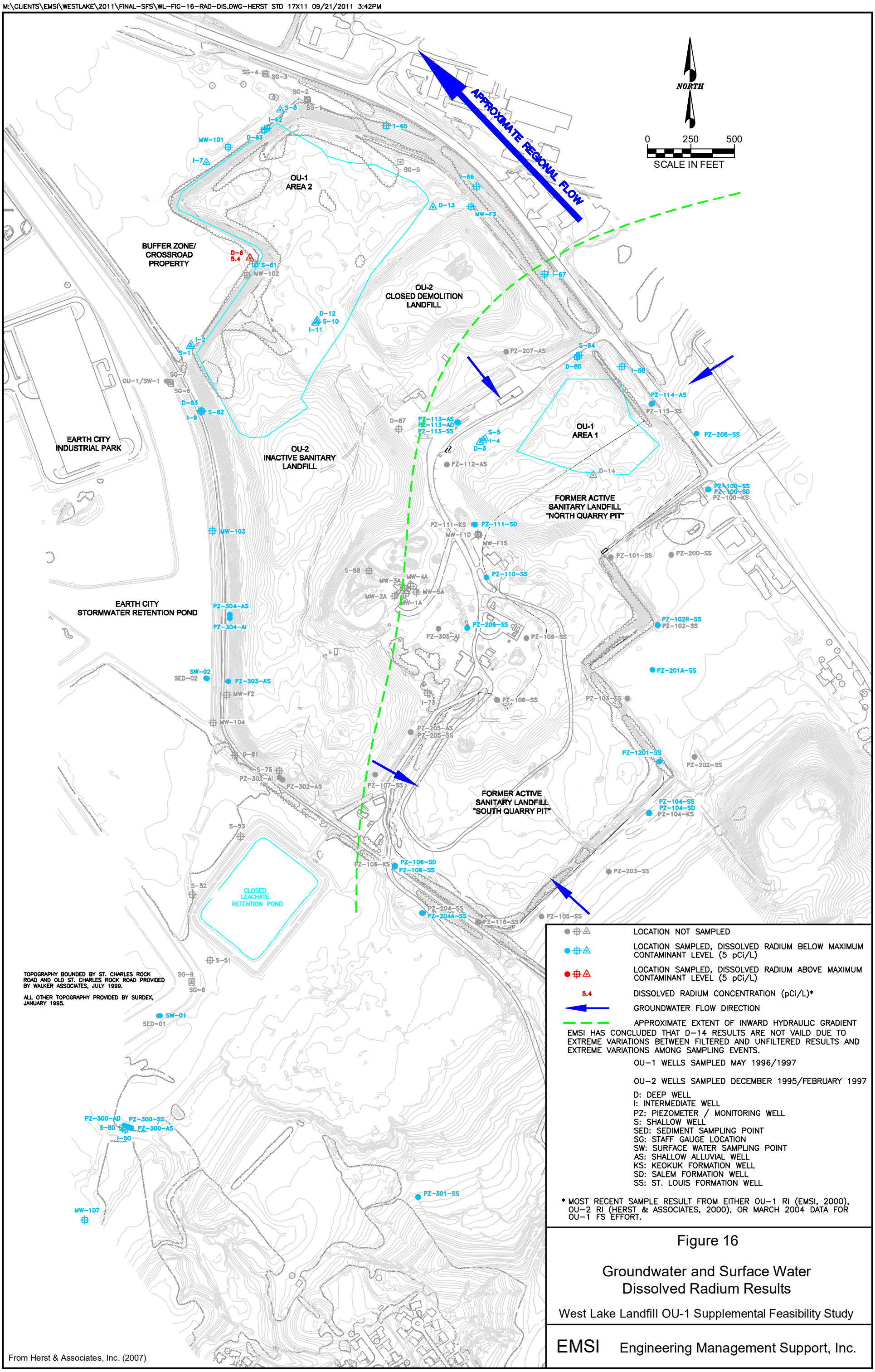


FIGURE 4-3 : SUMMARY OF RESULTS FOR THE FORD PROPERTY

APPENDIX U

COC ISOCONCENTRATION FIGURES

M:\CLIENTS\EMSI\WESTLAKE\2011\FINAL-SFS\WL-FIG-16-RAD-DIS.DWG-HERST STD 17X11 09/21/2011 3:42PM



LOCATION NOT SAMPLED

LOCATION SAMPLED, DISSOLVED RADIUM BELOW MAXIMUM CONTAMINANT LEVEL (5 pCi/L)

LOCATION SAMPLED, DISSOLVED RADIUM ABOVE MAXIMUM CONTAMINANT LEVEL (5 pCi/L)

5.4 DISSOLVED RADIUM CONCENTRATION (pCi/L)*

GROUNDWATER FLOW DIRECTION

APPROXIMATE EXTENT OF INWARD HYDRAULIC GRADIENT

EMSI HAS CONCLUDED THAT D-14 RESULTS ARE NOT VAILD DUE TO EXTREME VARIATIONS BETWEEN FILTERED AND UNFILTERED RESULTS AND EXTREME VARIATIONS AMONG SAMPLING EVENTS.

OU-1 WELLS SAMPLED MAY 1996/1997

OU-2 WELLS SAMPLED DECEMBER 1995/FEBRUARY 1997

D: DEEP WELL
I: INTERMEDIATE WELL
PZ: PIEZOMETER / MONITORING WELL
S: SHALLOW WELL
SED: SEDIMENT SAMPLING POINT
SG: STAFF GAUGE LOCATION
SW: SURFACE WATER SAMPLING POINT
AS: SHALLOW ALLUVIAL WELL
KS: KEOKUK FORMATION WELL
SD: SALEM FORMATION WELL
SS: ST. LOUIS FORMATION WELL

* MOST RECENT SAMPLE RESULT FROM EITHER OU-1 RI (EMSI, 2000), OU-2 RI (HERST & ASSOCIATES, 2000), OR MARCH 2004 DATA FOR OU-1 FS EFFORT.

From Herst & Associates, Inc. (2007)

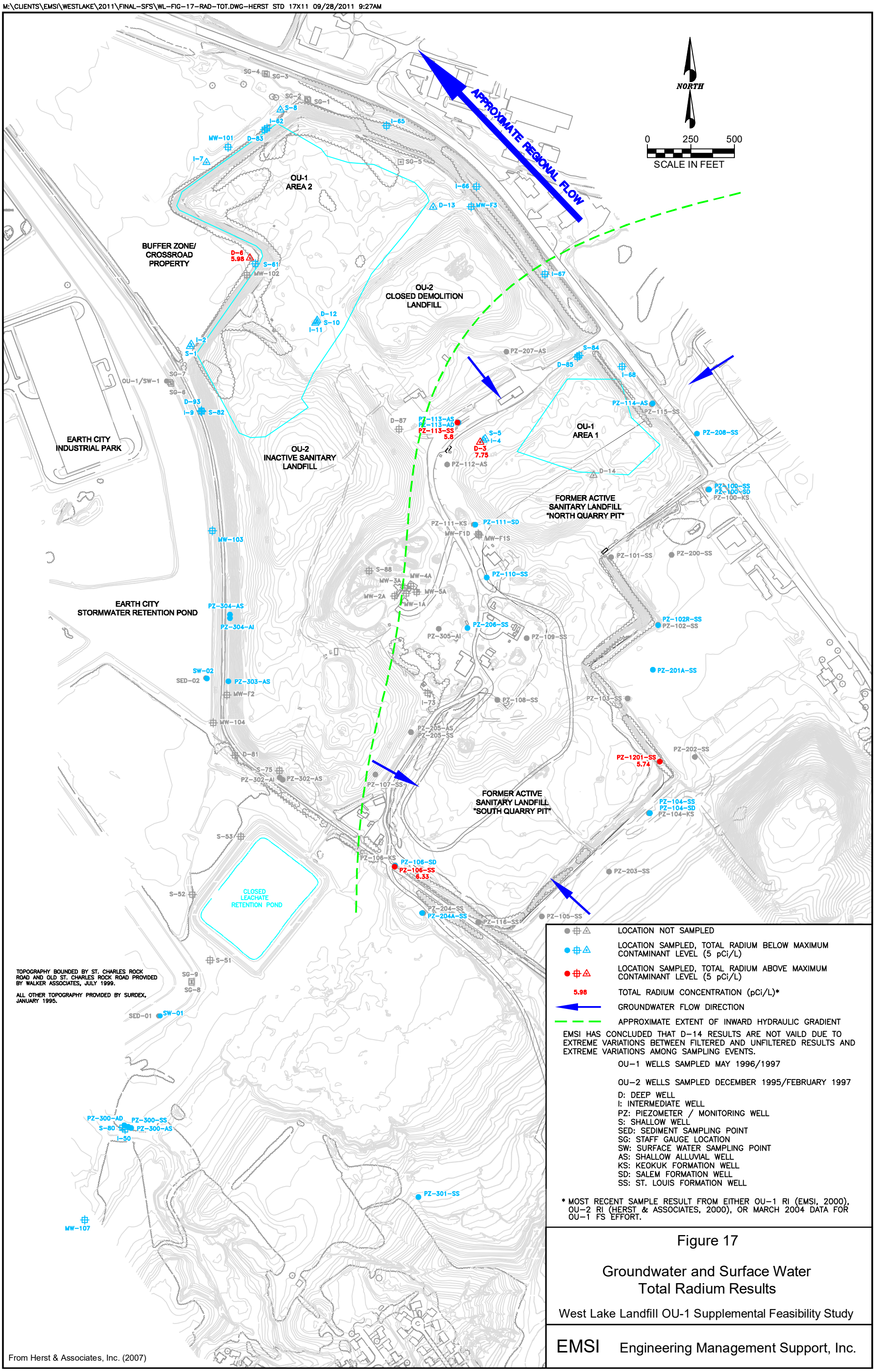
Figure 16

Groundwater and Surface Water Dissolved Radium Results

West Lake Landfill OU-1 Supplemental Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2011\FINAL-SFS\WL-FIG-17-RAD-TOT.DWG-HERST STD 17X11 09/28/2011 9:27AM



From Herst & Associates, Inc. (2007)

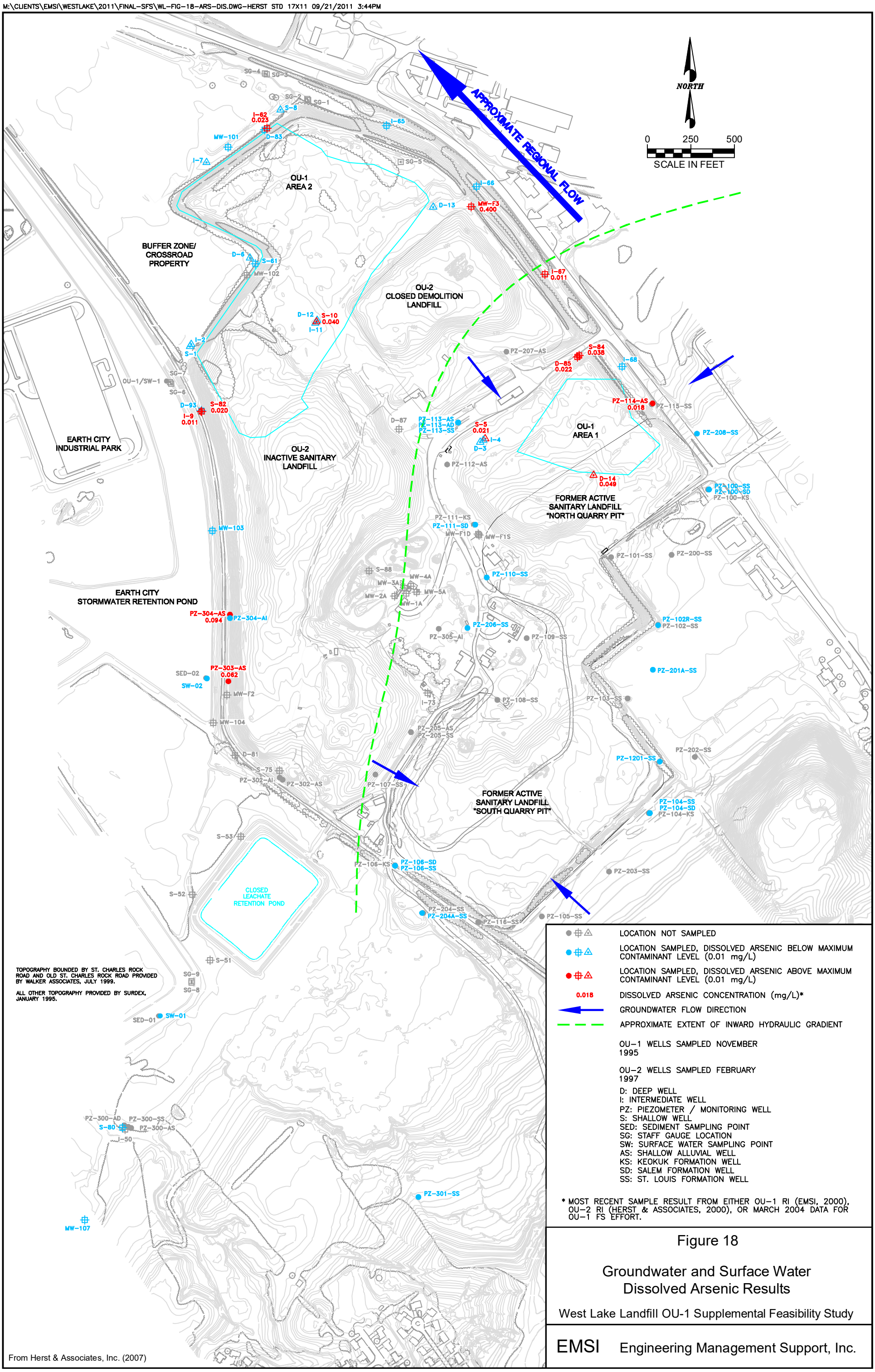
Figure 17

Groundwater and Surface Water
Total Radium Results

West Lake Landfill OU-1 Supplemental Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2011\FINAL-SFS\WL-FIG-18-ARS-DIS.DWG-HERST STD 17X11 09/21/2011 3:44PM



From Herst & Associates, Inc. (2007)

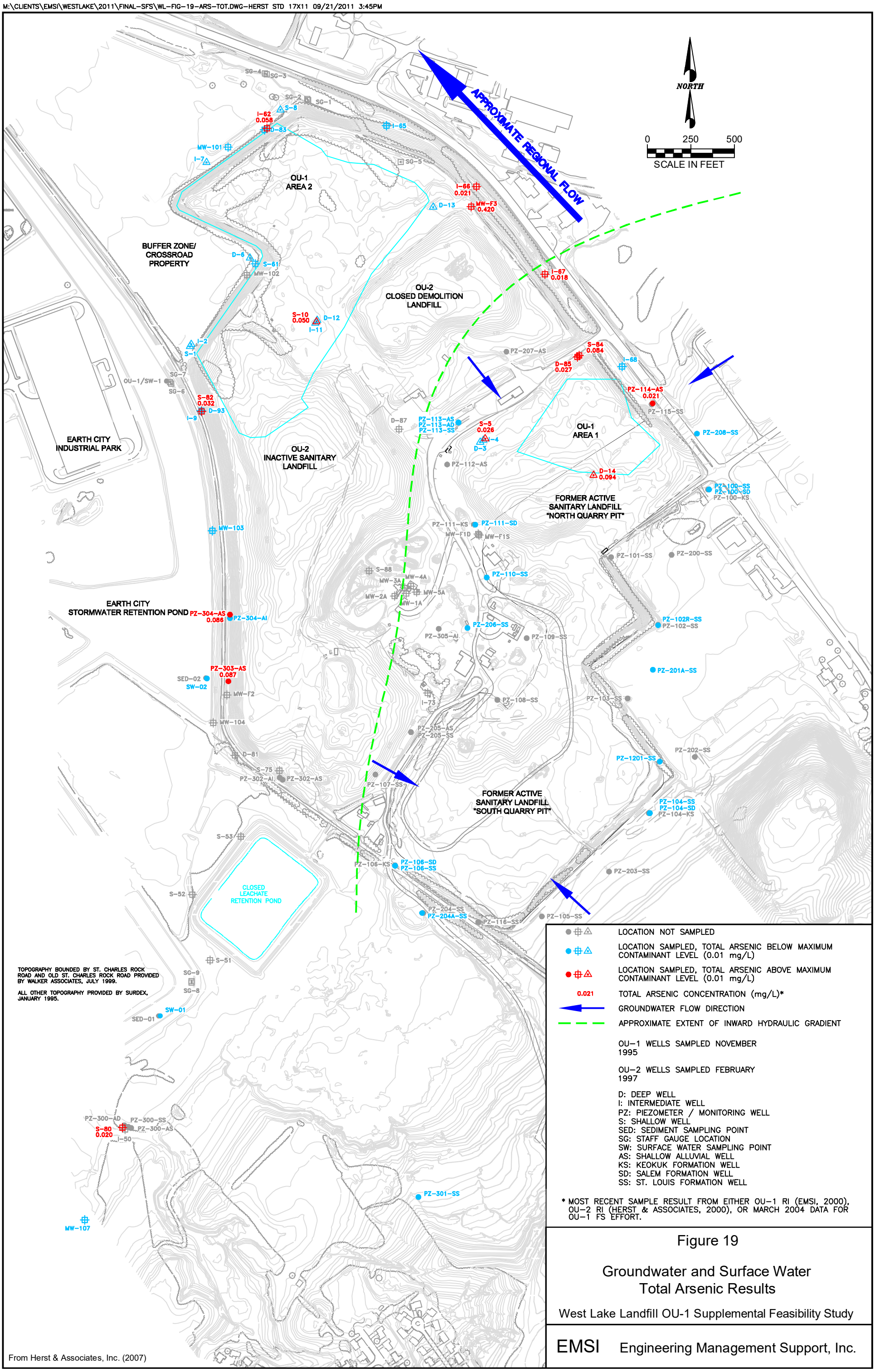
Figure 18

Groundwater and Surface Water Dissolved Arsenic Results

West Lake Landfill OU-1 Supplemental Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2011\FINAL-SFS\WL-FIG-19-ARS-TOT.DWG-HERST STD 17X11 09/21/2011 3:45PM



From Herst & Associates, Inc. (2007)

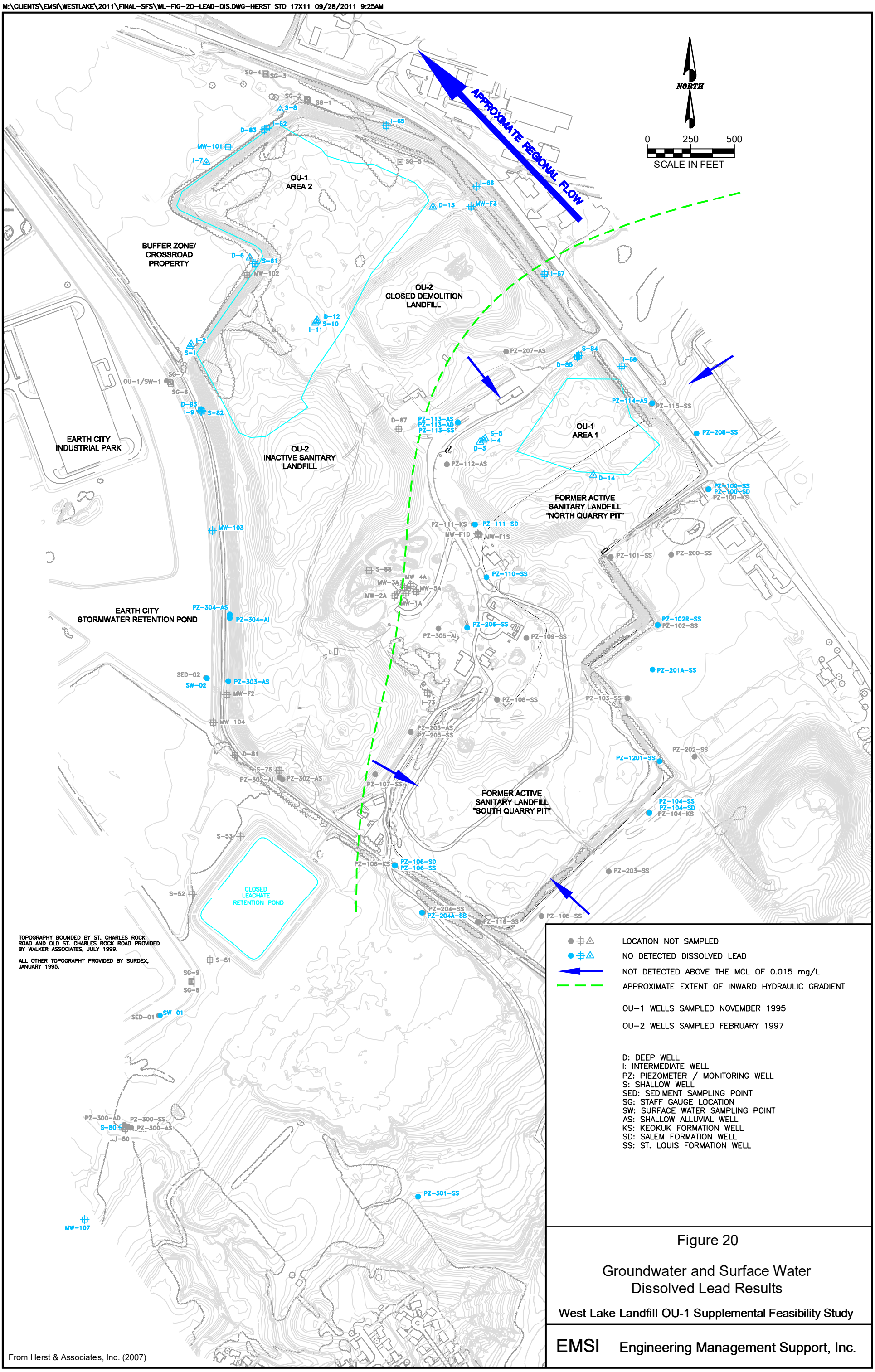
Figure 19

Groundwater and Surface Water Total Arsenic Results

West Lake Landfill OU-1 Supplemental Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2011\FINAL-SFS\WL-FIG-20-LEAD-DIS.DWG-HERST STD 17X11 09/28/2011 9:25AM



From Herst & Associates, Inc. (2007)

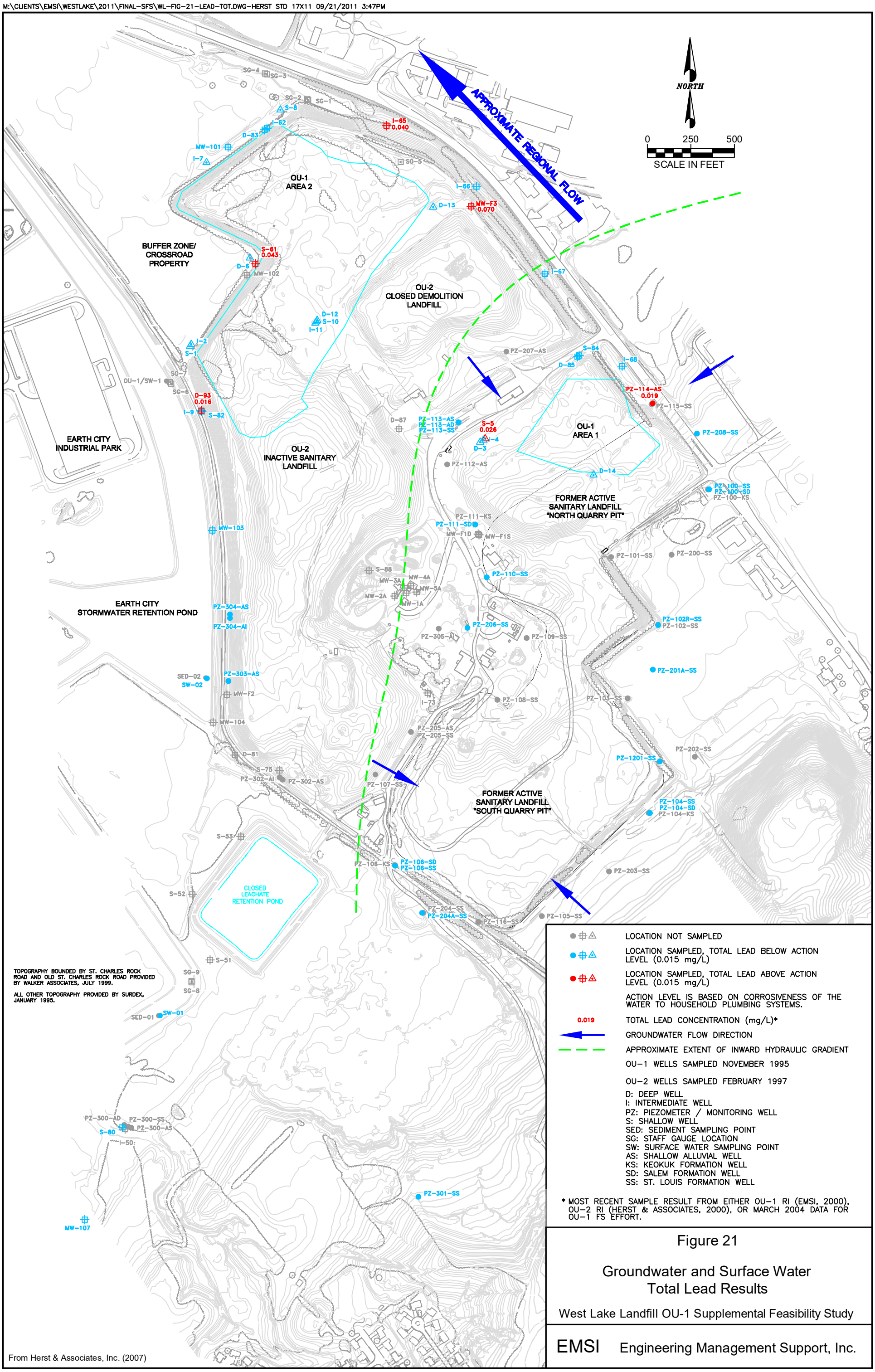
Figure 20

Groundwater and Surface Water Dissolved Lead Results

West Lake Landfill OU-1 Supplemental Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2011\FINAL-SFS\WL-FIG-21-LEAD-TOT.DWG-HERST STD 17X11 09/21/2011 3:47PM



TOPOGRAPHY BOUNDED BY ST. CHARLES ROCK ROAD AND OLD ST. CHARLES ROCK ROAD PROVIDED BY WALKER ASSOCIATES, JULY 1999.

ALL OTHER TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995.

From Herst & Associates, Inc. (2007)

- LOCATION NOT SAMPLED
- LOCATION SAMPLED, TOTAL LEAD BELOW ACTION LEVEL (0.015 mg/L)
- LOCATION SAMPLED, TOTAL LEAD ABOVE ACTION LEVEL (0.015 mg/L)

ACTION LEVEL IS BASED ON CORROSIVENESS OF THE WATER TO HOUSEHOLD PLUMBING SYSTEMS.

0.019 TOTAL LEAD CONCENTRATION (mg/L)*

GROUNDWATER FLOW DIRECTION

APPROXIMATE EXTENT OF INWARD HYDRAULIC GRADIENT

OU-1 WELLS SAMPLED NOVEMBER 1995

OU-2 WELLS SAMPLED FEBRUARY 1997

D: DEEP WELL
I: INTERMEDIATE WELL
PZ: PIEZOMETER / MONITORING WELL
S: SHALLOW WELL
SED: SEDIMENT SAMPLING POINT
SG: STAFF GAUGE LOCATION
SW: SURFACE WATER SAMPLING POINT
AS: SHALLOW ALLUVIAL WELL
KS: KEOKUK FORMATION WELL
SD: SALEM FORMATION WELL
SS: ST. LOUIS FORMATION WELL

* MOST RECENT SAMPLE RESULT FROM EITHER OU-1 RI (EMSI, 2000), OU-2 RI (HERST & ASSOCIATES, 2000), OR MARCH 2004 DATA FOR OU-1 FS EFFORT.

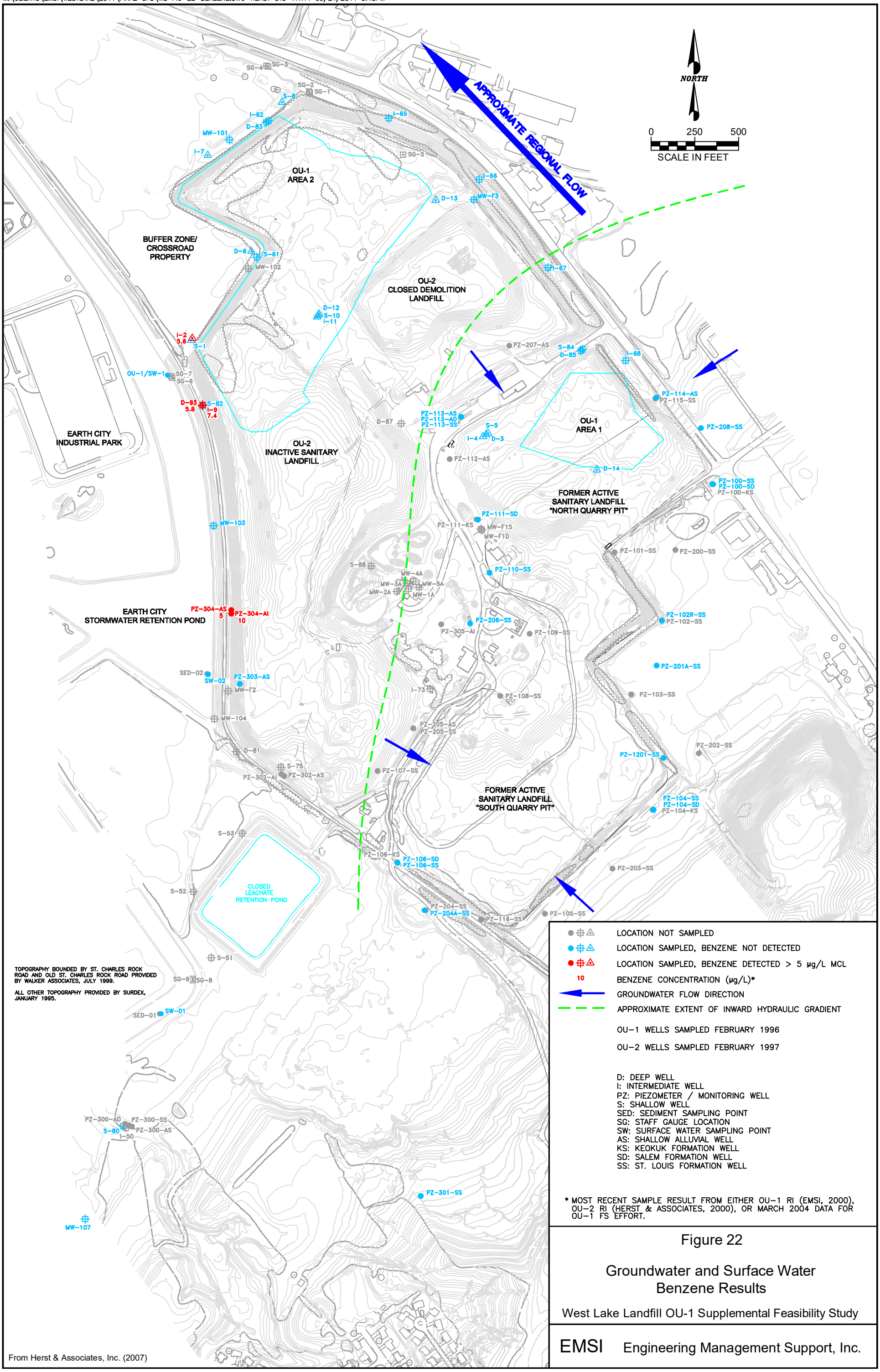
Figure 21

Groundwater and Surface Water Total Lead Results

West Lake Landfill OU-1 Supplemental Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2011\FINAL-SFS\WL-FIG-22-BENZENE.DWG-HERST STD 17X11 09/21/2011 3:48PM



TOPOGRAPHY BOUNDED BY ST. CHARLES ROCK ROAD AND OLD ST. CHARLES ROCK ROAD PROVIDED BY WALKER ASSOCIATES, JULY 1999.

ALL OTHER TOPOGRAPHY PROVIDED BY SURDEX, JANUARY 1995.

From Herst & Associates, Inc. (2007)

- LOCATION NOT SAMPLED
- LOCATION SAMPLED, BENZENE NOT DETECTED
- LOCATION SAMPLED, BENZENE DETECTED > 5 µg/L MCL
- 10 BENZENE CONCENTRATION (µg/L)*
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE EXTENT OF INWARD HYDRAULIC GRADIENT

OU-1 WELLS SAMPLED FEBRUARY 1996

OU-2 WELLS SAMPLED FEBRUARY 1997

D: DEEP WELL
I: INTERMEDIATE WELL
PZ: PIEZOMETER / MONITORING WELL
S: SHALLOW WELL
SED: SEDIMENT SAMPLING POINT
SG: STAFF GAUGE LOCATION
SW: SURFACE WATER SAMPLING POINT
AS: SHALLOW ALLUVIAL WELL
KS: KEOKUK FORMATION WELL
SD: SALEM FORMATION WELL
SS: ST. LOUIS FORMATION WELL

* MOST RECENT SAMPLE RESULT FROM EITHER OU-1 RI (EMSI, 2000), OU-2 RI (HERST & ASSOCIATES, 2000), OR MARCH 2004 DATA FOR OU-1 FS EFFORT.

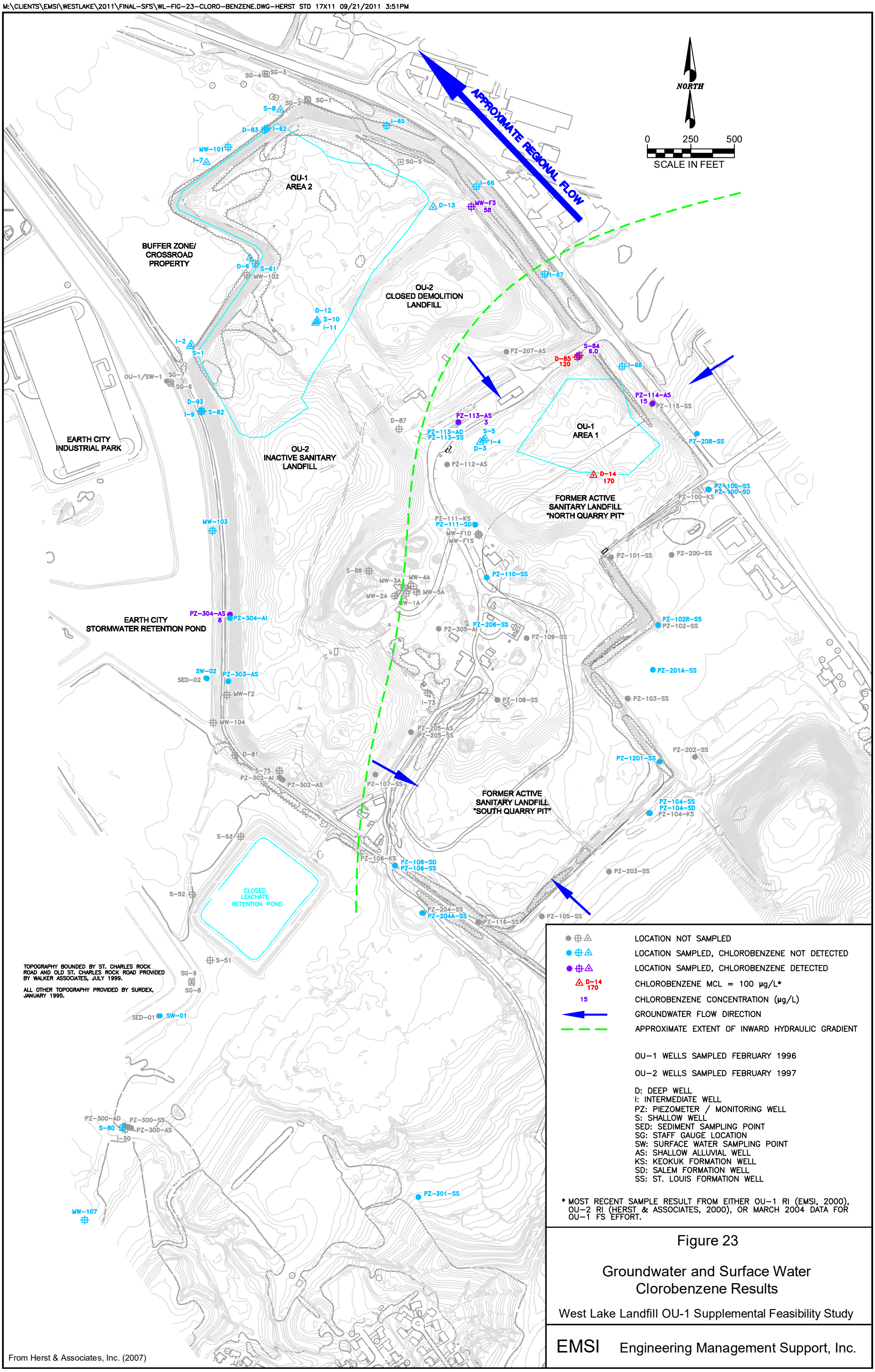
Figure 22

Groundwater and Surface Water Benzene Results

West Lake Landfill OU-1 Supplemental Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2011\FINAL-SFS\WL-FIG-23-CLORO-BENZENE.DWG-HERST STD 17X11 09/21/2011 3:51PM



From Herst & Associates, Inc. (2007)

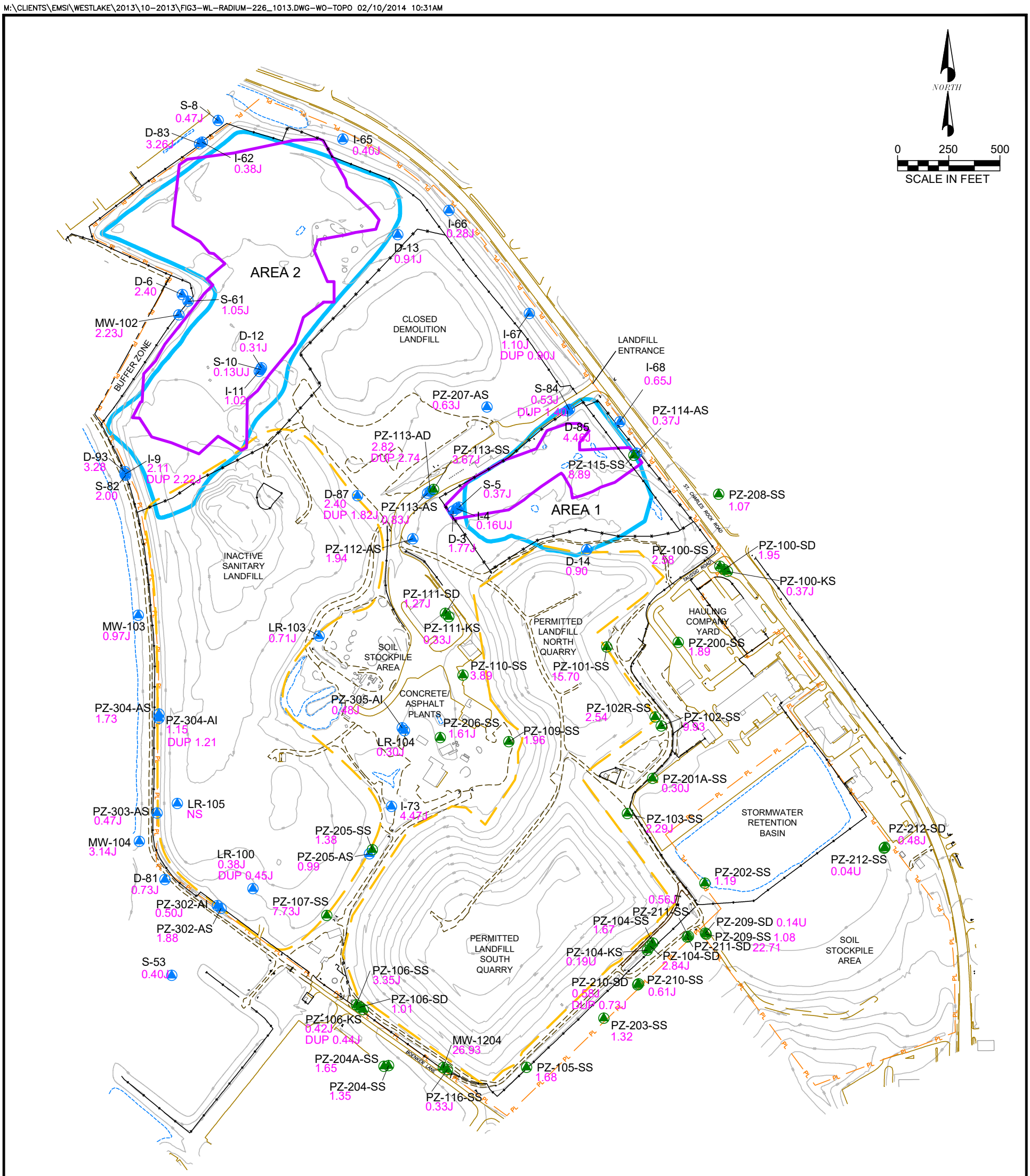
Figure 23

Groundwater and Surface Water Clorobenzene Results

West Lake Landfill OU-1 Supplemental Feasibility Study

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG3-WL-RADIUM-226_1013.DWG-WO-TOPO 02/10/2014 10:31AM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092 Radium-226 (pCi/L)
NS Not Sampled

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
UJ- = Non-Detect at the estimated reported value which may be biased low
J = Estimated result
J+ = Esitmated result which may be biased high

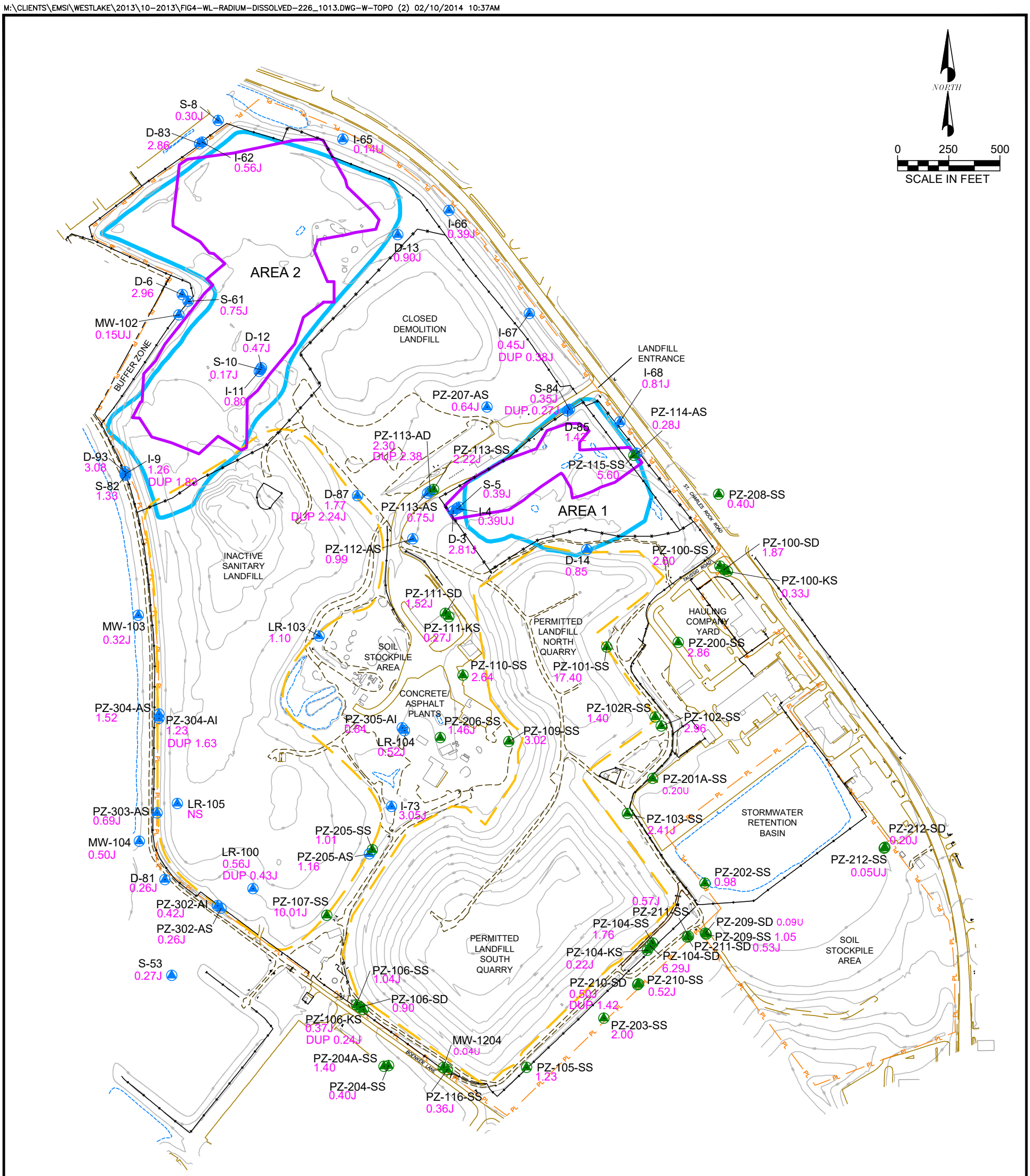
Figure 3

Total Radium-226 in Groundwater
October - November 2013

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG4-WL-RADIUM-DISSOLVED-226_1013.DWG-W-TOPO (2) 02/10/2014 10:37AM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092	Radium-226 (pCi/L)
NS	Not Sampled

Data Validation Qualifiers:

U	= Non-detect at the reported value
UJ	= Non-Detect at the estimated reported value
UJ+	= Non-Detect at the estimated reported value which may be biased high
UJ-	= Non-Detect at the estimated reported value which may be biased low
J	= Estimated result
J+	= Esitmated result which may be biased high

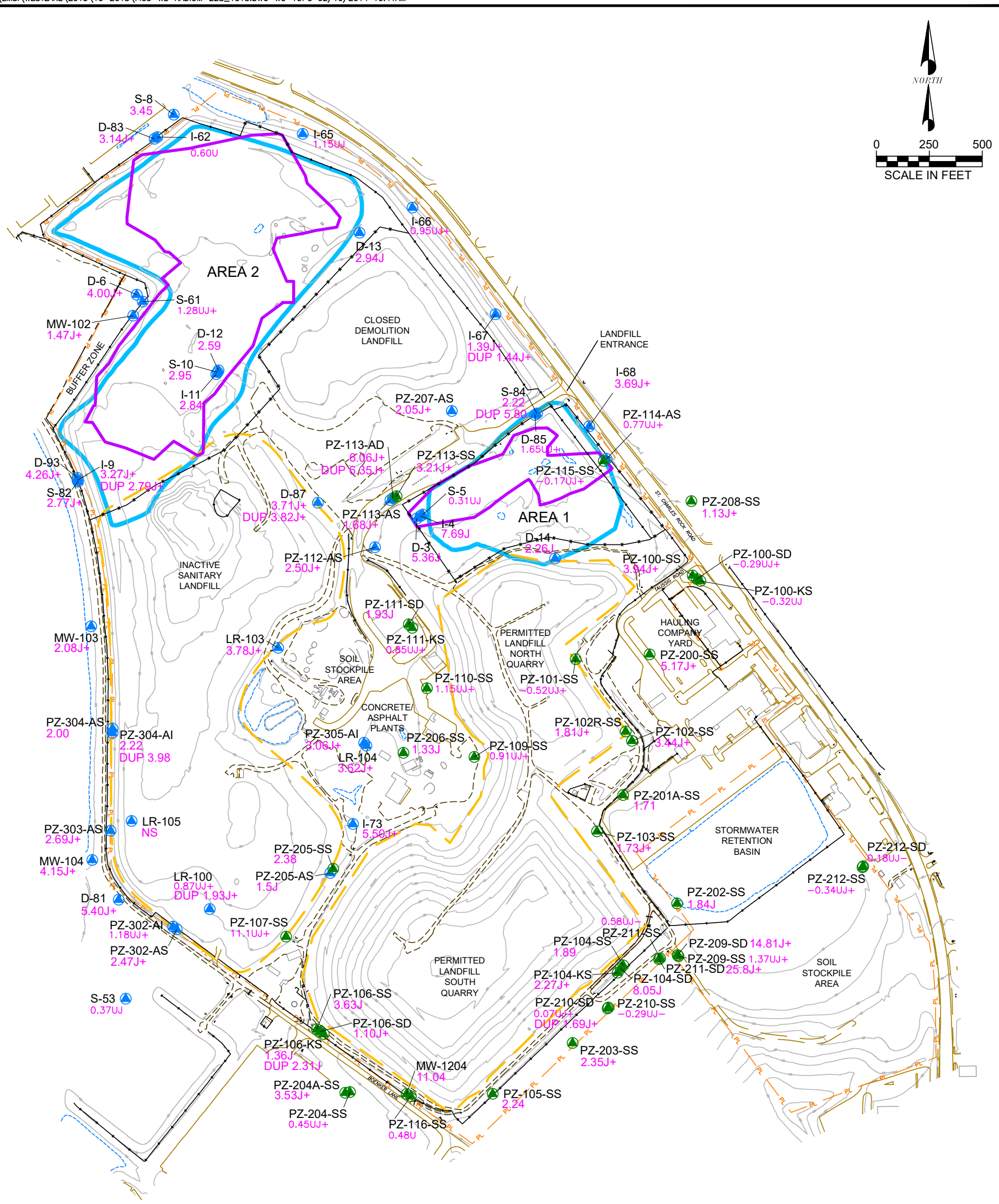
Figure 4

Dissolved Radium-226 in Groundwater
October - November 2013

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG5-WL-RADIUM-228_1013.DWG-WO-TOPO 02/10/2014 10:41AM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092	Radium-228 (pCi/L)
NS	Not Sampled

Data Validation Qualifiers:

U	= Non-detect at the reported value
UJ	= Non-Detect at the estimated reported value
UJ+	= Non-Detect at the estimated reported value which may be biased high
UJ-	= Non-Detect at the estimated reported value which may be biased low
J	= Estimated result
J+	= Esitmated result which may be biased high

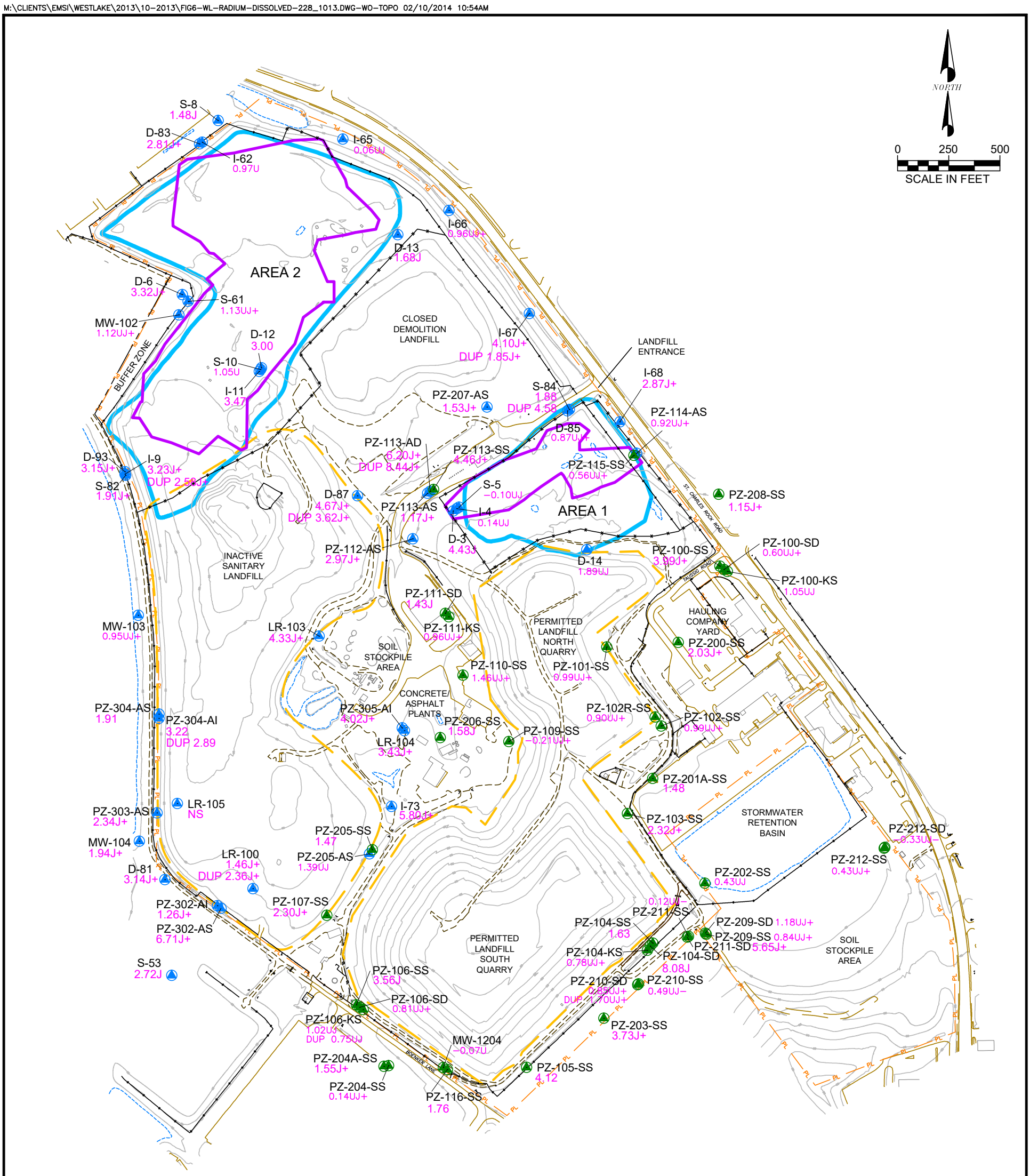
Figure 5

Total Radium-228 in Groundwater October - November 2013

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG6-WL-RADIUM-DISSOLVED-228_1013.DWG-WO-TOPO 02/10/2014 10:54AM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

.092	Radium-228 (pCi/L)
NS	Not Sampled

Data Validation Qualifiers:

U	= Non-detect at the reported value
UJ	= Non-Detect at the estimated reported value
UJ+	= Non-Detect at the estimated reported value which may be biased high
UJ-	= Non-Detect at the estimated reported value which may be biased low
J	= Estimated result
J+	= Esitmated result which may be biased high

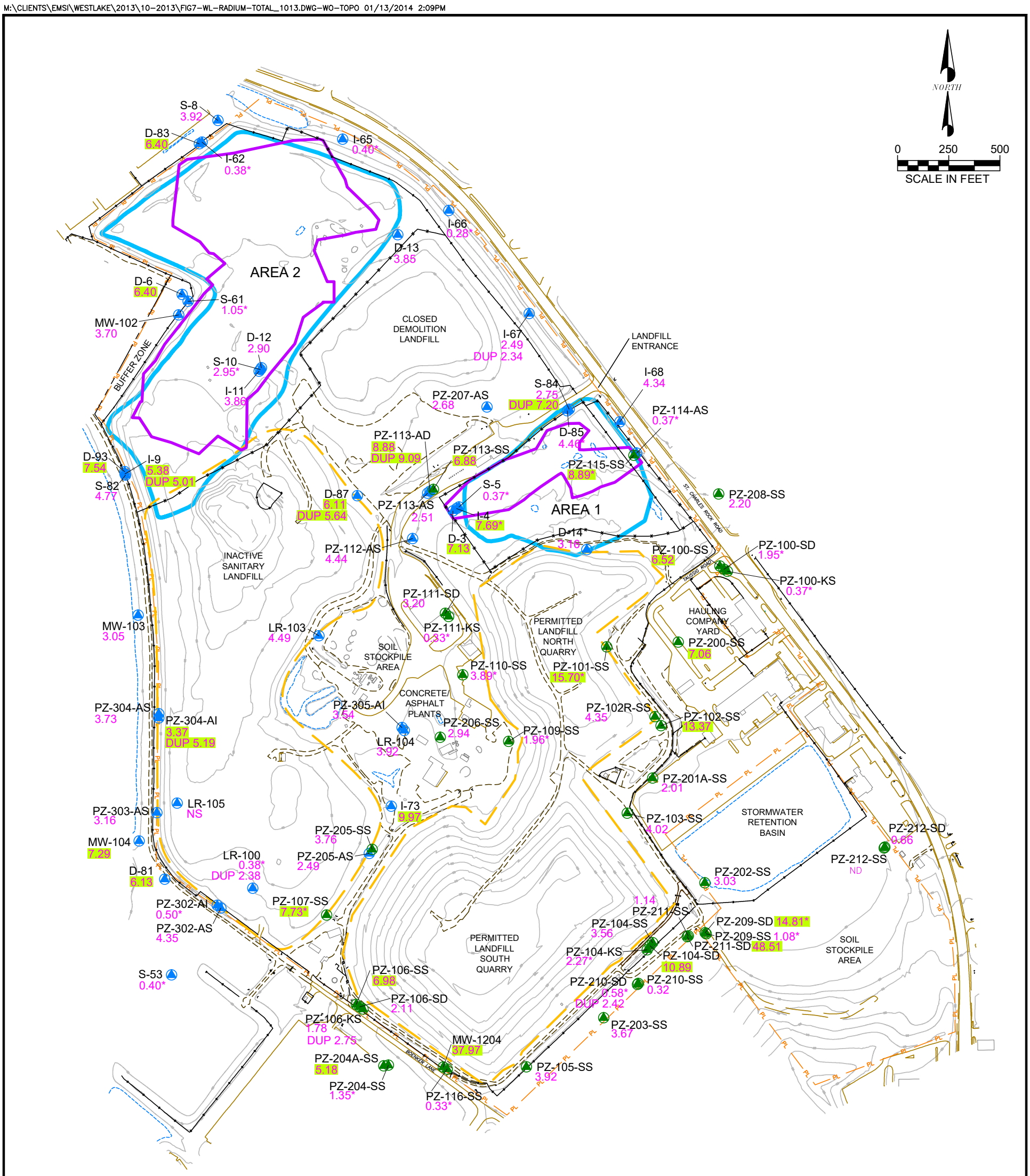
Figure 6

Dissolved Radium-228 in Groundwater October - November 2013

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG7-WL-RADIUM-TOTAL_1013.DWG-WO-TOPO 01/13/2014 2:09PM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

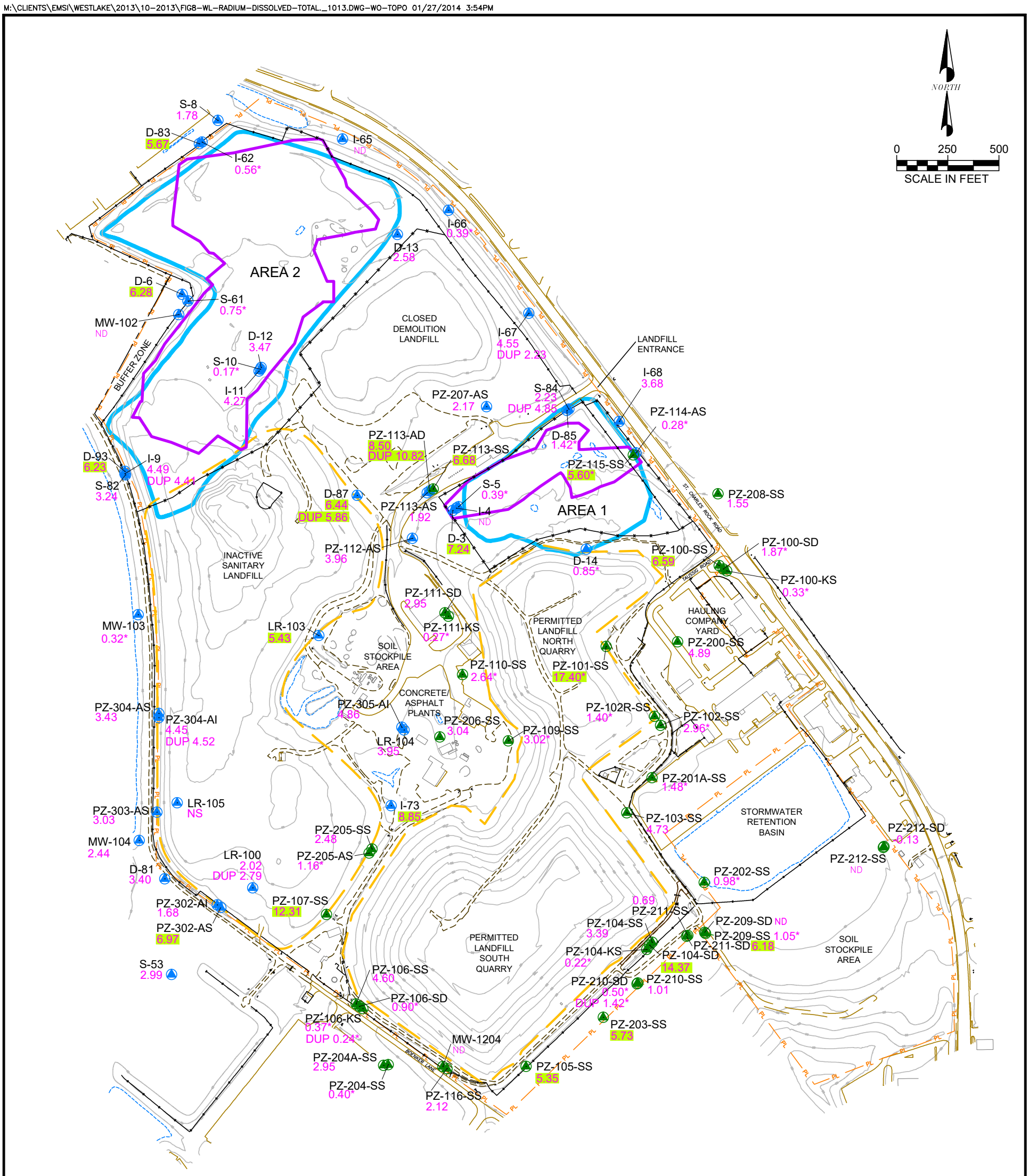
RADIUM EXPLANATION

1.72	Total Radium result that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
4.50*	Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *
6.10	Total Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
ND	Both Radium-226 and Radium-228 were non-detect
NS	Not Sampled

Figure 7
Combined
Total Radium-226 + Total Radium-228
in Groundwater
October - November 2013
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG8-WL-RADIUM-DISSOLVED-TOTAL._1013.DWG-WO-TOPO 01/27/2014 3:54PM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

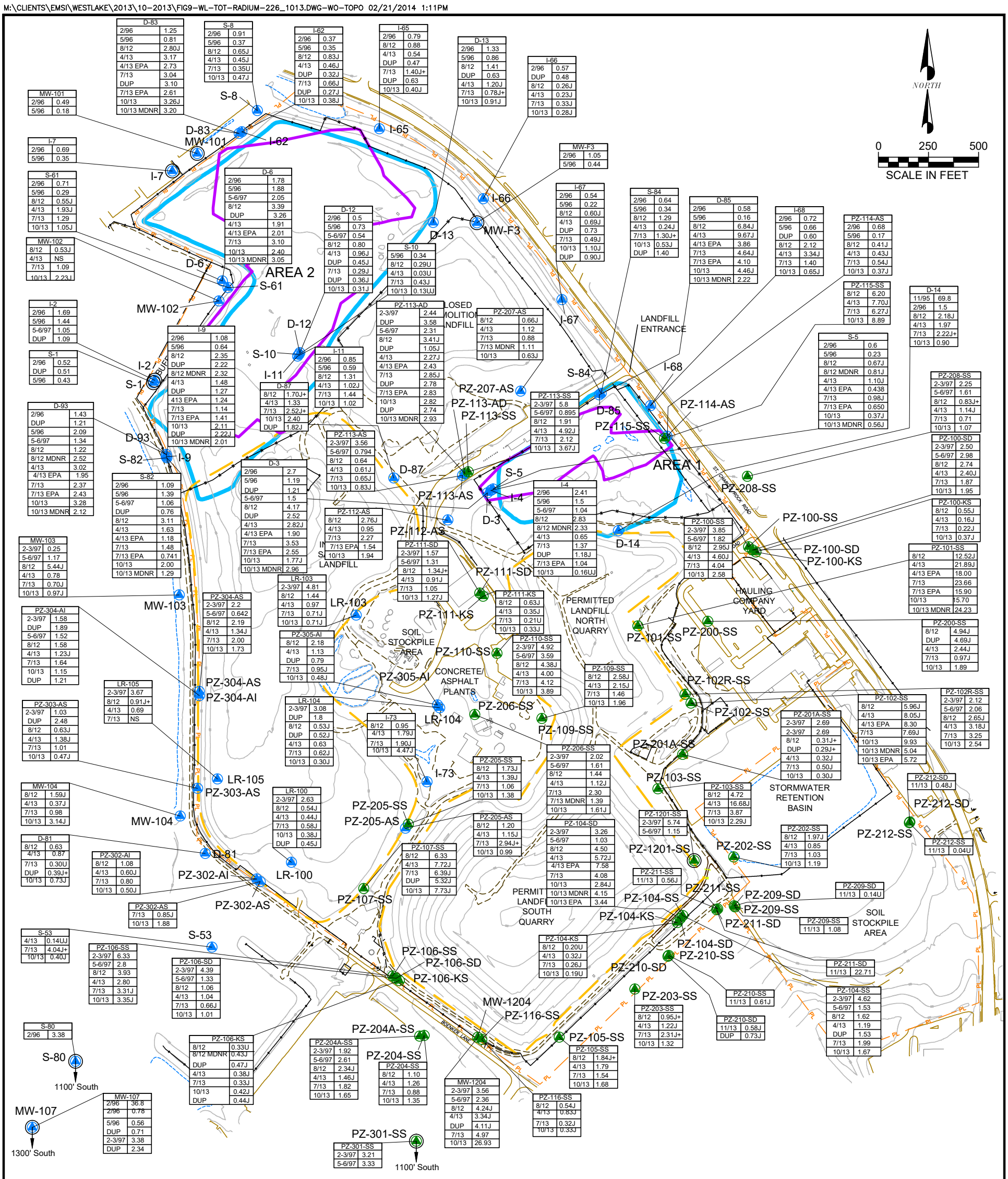
RADIUM EXPLANATION

.092	Total Dissolved Radium that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
1.08*	Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *
5.20	Total Dissolved Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
ND	Both Radium-226 and Radium-228 were non-detect
NS	Not Sampled

Figure 8
Combined
Dissolved Radium-226 + Dissolved Radium-228 in Groundwater
October - November 2013
West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG9-WL-TOT-RADIUM-226_1013.DWG-WO-TOPO 02/21/2014 1:11PM



D-83	
2/96	1.25
5/96	0.81
8/12	2.80J
4/13	3.17
4/13 EPA	2.73
7/13	3.04
DUP	3.10
7/13 EPA	2.61
10/13	3.26J
10/13 MDNR	3.20

S-8	
2/96	0.91
5/96	0.37
8/12	0.65J
4/13	0.45J
7/13	0.35U
10/13	0.47J

I-62	
2/96	0.37
5/96	0.35
8/12	0.83J
4/13	0.46J
DUP	0.32J
7/13	0.66J
DUP	0.27J
10/13	0.38J

I-65	
2/96	0.79
8/12	0.88
4/13	0.54
DUP	0.47
7/13	1.40J+
DUP	0.63
10/13	0.40J

D-13	
2/96	1.33
5/96	0.86
8/12	1.41
DUP	0.63
4/13	1.20J
7/13	0.78J+
10/13	0.91J

I-66	
2/96	0.57
DUP	0.48
8/12	0.26J
4/13	0.23J
7/13	0.33J
10/13	0.28J

MW-F3	
2/96	1.05
5/96	0.44

MW-101	
2/96	0.49
5/96	0.18

I-7	
2/96	0.69
5/96	0.35

S-61	
2/96	0.71
5/96	0.29
8/12	0.55J
4/13	1.93J
7/13	1.29
10/13	1.05J

MW-102	
8/12	0.53J
4/13	NS
7/13	1.09
10/13	2.23J

D-6	
2/96	1.78
5/96	1.88
5-6/97	2.05
8/12	3.39
DUP	3.26
4/13	1.91
4/13 EPA	2.01
7/13	3.10
10/13	2.40
10/13 MDNR	3.05

D-12	
2/96	0.5
5/96	0.73
5-6/97	0.54
8/12	0.80
4/13	0.96J
DUP	0.45J
7/13	0.29J
DUP	0.36J
10/13	0.31J

S-10	
5/96	0.34
8/12	0.29U
4/13	0.03U
7/13	0.43J
10/13	0.13UJ

I-67	
2/96	0.54
5/96	0.22
8/12	0.60J
4/13	0.69J
DUP	0.73
7/13	0.49J
10/13	1.10J
DUP	0.90J

S-84	
2/96	0.64
5/96	0.34
8/12	1.29
4/13	0.24J
7/13	1.30J+
10/13	0.53J
DUP	1.40

D-85	
2/96	0.58
5/96	0.16
8/12	6.84J
4/13	9.67J
4/13 EPA	3.86
7/13	4.64J
7/13 EPA	4.10
10/13	4.46J
10/13 MDNR	2.22

I-68	
2/96	0.72
5/96	0.66
DUP	0.60
8/12	2.12
4/13	3.34J
7/13	1.40
10/13	0.65J

PZ-114-AS	
2/96	0.68
5/96	0.17
8/12	0.41J
4/13	0.43J
7/13	0.54J
10/13	0.37J

PZ-115-SS	
8/12	6.20
4/13	7.70J
7/13	6.27J
10/13	8.89

D-14	
11/95	69.8
2/96	1.5
8/12	2.18J
4/13	1.97
7/13	2.22J+
10/13	0.90

I-2	
2/96	1.69
5/96	1.44
5-6/97	1.05
DUP	1.09

S-1	
2/96	0.52
DUP	0.51
5/96	0.43

I-9	
2/96	1.08
5/96	0.64
8/12	2.35
DUP	2.22
8/12 MDNR	2.32
4/13	1.48
DUP	1.27
413 EPA	1.24
7/13	1.14
7/13 EPA	1.41
10/13	2.11
DUP	2.22J
10/13 MDNR	2.01

D-87	
8/12	1.70J+
4/13	1.33
7/13	2.52J+
10/13	2.40
DUP	1.82J

I-11	
2/96	0.85
5/96	0.59
8/12	1.31
4/13	1.02J
7/13	1.44
10/13	1.02

PZ-113-AD	
2-3/97	2.44
DUP	3.58
5-6/97	2.31
8/12	3.41J
DUP	1.05J
4/13	2.27J
4/13 EPA	2.43
7/13	2.85J
DUP	2.78
7/13 EPA	2.83
10/13	2.82
DUP	2.74
10/13 MDNR	2.93

PZ-207-AS	
8/12	0.66J
4/13	1.12
7/13	0.88
7/13 MDNR	1.11
10/13	0.63J

PZ-113-SS	
2-3/97	5.8
5-6/97	0.895
8/12	1.91
4/13	4.92J
7/13	2.12
10/13	3.67J

S-5	
2/96	0.6
5/96	0.23
8/12	0.67J
8/12 MDNR	0.81J
4/13	1.10J
4/13 EPA	0.438
7/13	0.98J
7/13 EPA	0.650
10/13	0.37J
10/13 MDNR	0.56J

PZ-208-SS	
2-3/97	2.25
5-6/97	1.61
8/12	0.83J+
4/13	1.14J
7/13	0.71
10/13	1.07

D-93	
2/96	1.43
DUP	1.21
5/96	2.09
5-6/97	1.34
8/12	1.22
8/12 MDNR	2.52
4/13	3.02
4/13 EPA	1.95
7/13	2.37
7/13 EPA	2.43
10/13	3.28
10/13 MDNR	2.12

S-82	
2/96	1.09
5/96	1.39
5-6/97	1.06
DUP	0.76
8/12	3.11
4/13	1.63
4/13 EPA	1.18
7/13	1.48
7/13 EPA	0.741
10/13	2.00
10/13 MDNR	1.29

D-3	
2/96	2.7
5/96	1.19
DUP	1.21
5-6/97	1.5
8/12	4.17
DUP	2.52
4/13	2.82J
4/13 EPA	1.90
7/13	3.53
7/13 EPA	2.55
10/13	1.77J
10/13 MDNR	2.96

PZ-113-AS	
2-3/97	3.56
5-6/97	0.794
8/12	0.64
4/13	0.61J
7/13	0.65J
10/13	0.83J

PZ-112-AS	
8/12	2.76J
4/13	0.95
7/13	2.27
7/13 EPA	1.54
10/13	1.94

I-4	
2/96	2.41
5/96	1.5
5-6/97	1.04
8/12	2.83
8/12 MDNR	2.33
4/13	0.65
7/13	1.37
DUP	1.18J
7/13 EPA	1.04
10/13	0.16UJ

PZ-100-SS	
2-3/97	3.85
5-6/97	1.82
8/12	2.95J
4/13	4.60J
7/13	4.04
10/13	2.58

PZ-100-KS	
8/12	0.55J
4/13	0.16J
7/13	0.22J
10/13	0.37J

PZ-101-SS	
8/12	12.52J
4/13	21.89J
4/13 EPA	18.00
7/13	23.66
7/13 EPA	15.90
10/13	15.70
10/13 MDNR	24.23

PZ-111-SD	
2-3/97	1.57
5-6/97	1.31
8/12	1.34J+
4/13	0.91J
7/13	1.05
10/13	1.27J

PZ-111-KS	
8/12	0.63J
4/13	0.35J
7/13	0.21U
10/13	0.33J

LR-103	
2-3/97	4.81
8/12	1.44
4/13	0.97
7/13	0.71J
10/13	0.71J

PZ-304-AS	
2-3/97	2.2
5-6/97	0.642
8/12	2.19
4/13	1.34J
7/13	2.00
10/13	1.73

PZ-304-AI	
2-3/97	1.58
DUP	1.89
5-6/97	1.52
8/12	1.58
4/13	1.23J
7/13	1.64
10/13	1.15
DUP	1.21

PZ-305-AI	
8/12	2.18
4/13	1.13
DUP	0.79
7/13	0.95J
10/13	0.48J

PZ-110-SS	
2-3/97	4.92
5-6/97	3.59
8/12	4.38J
4/13	4.00
7/13	4.12
10/13	3.89

PZ-109-SS	
8/12	2.58J
4/13	2.15J
7/13	1.46
10/13	1.96

PZ-102R-SS	
2-3/97	2.12
5-6/97	2.06
8/12	2.65J
4/13	3.18J
7/13	3.25
10/13	2.54

PZ-102-SS	
8/12	5.96J
4/13	8.05J
4/13 EPA	8.30
7/13	7.69J
10/13	9.93
10/13 MDNR	5.04
10/13 EPA	5.72

PZ-201A-SS	
2-3/97	2.69
2-3/97	2.69
8/12	0.31J+
DUP	0.29J+
4/13	0.32J
7/13	0.50J
10/13	0.30J

PZ-212-SD	
11/13	0.48J

PZ-212-SS	
11/13	0.04U

LR-105	
2-3/97	3.67
8/12	0.91J+
4/13	0.69
7/13	NS

LR-104	
2-3/97	3.08
DUP	1.8
8/12	0.53J
DUP	0.52J
4/13	0.63
7/13	0.62J
10/13	0.30J

I-73	
8/12	0.95
4/13	1.79J
7/13	1.90J
10/13	4.47J

PZ-205-SS	
8/12	1.73J
4/13	1.39J
7/13	1.06
10/13	1.38

PZ-206-SS	
2-3/97	2.02
5-6/97	1.61
8/12	1.44
4/13	1.12J
7/13	2.30
7/13 MDNR	1.39
10/13	1.61J

PZ-103-SS	
8/12	4.72
4/13	16.68J
7/13	3.87
10/13	2.29J

PZ-1201-SS	
2-3/97	5.74
5-6/97	1.15

PZ-202-SS	
8/12	1.97J
4/13	0.85
7/13	1.03
10/13	1.19

LR-100	
2-3/97	2.63
8/12	0.54J
4/13	0.44J
7/13	0.58J
10/13	0.38J
DUP	0.45J

PZ-205-AS	
8/12	1.20
4/13	1.15J
7/13	2.94J+
10/13	0.99

PZ-104-SD	
2-3/97	3.26
5-6/97	1.03
8/12	4.50
4/13	5.72J
4/13 EPA	7.58
7/13	4.08
10/13	2.84J
10/13 MDNR	4.15
10/13 EPA	3.44

PZ-107-SS	
8/12	6.33
4/13	7.72J
7/13	6.39J
DUP	5.32J
10/13	7.73J

PZ-211-SS	
11/13	0.56J

PZ-209-SD	
11/13	0.14U

PZ-209-SS	
11/13	1.08

D-81	
8/12	0.63
4/13	0.87
7/13	0.30U
DUP	0.39J+
10/13	0.73J

PZ-302-AI	
8/12	1.08
4/13	0.60J
7/13	0.80
10/13	0.50J

PZ-302-AS	
7/13	0.85J
10/13	1.88

S-53	
4/13	0.14UJ
7/13	4.04J+
10/13	0.40J

PZ-106-SS	
2-3/97	6.33
5-6/97	2.8
8/12	3.93
4/13	2.80
7/13	3.31J
10/13	3.35J

PZ-106-SD	
2-3/97	4.39
5-6/97	1.33
8/12	1.06
4/13	1.04
7/13	0.66J
10/13	1.01

PZ-104-KS	
8/12	0.20U
4/13	0.32J
7/13	0.26J
10/13	0.19U

PZ-211-SD	
11/13	22.71

PZ-104-SS	
2-3/97	4.62
5-6/97	1.53
8/12	1.62
4/13	1.19
DUP	1.53
7/13	1.99
10/13	1.67

PZ-203-SS	
8/12	0.95J+
4/13	1.22J
7/13	2.31J+
10/13	1.32

PZ-210-SS	
11/13	0.61J

PZ-210-SD	
11/13	0.58J
DUP	0.73J

PZ-106-KS	
8/12	0.33U
8/12 MDNR	0.43J
DUP	0.47J
4/13	0.38J
7/13	0.33J
10/13	0.42J
DUP	0.44J

PZ-204A-SS	
2-3/97	1.92
5-6/97	2.61
8/12	2.34J
4/13	1.46J
7/13	1.82
10/13	1.65

PZ-204-SS	
8/12	1.10
4/13	1.26
7/13	0.88
10/13	1.35

MW-1204	
2-3/97	3.56
5-6/97	2.36
8/12	4.24J
4/13	3.34J
DUP	4.11J
7/13	4.97
10/13	26.93

PZ-116-SS	
8/12	0.54J
4/13	0.83J
7/13	0.32J
10/13	0.33J

PZ-105-SS	
8/12	1.84J+
4/13	1.79
7/13	1.54
10/13	1.68

S-80	
2/96	3.38

MW-107	
2/96	36.8
2/96	0.78
5/96	0.56
DUP	0.71
2-3/97	3.38
DUP	2.34

PZ-301-SS	
2-3/97	3.21
5-6/97	3.33

LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- RI/FS Groundwater Well That No Longer Exists
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
UJ- = Non-Detect at the estimated reported value which may be biased low
J = Estimated result
J+ = esitmated result which may be biased high

Well Number — MW-1204
Date Sampled — 2-3/97 | 3.56 — Total Radium-226 Concentration in (pCi/L)

RADIUM EXPLANATION

EMSI has concluded that D-14 results are not vaild due to extreme variations between filtered and unfiltered results and extreme variations among sampling events.

OU-1 Wells Sampled 11/95, 2/96, 5/96, 5/97, 3/04, 5/04, 8/12, 4/13 and 7/13
OU-2 Wells Sampled 2-3/97 and 5-6/97, 8/12, 4/13 and 7/13

Data from either OU-1 RI (EMSI, 2000), OU-2 RI (Herst & Associates, 2000), or 2004 Data for OU-1 FS Effort.

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

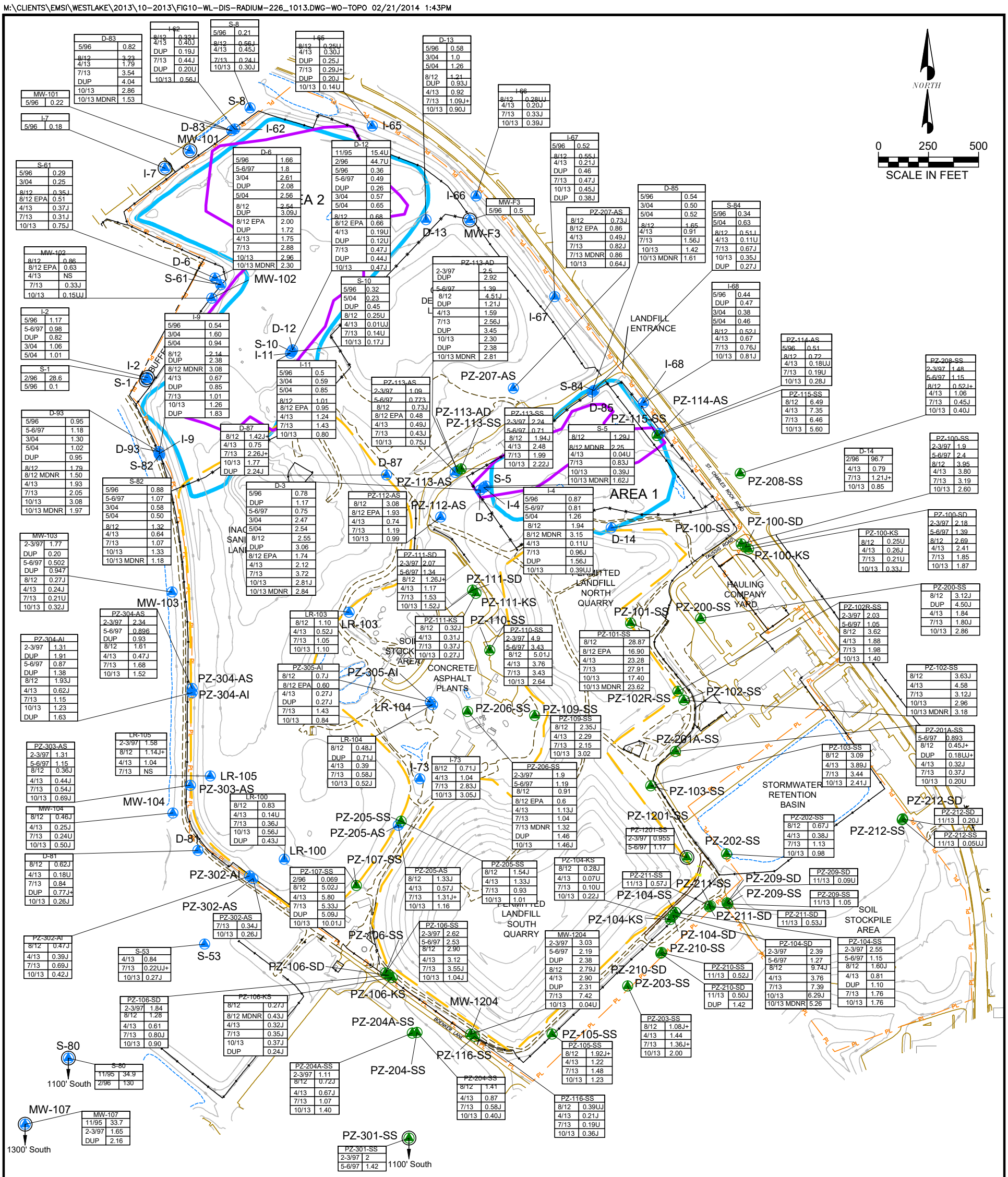
Figure 9

2013, 2012 and RI/FS Results for Total Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\CLIENTS\EMSI\WESTLAKE\2013\10-2013\FIG10-WL-DIS-RADIUM-226_1013.DWG-WO-TOPO 02/21/2014 1:43PM



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- RI/FS Groundwater Well That No Longer Exists
- Operable Unit-1 Area as Defined By ROD
- Estimated Extent of Radiologically Impacted Material
- Paved Road
- Unpaved Road

WELL FORMATION DESIGNATIONS

- LR or MW: Undifferentiated
- S or AS: Alluvial Shallow Well
- I or AI: Alluvial Intermediate Well
- D or AD: Alluvial Deep Well
- SS: St. Louis Formation Well
- SD: Salem Formation Well
- KS: Keokuk Formation Well

Data Validation Qualifiers:

- U = Non-detect at the reported value
- UJ = Non-Detect at the estimated reported value
- UJ+ = Non-Detect at the estimated reported value which may be biased high
- UJ- = Non-Detect at the estimated reported value which may be biased low
- J = Estimated result
- J+ = esitmated result which may be biased high

RADIUM EXPLANATION

Well Number — MW-1204 — Date Sampled: 2-3/97 — 3.03 — Dissolved Radium-226 Concentration in (pCi/L)

EMSI has concluded that D-14 results are not vaild due to extreme variations between filtered and unfiltered results and extreme variations among sampling events.

OU-1 Wells Sampled 11/95, 2/96, 5/96, 5/97, 3/04, 5/04, 8/12, 4/13 and 7/13
OU-2 Wells Sampled 2-3/97 and 5-6/97, 8/12, 4/13 and 7/13

Data from either OU-1 RI (EMSI, 2000), OU-2 RI (Herst & Associates, 2000), or 2004 Data for OU-1 FS Effort.

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

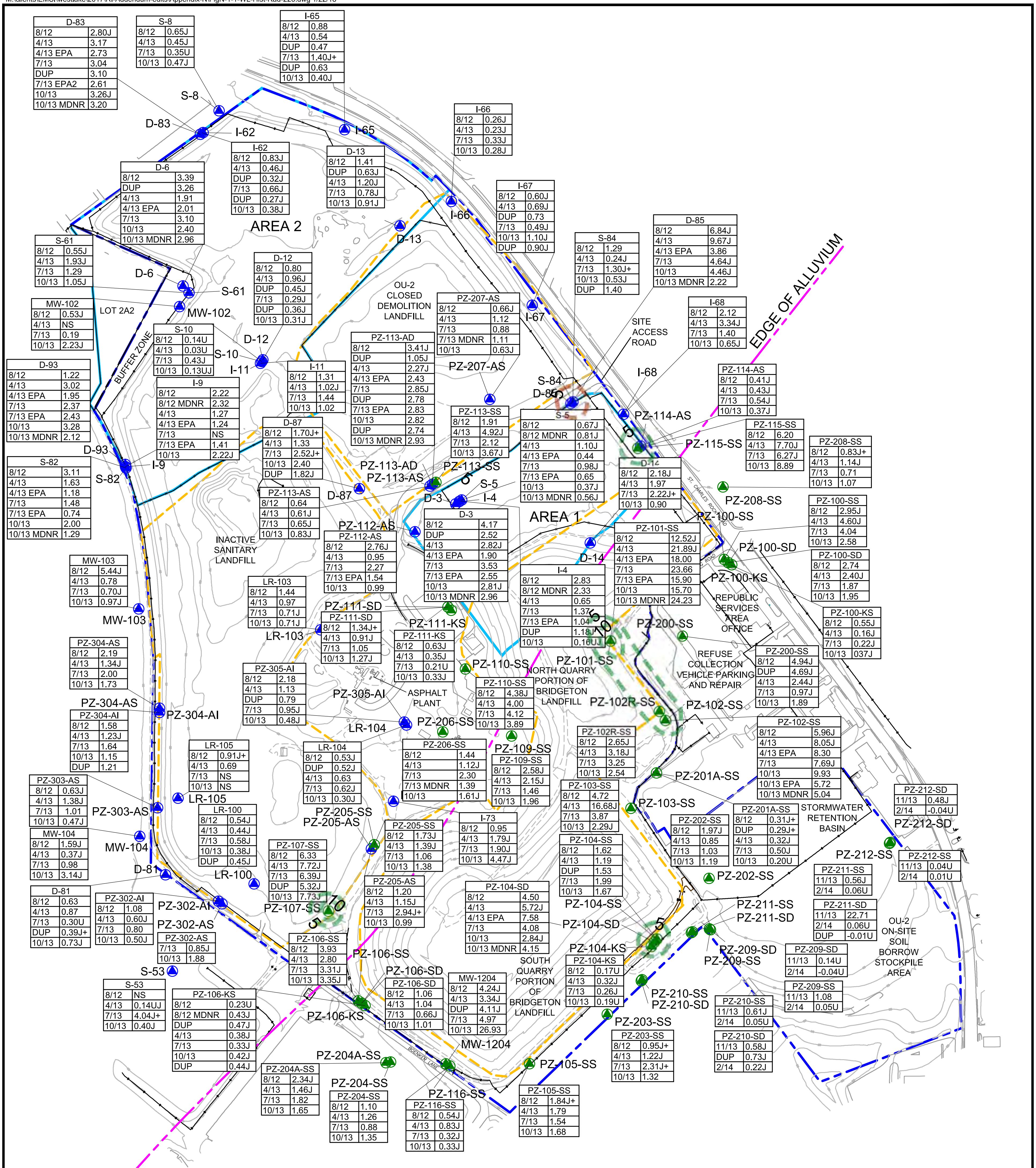
Figure 10

2013, 2012 and RI/FS Results for Dissolved Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-N\FigN-1-1-WL-Hist-Rad-226.dwg 1/22/18



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

- LR or MW: Undifferentiated
- S or AS: Alluvial Shallow Well
- I or AI: Alluvial Intermediate Well
- D or AD: Alluvial Deep Well
- SS: St. Louis Formation Well
- SD: Salem Formation Well
- KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

Well Number — MW-1204

Date Sampled — 8/12 | 3.03 — Total Radium-226 Concentration in (pCi/L)

NS = Not Sampled

Data Validation Qualifiers:

- U = Non-detect at the reported value
- UJ = Non-Detect at the estimated reported value
- UJ+ = Non-Detect at the estimated reported value which may be biased high
- UJ- = Non-Detect at the estimated reported value which may be biased low
- J = Estimated result
- J+ = Esitmated result which may be biased high

Contour of Dissolved Radium in Alluvium Groundwater

Contour of Dissolved Radium in Bedrock Groundwater

NORTH

0 250 500

SCALE IN FEET

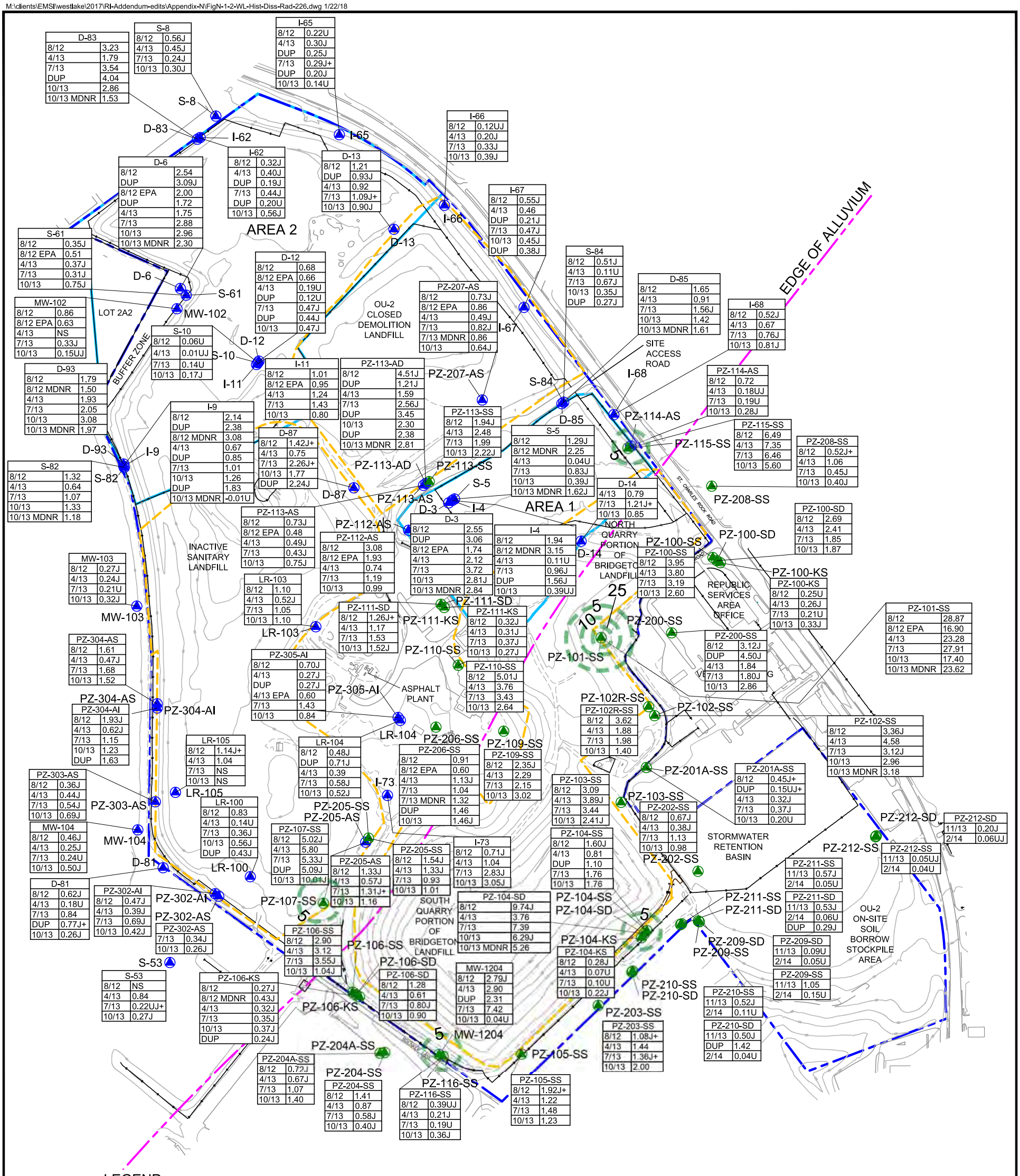
Figure N-1.1

Total Radium-226 in Groundwater August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-N\FigN-1-2-WL-Hist-Diss-Rad-226.dwg 1/22/18



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

Well Number — MW-1204
Date Sampled — 8/12 | 3.03 — Dissolved Radium-226 Concentration in (pCi/L)
NS = Not Sampled

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
UJ- = Non-Detect at the estimated reported value which may be biased low
J = Estimated result
J+ = Esitmated result which may be biased high

Contour of Dissolved Radium in Alluvium Groundwater
Contour of Dissolved Radium in Bedrock Groundwater

NORTH
0 250 500
SCALE IN FEET

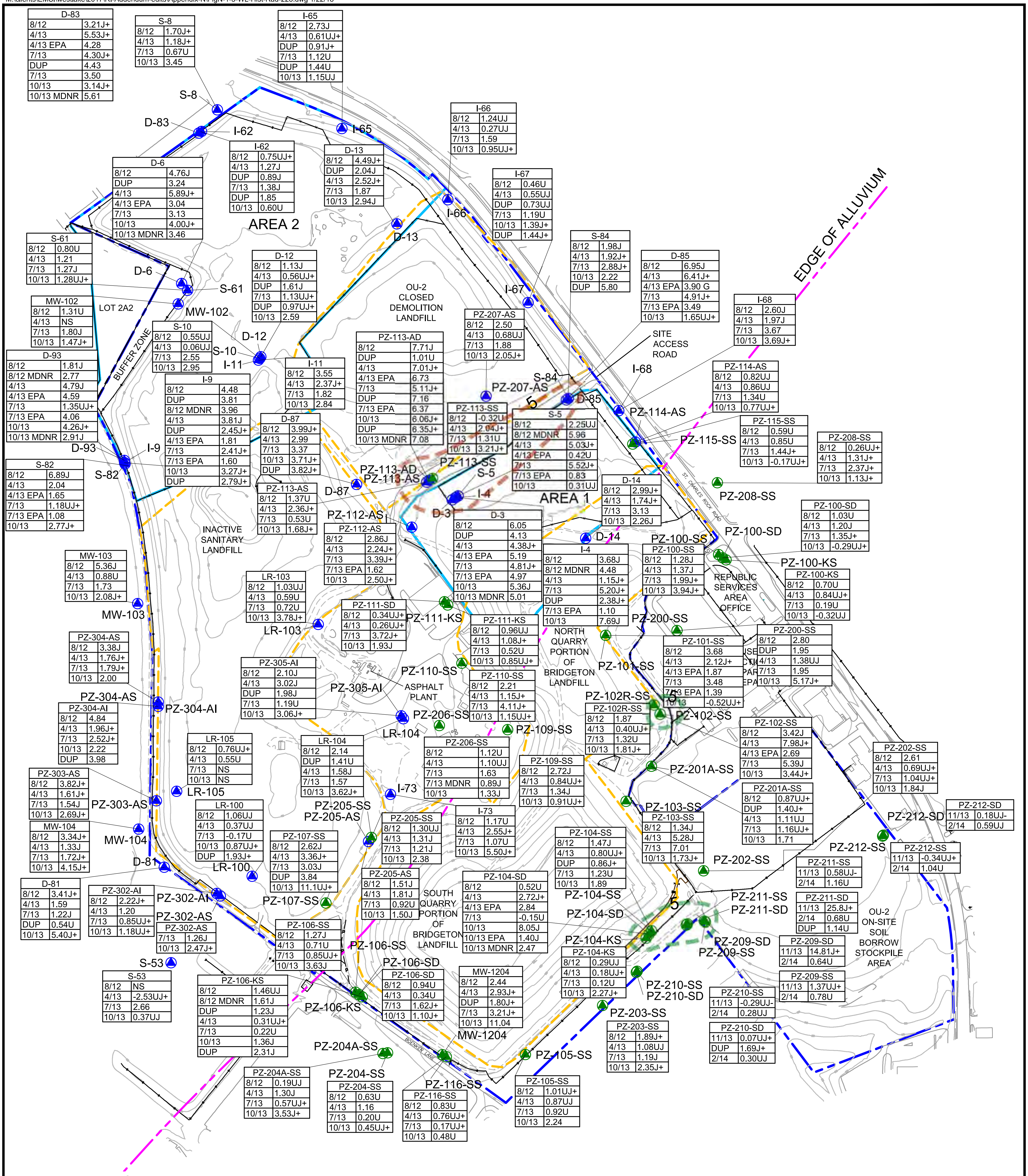
Figure N-1.2

Dissolved Radium-226 in Groundwater August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-N\FigN-1-3-WL-Hist-Rad-228.dwg 1/22/18



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

Well Number: MW-1204
Date Sampled: 8/12 — 3.03 — Total Radium-228 Concentration in (pCi/L)
NS = Not Sampled

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
UJ- = Non-Detect at the estimated reported value which may be biased low
J = Estimated result
J+ = Esitmated result which may be biased high

Contour of Dissolved Radium in Alluvium Groundwater
Contour of Dissolved Radium in Bedrock Groundwater

NORTH

0 250 500
SCALE IN FEET

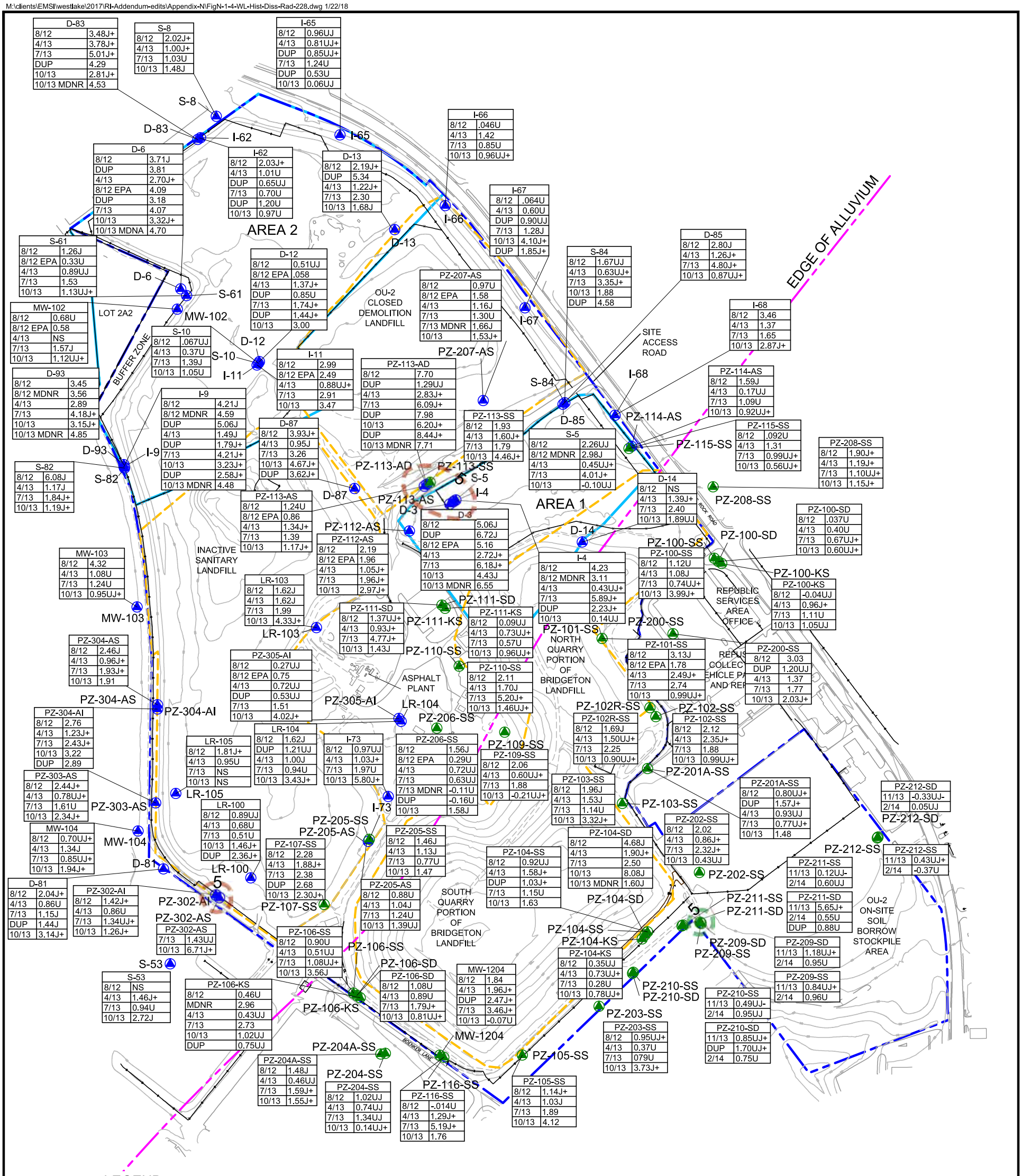
Figure N-1.3

Total Radium-228 in Groundwater
August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-N\FigN-1-4-WL-Hist-Diss-Rad-228.dwg 1/22/18



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

Well Number — MW-1204
Date Sampled — 8/12 | 3.03 — Total Radium-228 Concentration in (pCi/L)
NS = Not Sampled

Data Validation Qualifiers:

U = Non-detect at the reported value
UJ = Non-Detect at the estimated reported value
UJ+ = Non-Detect at the estimated reported value which may be biased high
UJ- = Non-Detect at the estimated reported value which may be biased low
J = Estimated result
J+ = Esitmated result which may be biased high

Contour of Dissolved Radium in Alluvium Groundwater
Contour of Dissolved Radium in Bedrock Groundwater

NORTH

0 250 500
SCALE IN FEET

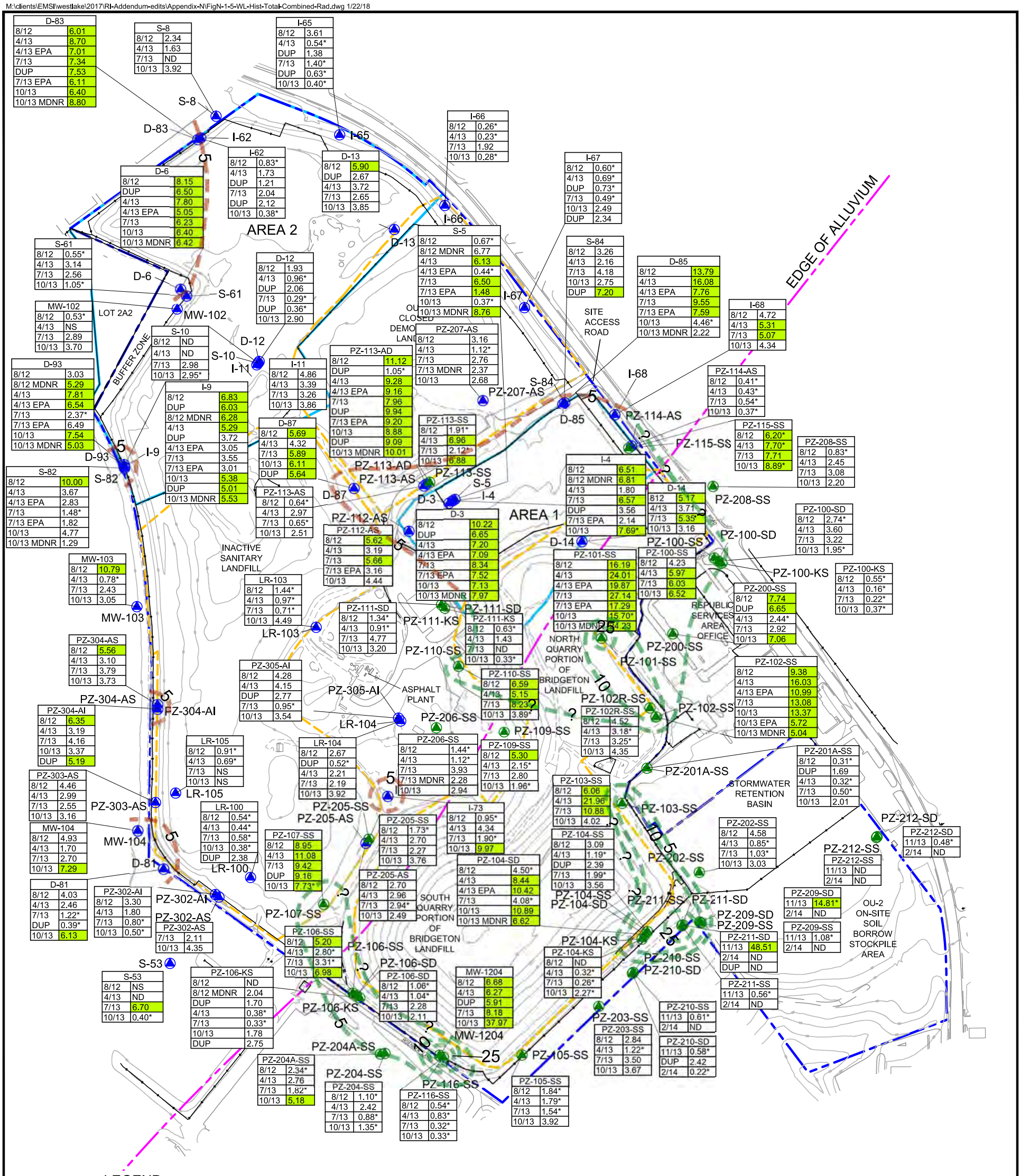
Figure N-1.4

Dissolved Radium-228 in Groundwater August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-N\FigN-1-5-WL-Hist-Total-Combined-Rad.dwg 1/22/18



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

Well Number — MW-1204
Date Sampled — 8/12 | 3.03 — Combined Total Radium-226 + Total Radium-228 Concentration in (pCi/L)

1.72	Total Radium result that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
4.50*	Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *
6.10	Total Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
ND	Both Radium-226 and Radium-228 were non-detect
NS	Not Sampled
	Contour of Dissolved Radium in Alluvium Groundwater
	Contour of Dissolved Radium in Bedrock Groundwater

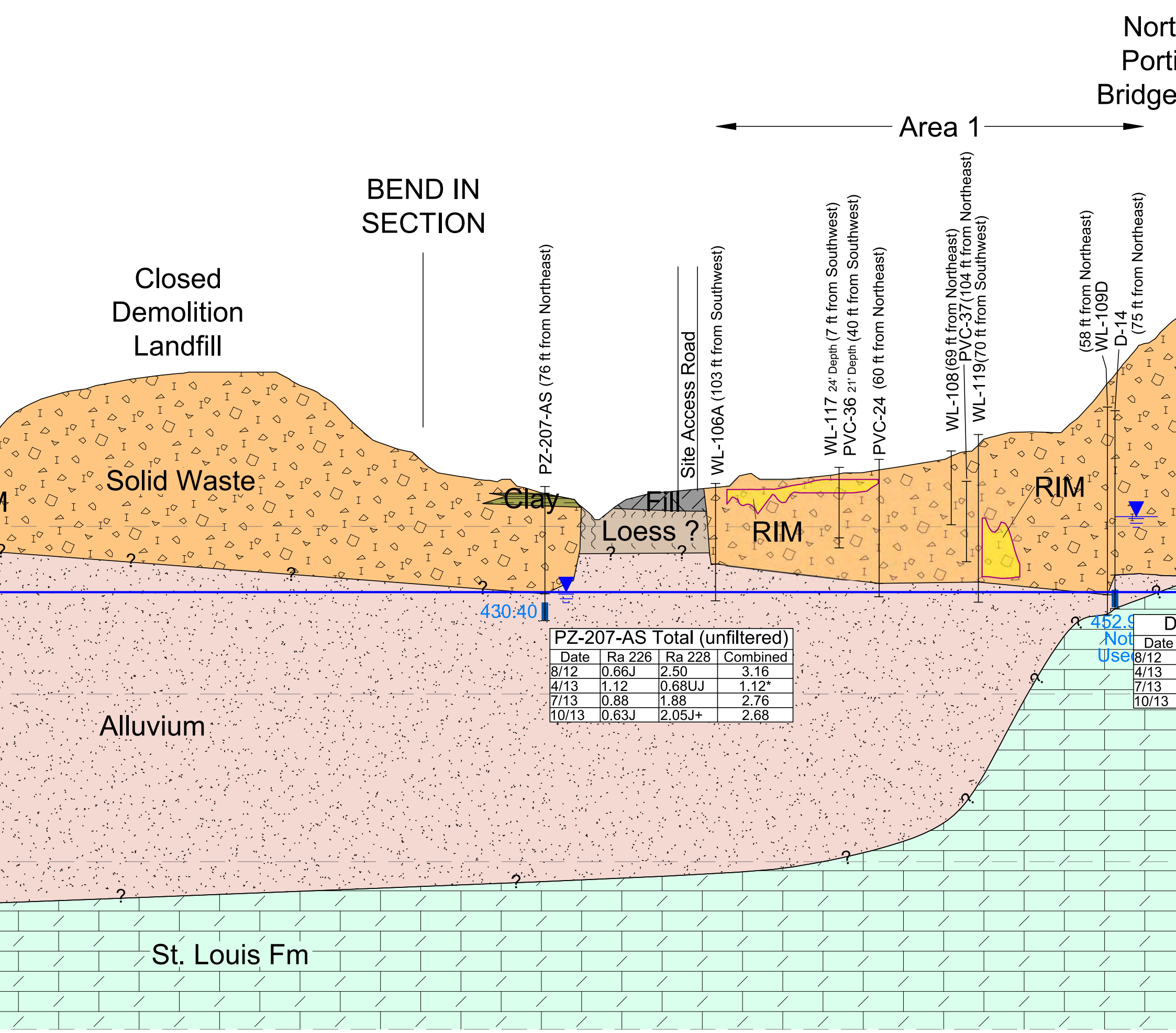
NORTH

0 250 500
SCALE IN FEET

Figure N-1.5
Combined Total Radium-226 + Total Radium-228 in Groundwater, August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.



LEGEND

- September 2013 Alluvial Groundwater Elevation Taken at Well
- September 2013 St Louis Fm Groundwater Elevation Taken at Well
- September 2013 Leachate Groundwater Elevation Taken at Well
- September 2013 Alluvial Groundwater Elevation at Cross Section Intersection
- September 2013 St Louis Fm Groundwater Elevation at Cross Section Intersection
- Geostatisical Estimate of Radiologically Impacted Material (RIM)
- Well Screen Interval

Well Number

PZ-200-SS Total (unfiltered)

Date	Ra 226	Ra 228	Combined
8/12	4.94J	2.80	7.74
4/13	2.44J	1.38UJ	2.44*

Date Sampled

Total Radium-226 Concentration in (pCi/L)

Total R
Concer

2.76 Total Radium result that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228

1.12* Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *

7.

N

N

D-87 (82 ft from Northeast)

PZ-112-AS (184 ft from Northeast)

PZ-111-SD (106 ft from Northeast)
PZ-111-KS (110 ft from Northeast)
MW-F1D (112 ft from Northeast)

PZ-110-SS

PZ-109-SS

ste

Fill

Loess

Loess

?

?

430.42

PZ-112-AS Total (unfiltered)			
Date	Ra 226	Ra 228	Combined
8/12	2.76J	2.86J	5.62
4/13	0.95	2.24J+	3.19
7/13	2.27	3.39J+	5.66
7/13 EPA	1.54	1.62	3.16
10/13	1.94	2.50J+	4.44

D-87 Total (unfiltered)			
Date	Ra 226	Ra 228	Combined
8/12	1.70J+	3.99J+	5.69
4/13	1.33	2.99	4.32
7/13	2.52J+	3.37	5.89
10/13	2.40	3.71J+	6.11
DUP	1.82J	3.82J+	5.64

St. Louis Fm

?

?

Salem Fm

PZ-110-SS Total (unfiltered)			
Date	Ra 226	Ra 228	Combined
8/12	4.38J	2.21	6.59
4/13	4.00	1.15J+	5.15
7/13	4.12	4.11J+	8.23
10/13	3.89	1.15UJ+	3.89*

PZ-109-SS Total (unfiltered)			
Date	Ra 226	Ra 228	Combined
8/12	2.58J	2.72J	5.30
4/13	2.15J	0.84UJ+	2.15*
7/13	1.46	1.34J	2.80
10/13	1.96	0.91UJ+	1.96*

430.75

d Total Radium-226 + Total
228 Concentration in (pCi/L)

)

m greater than the Maximum
nt Level of 5 pCi/L for
Radium-226 and Radium-228

m-226 and
3 were non-detect
d

PZ-111-SD Total (unfiltered)			
Date	Ra 226	Ra 228	Combined
8/12	1.34J+	0.34UJ+	1.34*
4/13	0.91J	0.26UJ+	0.91*
7/13	1.05	3.72J+	4.77
10/13	1.27J	1.93J	3.20

431.35

?

?

?

?

Warsaw Fm

450

DATA VALIDATION

U = Non-detect at the reporte
UJ = Non-Detect at the estima
UJ+ = Non-Detect at the estima
which may be biased hig
UJ- = Non-Detect at the estima
which may be biased low
J = Estimated result
J+ = Estimated result which m

?

?

PZ-111-KS Total (unfiltered)			
Date	Ra 226	Ra 228	Combined
8/12	0.63J	0.96UJ	0.63*
4/13	0.35J	1.08J+	1.43
7/13	0.21U	0.52U	ND
10/13	0.33J	0.85UJ+	0.33*

456.45

Keokok F

LEGEND

Geostatisical Estimate of Radiologically Impacted Material (RIM)

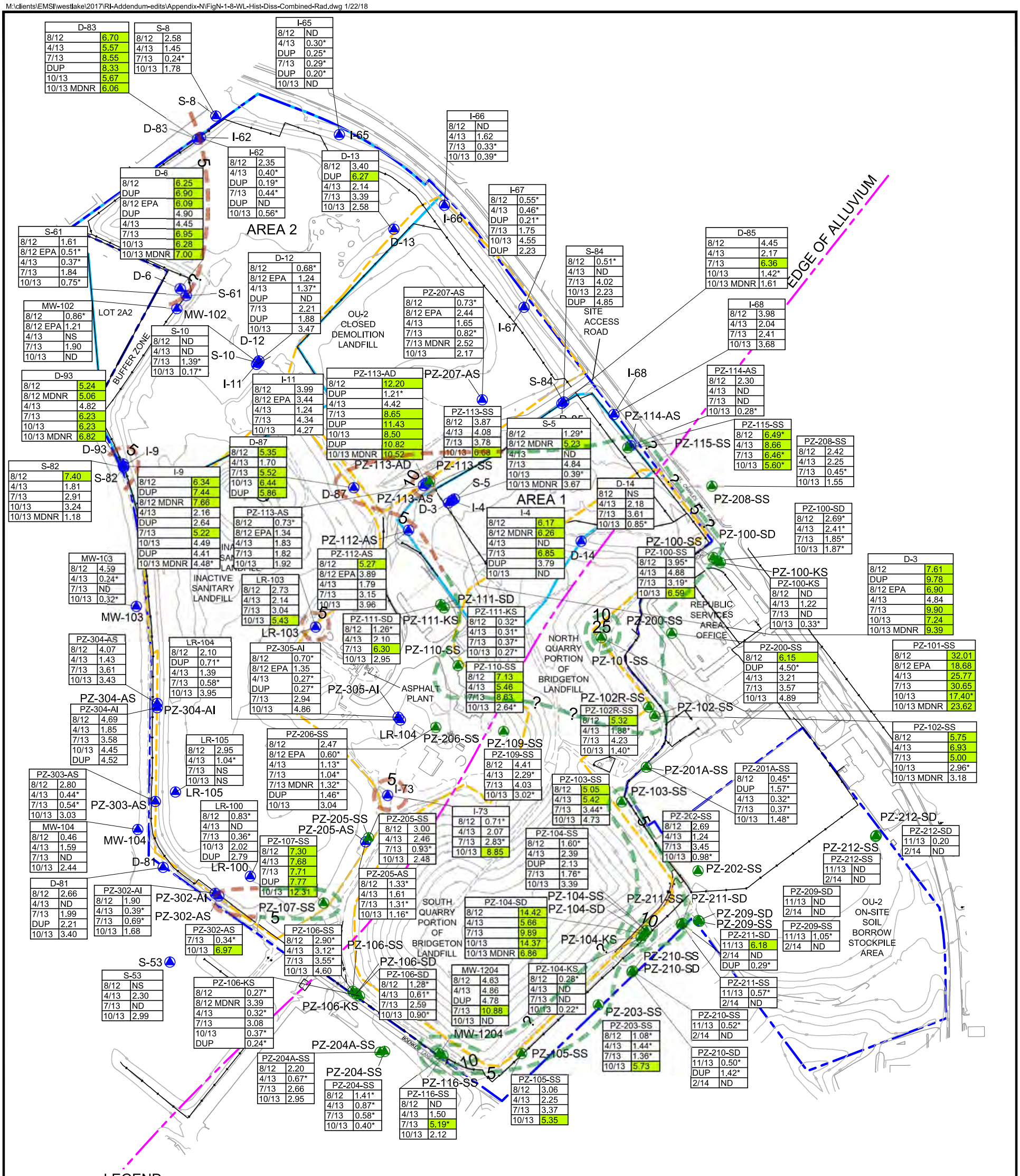
Well Screen Interval

September 2013 Alluvial Groundwater Elevation Taken at Well

September 2013 St Louis Fm Groundwater Elevation Taken at Well

September 2013 Alluvial Groundwater Elevation at Cross Section Intersection

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-N\FigN-1-8-WL-Hist-Diss-Combined-Rad.dwg 1/22/18



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

Well Number
Date Sampled — MW-1204 | 8/12 | 3.03 — Combined Total Radium-226 + Total Radium-228 Concentration in (pCi/L)

1.72	Total Dissolved Radium result that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
4.50*	Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *
6.10	Total Dissolved Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228
ND	Both Radium-226 and Radium-228 were non-detect
NS	Not Sampled
	Contour of Dissolved Radium in Alluvium Groundwater
	Contour of Dissolved Radium in Bedrock Groundwater

NORTH

0 250 500
SCALE IN FEET

Figure N-1.8
Combined Dissolved Radium-226 + Dissolved Radium-228 in Groundwater, August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

Nort
Porti
Bridge

Area 1

BEND IN SECTION

Closed Demolition Landfill

Solid Waste

Clay

Fill

Loess ?

RIM

RIM

Alluvium

St. Louis Fm

PZ-207-AS (76 ft from Northeast)

Site Access Road

WL-106A (103 ft from Southwest)

WL-117 24' Depth (7 ft from Southwest)

PVC-36 21' Depth (40 ft from Southwest)

PVC-24 (60 ft from Northeast)

WL-108 (69 ft from Northeast)

PVC-37 (104 ft from Northeast)

WL-119 (70 ft from Southwest)

(58 ft from Northeast)

WL-109D

D-14

(75 ft from Northeast)

430.40

452.9

Not Used

PZ-207-AS Dissolved (filtered)			
Date	Ra 226	Ra 228	Combined
8/12	0.73J	0.97U	0.73*
8/12 EPA	0.86	1.58	2.44
4/13	0.49J	1.16J	1.65
7/13	0.82J	1.30U	0.82*
7/13 MDNR	0.86	1.66J	2.52
10/13	0.64J	1.53J+	2.17

LEGEND

- September 2013 Alluvial Groundwater Elevation Taken at Well
- September 2013 St Louis Fm Groundwater Elevation Taken at Well
- September 2013 Leachate Groundwater Elevation Taken at Well
- September 2013 Alluvial Groundwater Elevation Cross Section Intersection
- September 2013 St Louis Fm Groundwater Elevation at Cross Section Intersection
- Geostatisical Estimate of Radiologically Impacted Material (RIM)
- Well Screen Interval

Well Number

Date Sampled

Dissolved Radium-226 Concentration in (pCi/L)

PZ-102R-SS Dissolved (filtered			
Date	Ra 226	Ra 228	Combined
8/12	3.62	1.69J	5.32
4/13	1.88	1.50UJ+	1.88*

Dissolv
Concer

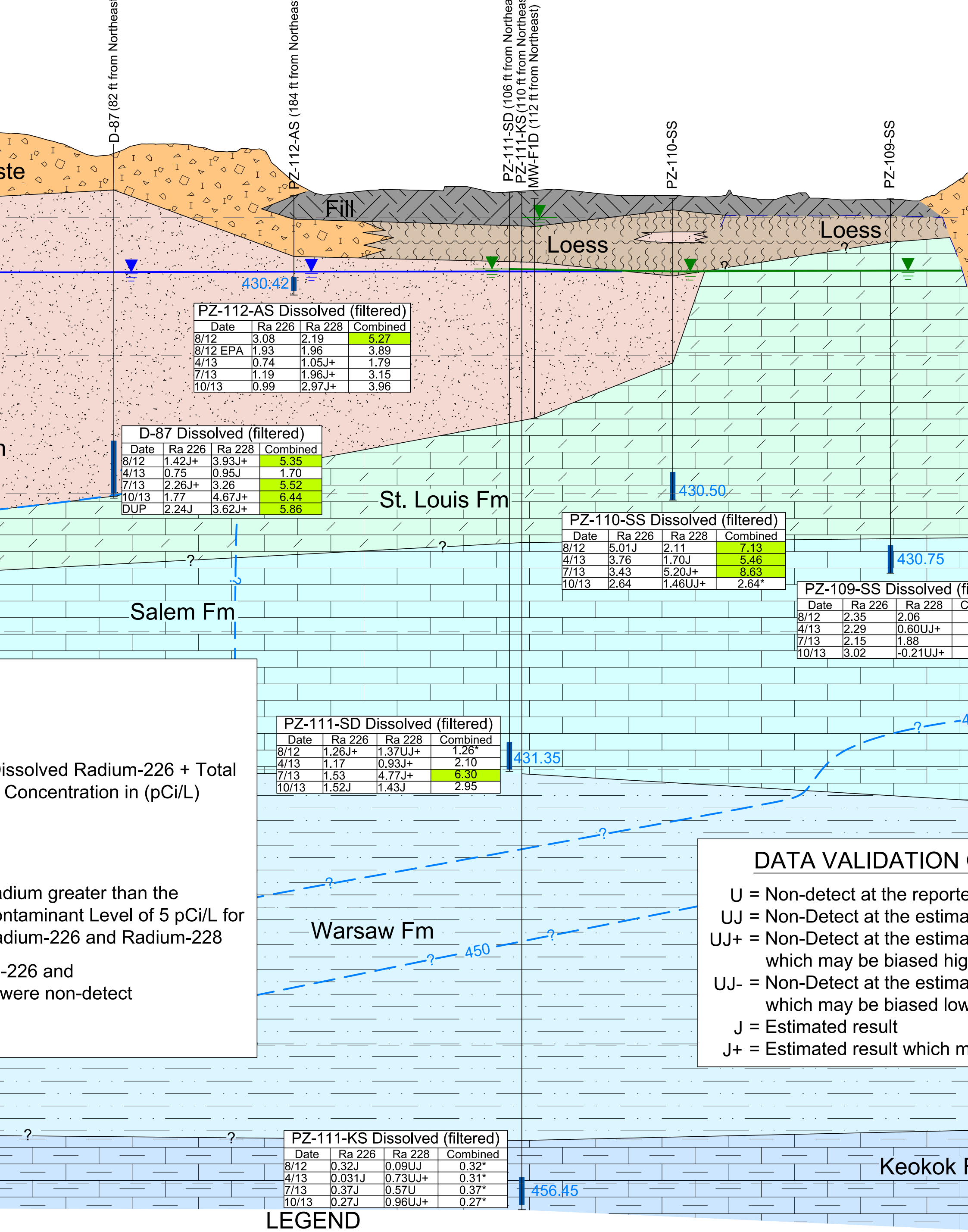
2.17 Dissolved Radium result that is less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228

6.

4.50* Combined Ra-226 and Ra-228 results unless one of results was non-detect, in which case only the detected result is shown and the value is flagged with a *

N

N



PZ-112-AS Dissolved (filtered)

Date	Ra 226	Ra 228	Combined
8/12	3.08	2.19	5.27
8/12 EPA	1.93	1.96	3.89
4/13	0.74	1.05J+	1.79
7/13	1.19	1.96J+	3.15
10/13	0.99	2.97J+	3.96

D-87 Dissolved (filtered)

Date	Ra 226	Ra 228	Combined
8/12	1.42J+	3.93J+	5.35
4/13	0.75	0.95J	1.70
7/13	2.26J+	3.26	5.52
10/13	1.77	4.67J+	6.44
DUP	2.24J	3.62J+	5.86

PZ-110-SS Dissolved (filtered)

Date	Ra 226	Ra 228	Combined
8/12	5.01J	2.11	7.13
4/13	3.76	1.70J	5.46
7/13	3.43	5.20J+	8.63
10/13	2.64	1.46UJ+	2.64*

PZ-109-SS Dissolved (fi

Date	Ra 226	Ra 228	C
8/12	2.35	2.06	
4/13	2.29	0.60UJ+	
7/13	2.15	1.88	
10/13	3.02	-0.21UJ+	

PZ-111-SD Dissolved (filtered)

Date	Ra 226	Ra 228	Combined
8/12	1.26J+	1.37UJ+	1.26*
4/13	1.17	0.93J+	2.10
7/13	1.53	4.77J+	6.30
10/13	1.52J	1.43J	2.95

PZ-111-KS Dissolved (filtered)

Date	Ra 226	Ra 228	Combined
8/12	0.32J	0.09UJ	0.32*
4/13	0.031J	0.73UJ+	0.31*
7/13	0.37J	0.57U	0.37*
10/13	0.27J	0.96UJ+	0.27*

issolved Radium-226 + Total
Concentration in (pCi/L)

adium greater than the
ntaminant Level of 5 pCi/L for
adium-226 and Radium-228

-226 and
were non-detect

DATA VALIDATION

U = Non-detect at the reporte
UJ = Non-Detect at the estima
UJ+ = Non-Detect at the estima
which may be biased hig
UJ- = Non-Detect at the estima
which may be biased low
J = Estimated result
J+ = Estimated result which m

LEGEND

Geostatisical Estimate of Radiologically Impacted Material (RIM)

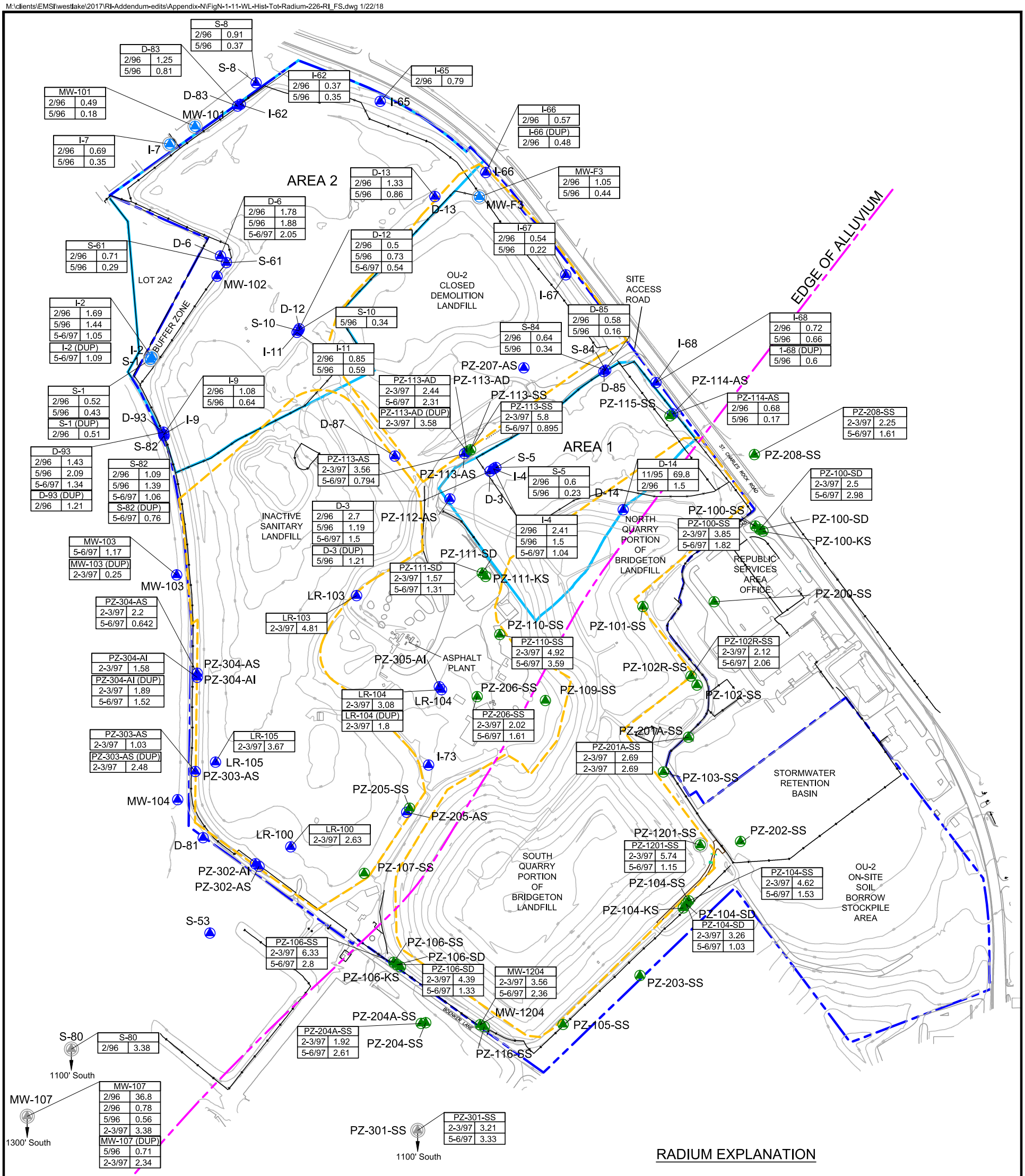
Well Screen Interval

September 2013 Alluvial Groundwater Elevation Taken at Well

September 2013 St Louis Fm Groundwater Elevation Taken at Well

September 2013 Alluvial Groundwater Elevation at Cross Section Intersection

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-N\FigN-1-11-WL-Hist-Tot-Radium-226-RI_FS.dwg 1/22/18



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Abandoned Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

Sample Number — MW-1204
Date Sampled — 2-3/97 — 3.56 — Total Radium-226 Concentration in (pCi/L)

EMSI has concluded that D-14 results are not vaild due to extreme variations between filtered and unfiltered results and extreme variations among sampling events.

OU-1 Wells Sampled 11/95, 2/29, 5/96, 5/97, 3/04, and 5/04
OU-2 Wells Sampled 2-3/97 and 5-6/97

Data from either OU-1 RI (EMSI, 2000), OU-2 RI (Herst & Associates, 2000), or 2004 Data for OU-1 FS Effort.

Note: During the 2012 groundwater monitoring event, it was determined that wells D-93 and I-9 had been mislabeled at some point in the past with D-93 being labeled as I-9 and I-9 labeled as D-93. Data reported for these two wells prior to 2012 should consider the potential for mis-identification of these two wells.

NORTH

0 250 500
SCALE IN FEET

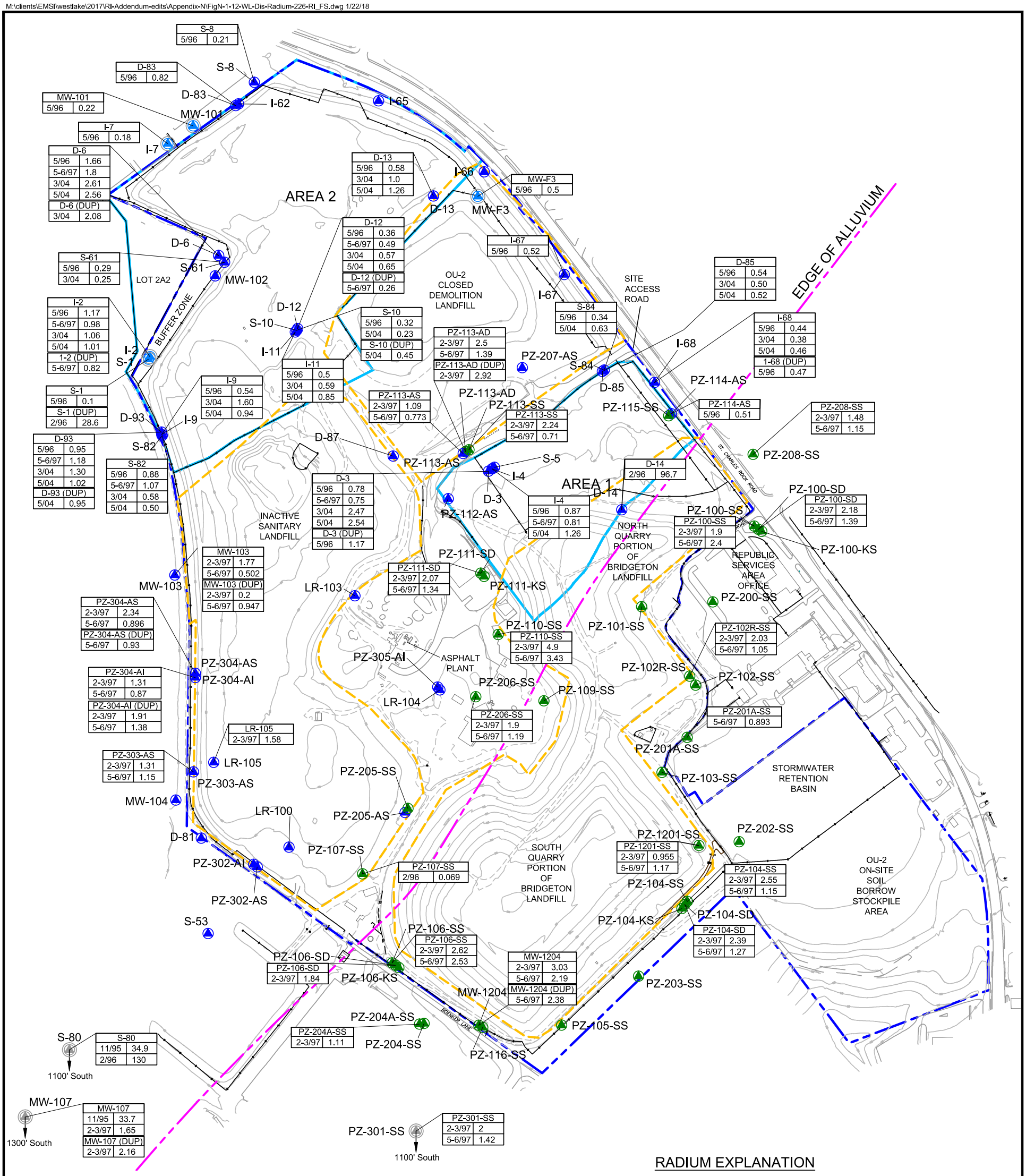
Figure N-1.11

RI/FS Results for
Total Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Appendix-N\FigN-1-12-WL-Dis-Radium-226-RI_FS.dwg 1/22/18



LEGEND

- Alluvium Groundwater Well
- Bedrock Groundwater Well
- Abandoned Groundwater Well
- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

Sample Number — MW-1204
Date Sampled — 2-3/97 3.03 — Dissolved Radium-226 Concentration in (pCi/L)

EMSI has concluded that D-14 results are not vaild due to extreme variations between filtered and unfiltered results and extreme variations among sampling events.

OU-1 Wells Sampled 11/95, 2/29, 5/96, 5/97, 3/04, and 5/04
OU-2 Wells Sampled 2-3/97 and 5-6/97

Data from either OU-1 RI (EMSI, 2000), OU-2 RI (Herst & Associates, 2000), or 2004 Data for OU-1 FS Effort.

Note: During the 2012 groundwater monitoring event, it was determined that wells D-93 and I-9 had been mislabeled at some point in the past with D-93 being labeled as I-9 and I-9 labeled as D-93. Data reported for these two wells prior to 2012 should consider the potential for mis-identification of these two wells.

NORTH

0 250 500
SCALE IN FEET

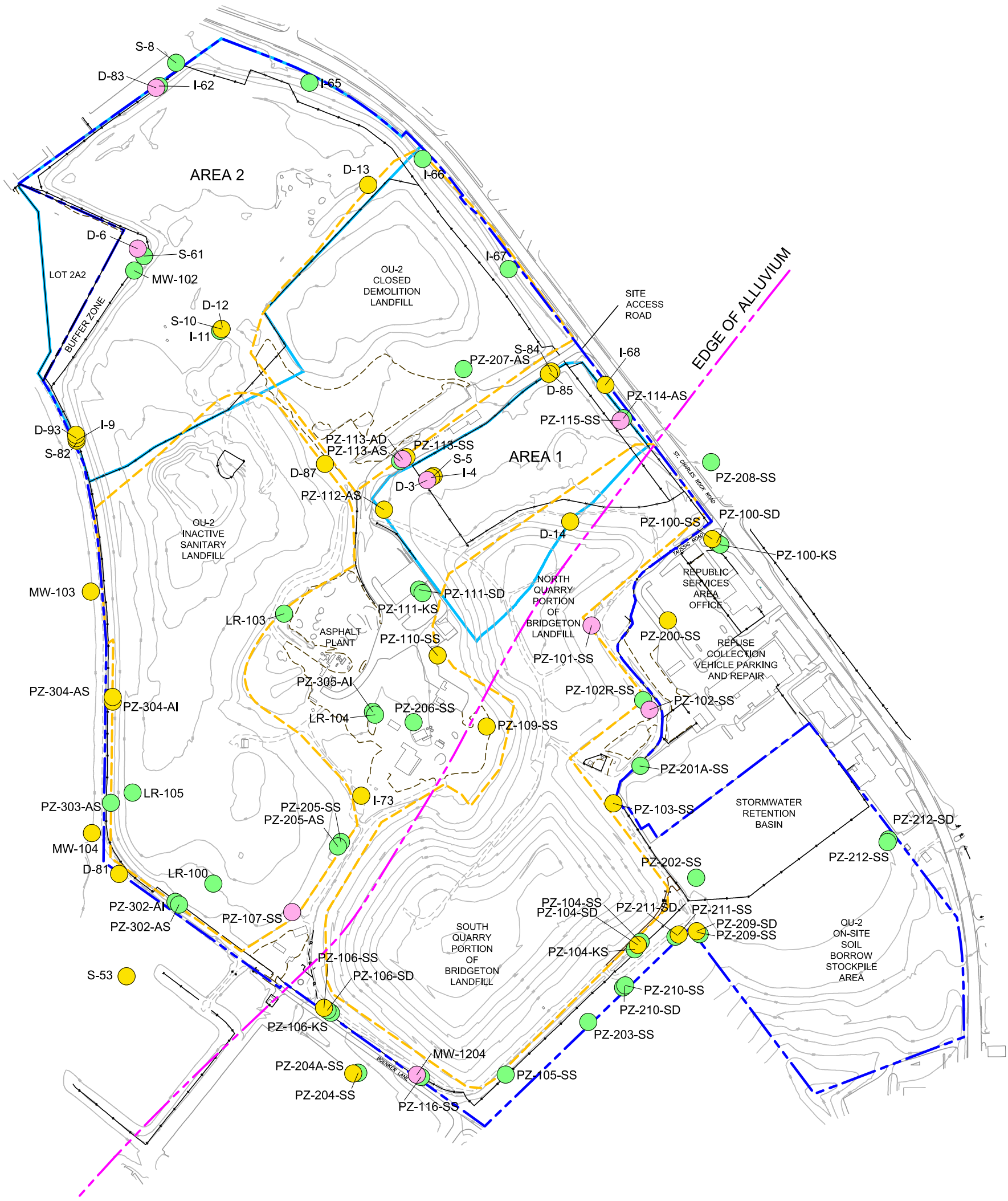
Figure N-1.12

RI/FS Results for Dissolved Radium-226 in Groundwater

West Lake Landfill Operable Unit-1

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-7\FIG-7-2-Com-Tot-RAD-226-228-PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

- Total Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228 (all sampling dates)
- Total Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228 (at least one sampling date but not all sampling dates)
- Total Radium less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228 (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

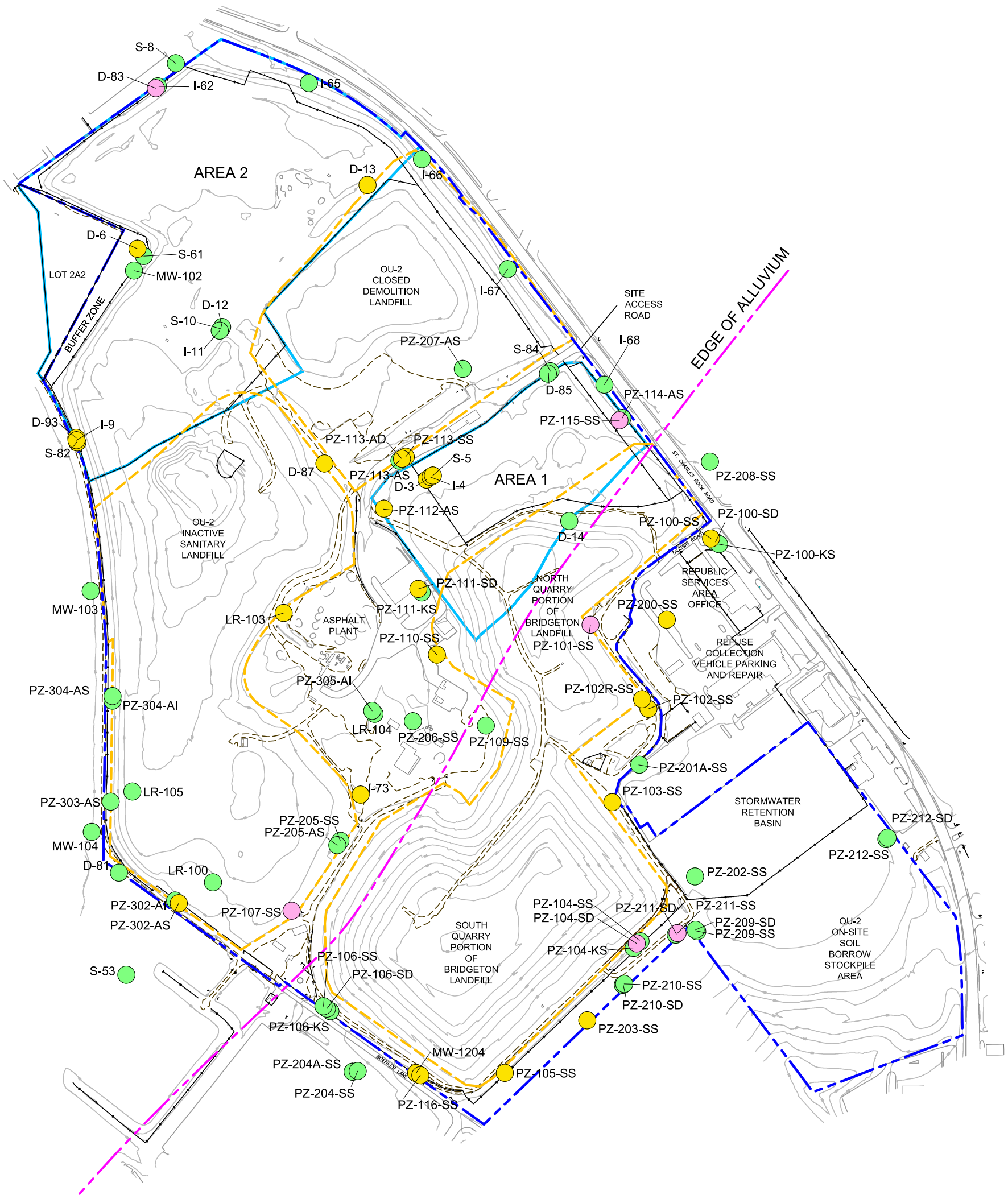
Figure 7-2

Combined Total Radium-226 + 228 in Groundwater, August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-7\FIG-7-3-Com-Dis-RAD-226-228-PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

RADIUM EXPLANATION

- Dissolved Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228 (all sampling dates)
- Dissolved Radium greater than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228 (at least one sampling date but not all sampling dates)
- Dissolved Radium less than the Maximum Contaminant Level of 5 pCi/L for combined Radium-226 and Radium-228 (all sampling dates)

NORTH

0 250 500

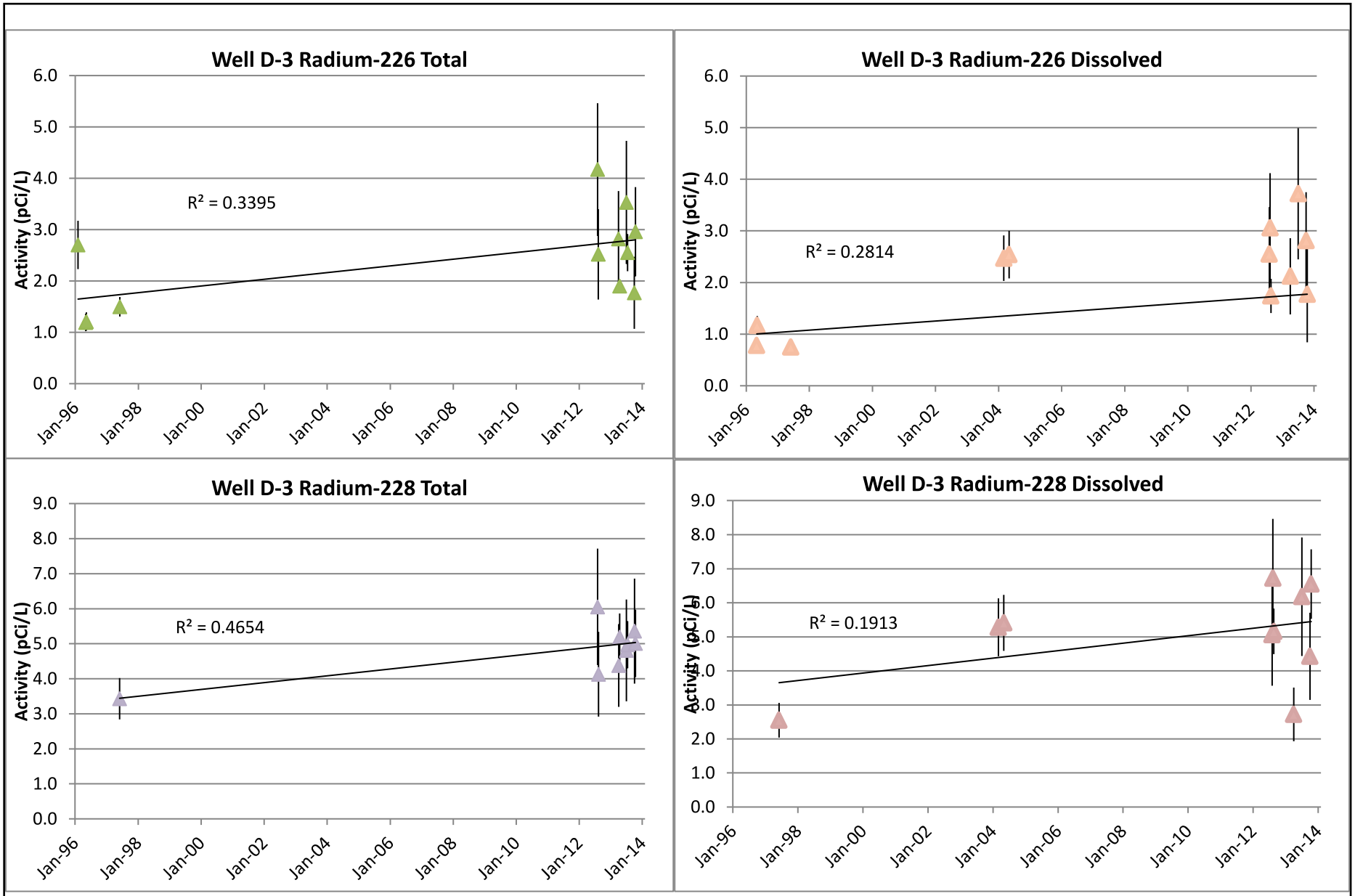
SCALE IN FEET

Figure 7-3

Combined Dissolved Radium-226 + 228 in Groundwater, August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.



Legend

Result plus 2 Sigma
Radium Result
Result minus 2 Sigma

Note: Early non-detect results with elevated MDAs not shown.

Linear regression trend line

R^2 - linear regression line correlation coefficient

Figure 7-4

Well D-3 Radium Results

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

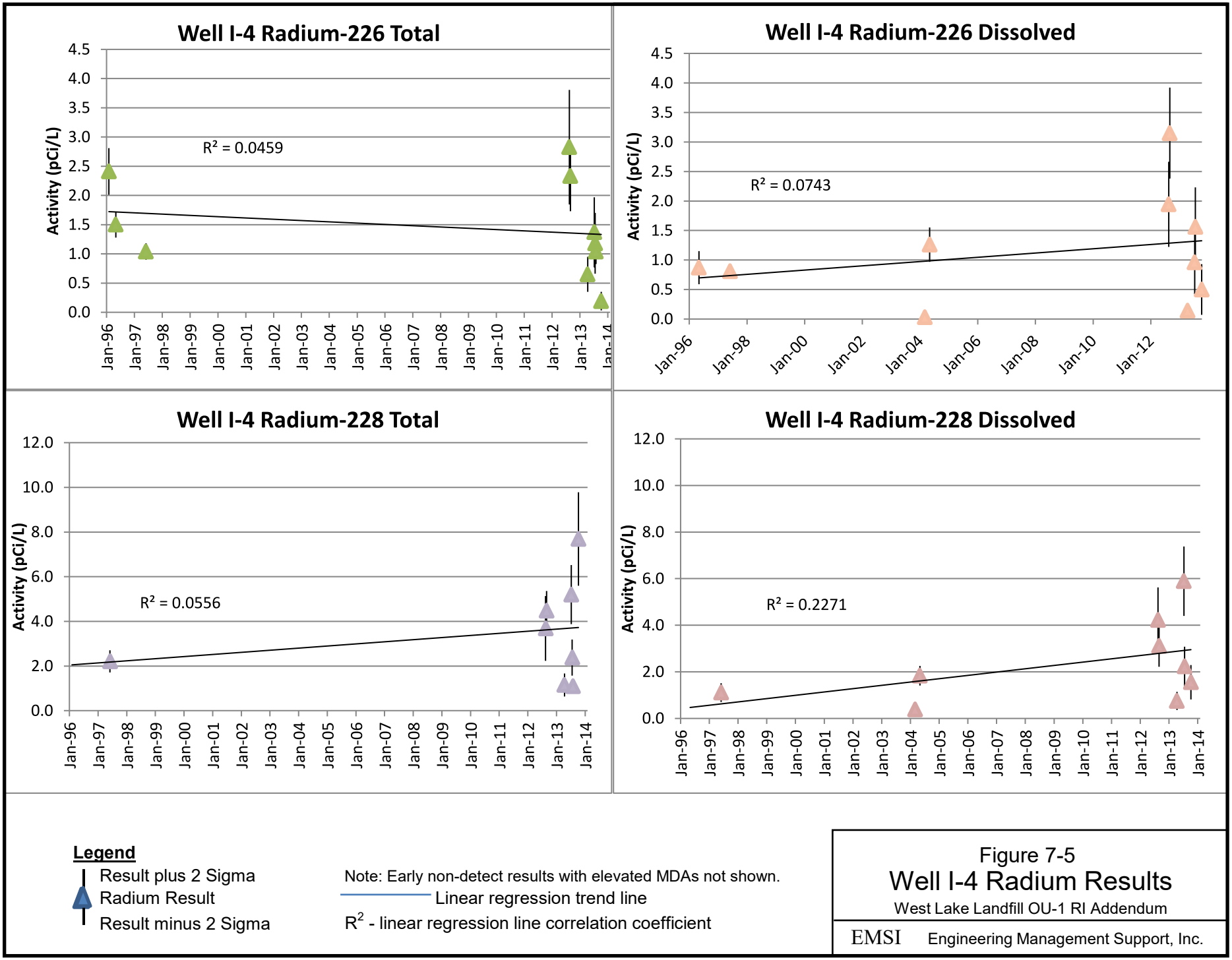
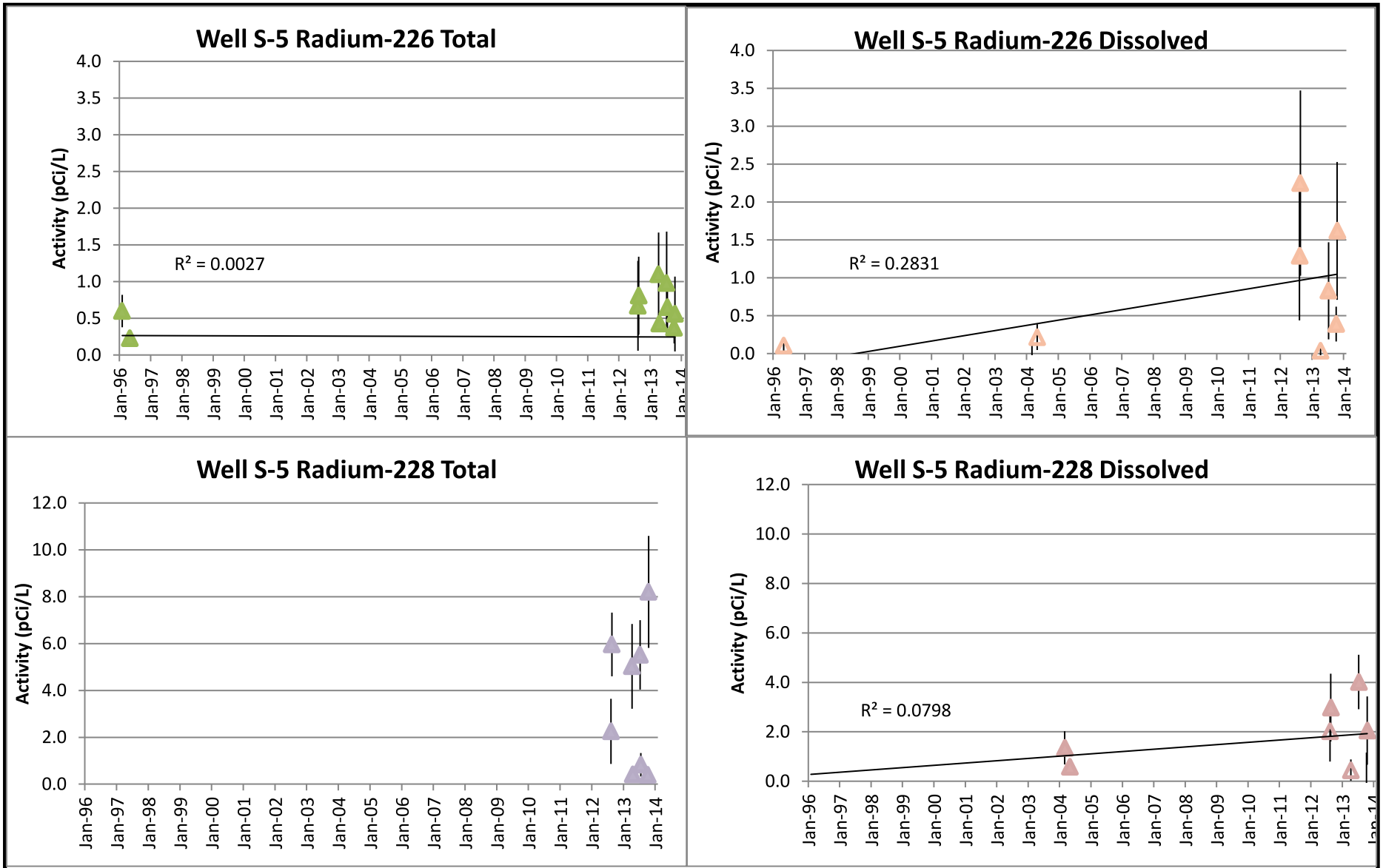


Figure 7-5
Well I-4 Radium Results
West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.



Legend

Result plus 2 Sigma
Radium Result
Result minus 2 Sigma

Note: Early non-detect results with elevated MDAs not shown.

Linear regression trend line

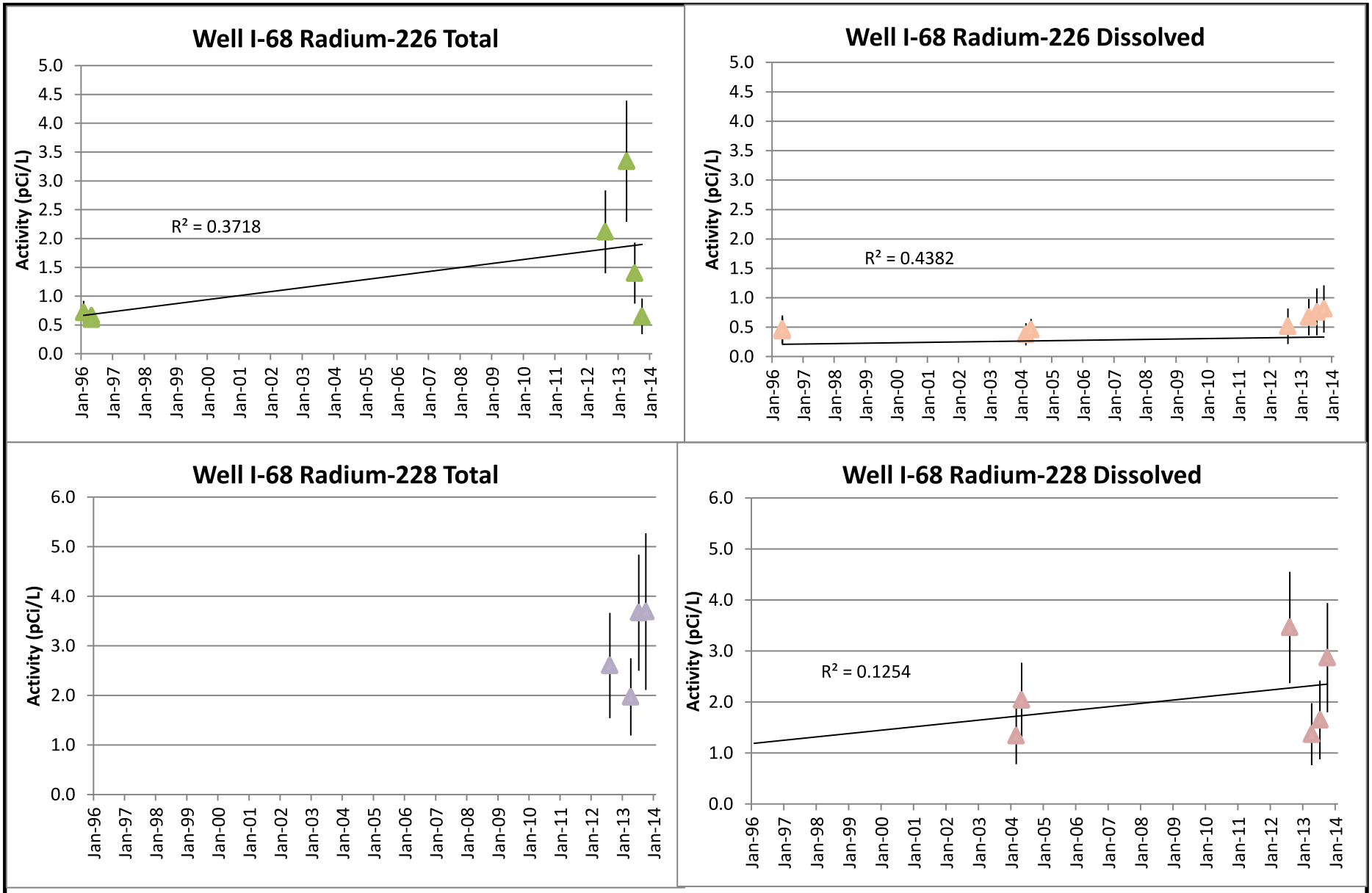
R^2 - linear regression line correlation coefficient

Figure 7-6

Well S-5 Radium Results

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.



Legend

Result plus 2 Sigma
Radium Result
Result minus 2 Sigma

Note: Early non-detect results with elevated MDAs not shown.

Linear regression trend line

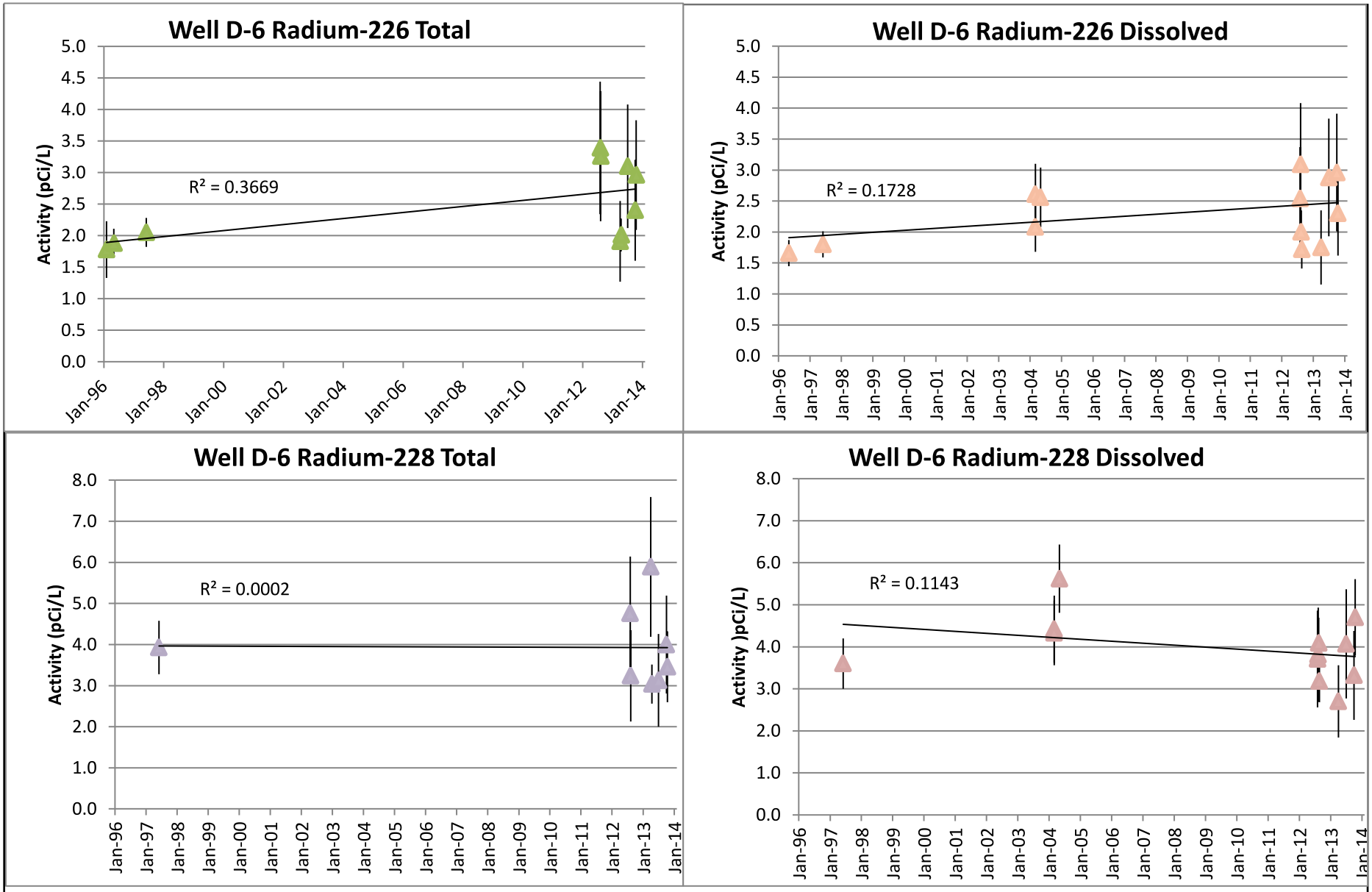
R^2 - linear regression line correlation coefficient

Figure 7-7

Well I-68 Radium Results

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.



Legend

Result plus 2 Sigma
Radium Result
Result minus 2 Sigma

Note: Early non-detect results with elevated MDAs not shown.

Linear regression trend line

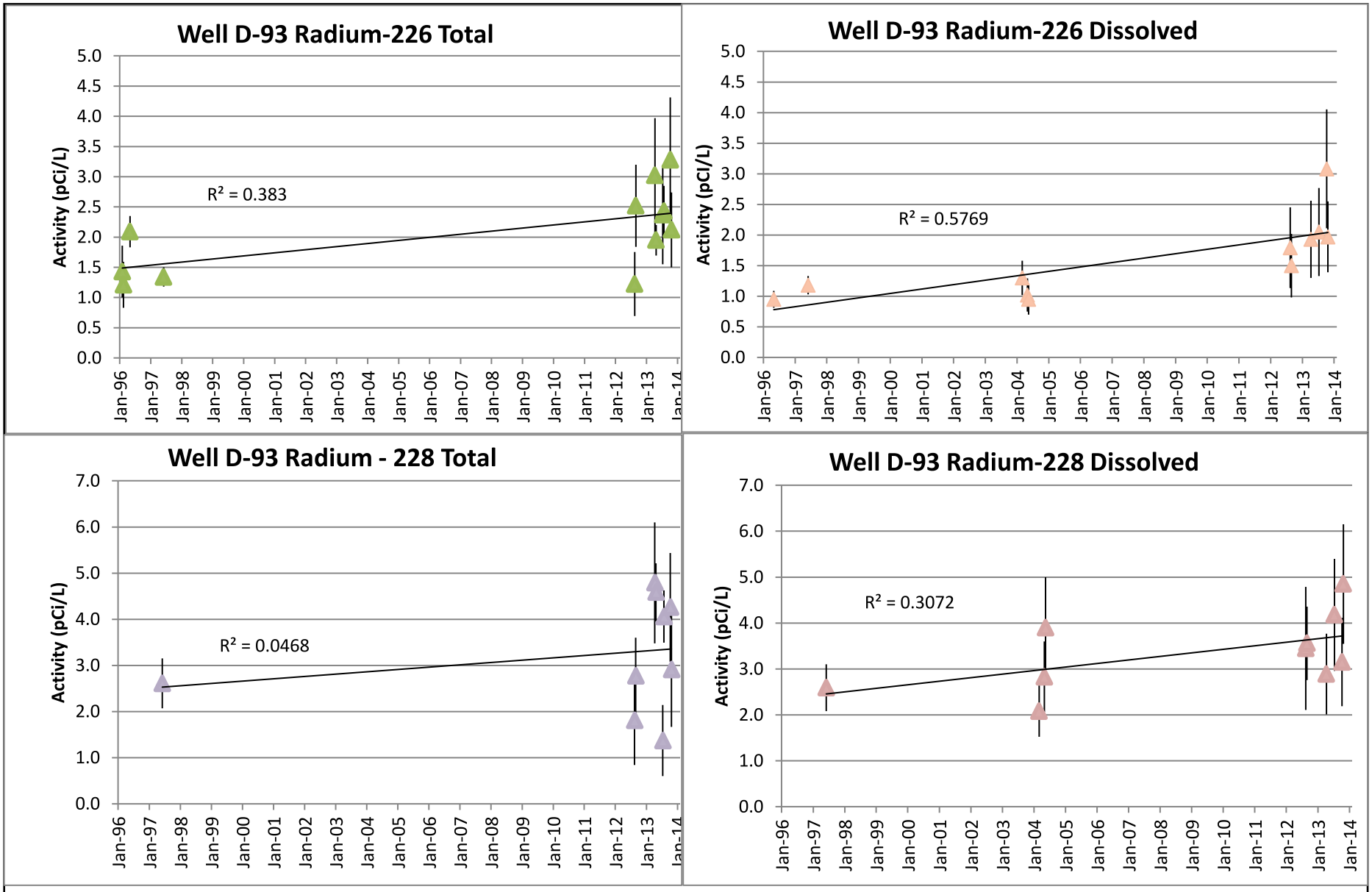
R^2 - linear regression line correlation coefficient

Figure 7-8

Well D-6 Radium Results

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.



Legend

Result plus 2 Sigma
Radium Result
Result minus 2 Sigma

Note: Early non-detect results with elevated MDAs not shown.

Linear regression trend line

R^2 - linear regression line correlation coefficient

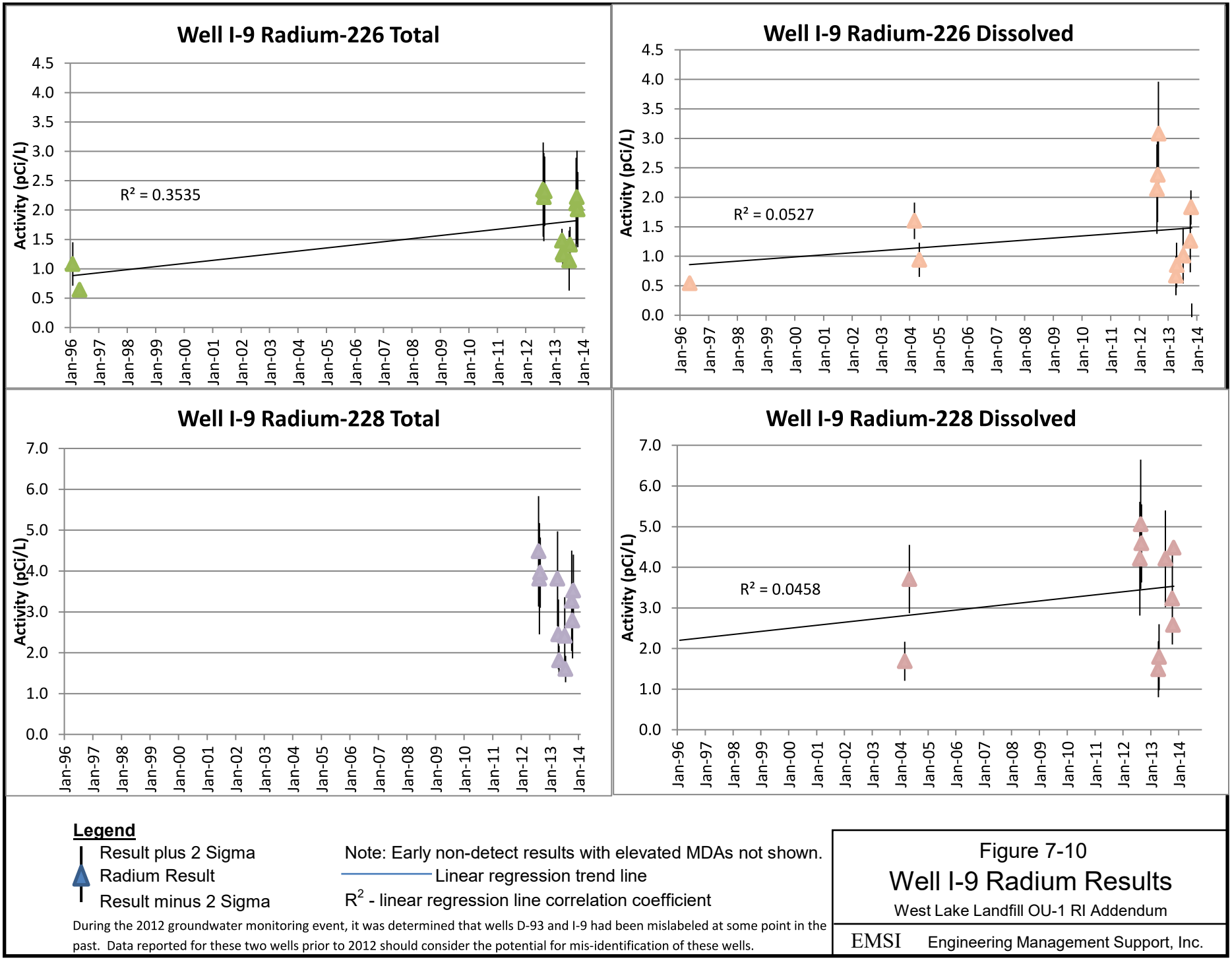
During the 2012 groundwater monitoring event, it was determined that wells D-93 and I-9 had been mislabeled at some point in the past. Data reported for these two wells prior to 2012 should consider the potential for mis-identification of these wells.

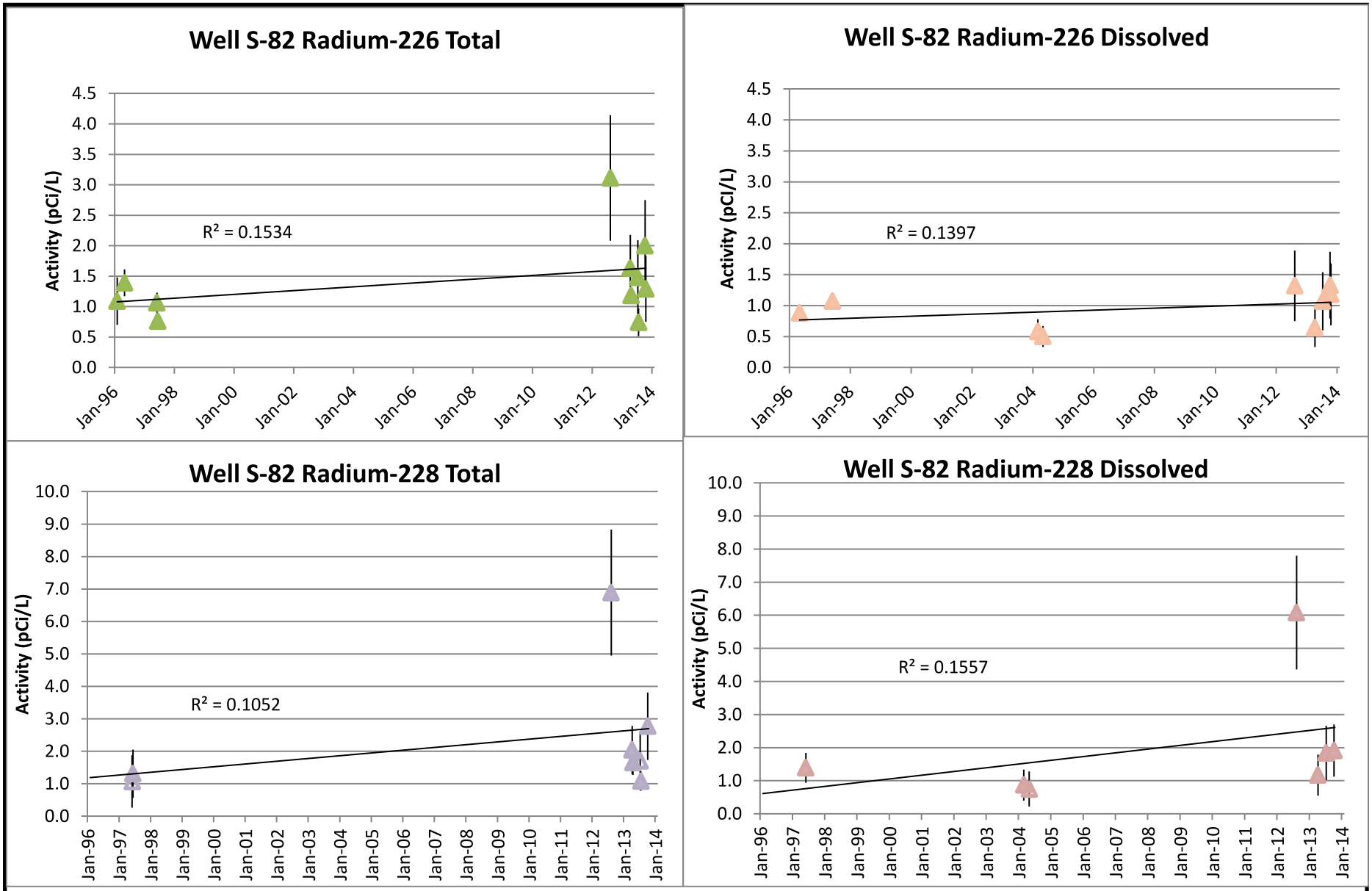
Figure 7-9

Well D-93 Radium Results

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.


Well I-9 Radium-226 Total
Activity (pCi/L)
R² = 0.3535
Well I-9 Radium-226 Dissolved
R² = 0.0527
Well I-9 Radium-228 Total
R² = 0.0458
Well I-9 Radium-228 Dissolved
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Legend
Result plus 2 Sigma
Radium Result
Result minus 2 Sigma
Note: Early non-detect results with elevated MDAs not shown.
Linear regression trend line
R2 - linear regression line correlation coefficient
During the 2012 groundwater monitoring event, it was determined that wells D-93 and I-9 had been mislabeled at some point in the past. Data reported for these two wells prior to 2012 should consider the potential for mis-identification of these wells.
Figure 7-10
Well I-9 Radium Results
West Lake Landfill OU-1 RI Addendum
EMSI Engineering Management Support, Inc.



Legend

Result plus 2 Sigma
Radium Result
Result minus 2 Sigma

Note: Early non-detect results with elevated MDAs not shown.

Linear regression trend line

R^2 - linear regression line correlation coefficient

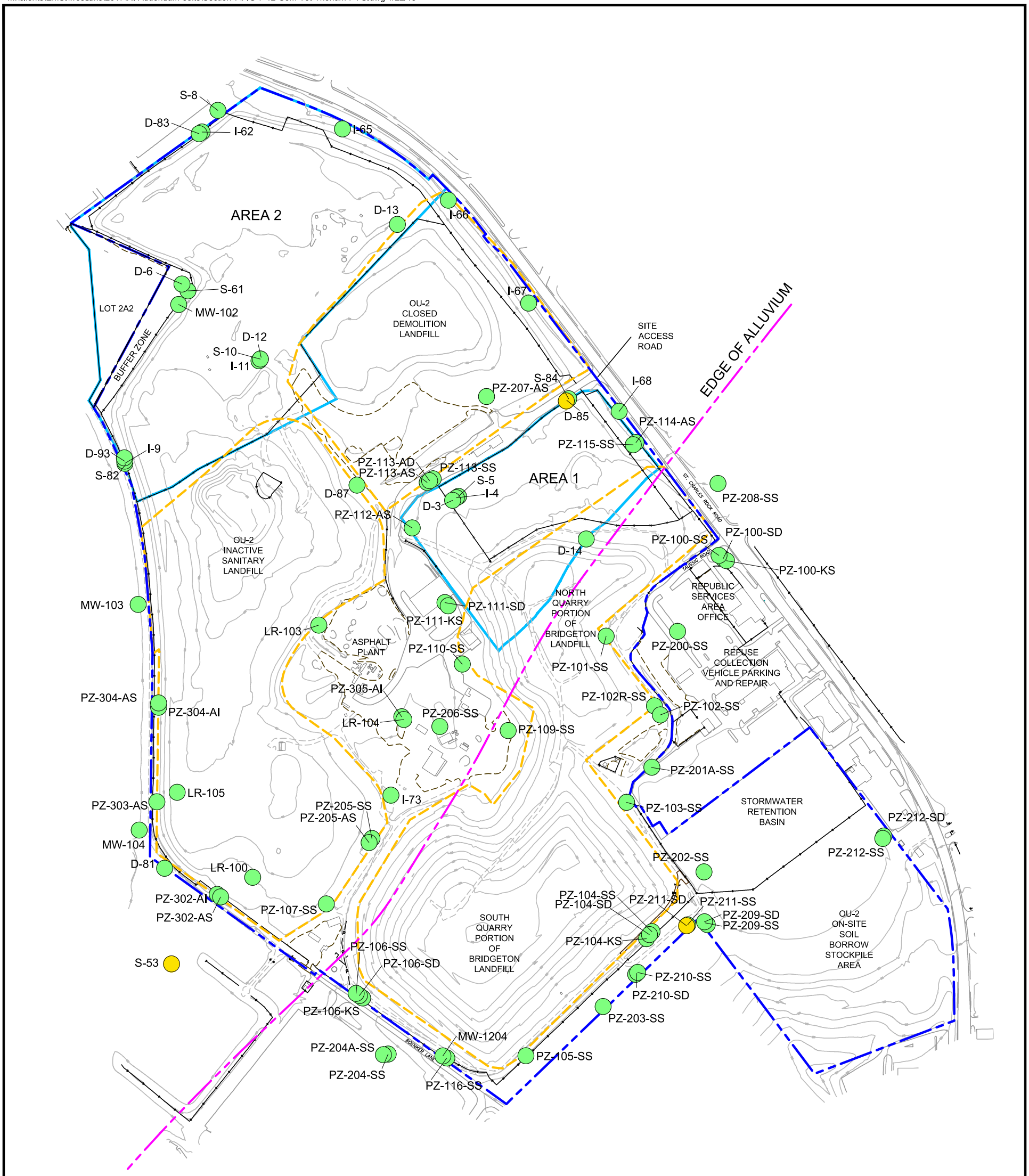
Figure 7-11

Well S-82 Radium Results

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-7\FIG-7-12-Com-Tot-Thorium-PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

THORIUM EXPLANATION

- Total Thorium-230 + 232 less than15 pCi/L [the Gross Alpha MCL] (all sampling dates)
- Total Thorium-230 + 232 less than15 pCi/L [the Gross Alpha MCL] (at least one sampling date but not all sampling dates)
- Total Thorium-230 + 232 less than15 pCi/L [Less than the Gross Alpha MCL] (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

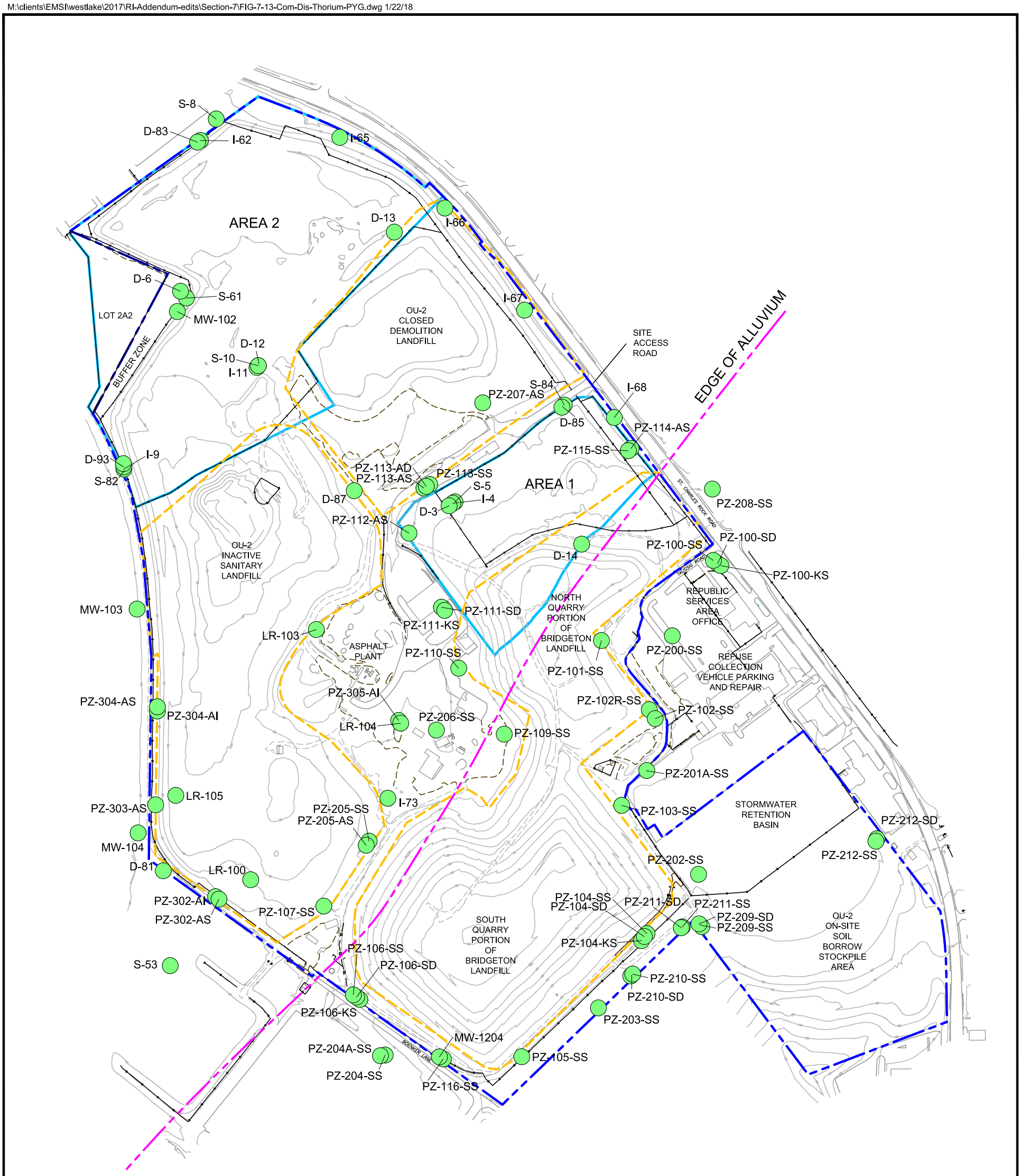
Figure 7-12

Combined Total Thorium-230 + 232 in Groundwater, August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-7\FIG-7-13-Com-Dis-Thorium-PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

THORIUM EXPLANATION

- Dissolved Thorium-230 + 232 less than15 pCi/L [the Gross Alpha MCL] (all sampling dates)
- Dissolved Thorium-230 + 232 less than15 pCi/L [the Gross Alpha MCL] (at least one sampling date but not all sampling dates)
- Dissolved Thorium-230 + 232 less than15 pCi/L [Less than the Gross Alpha MCL] (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

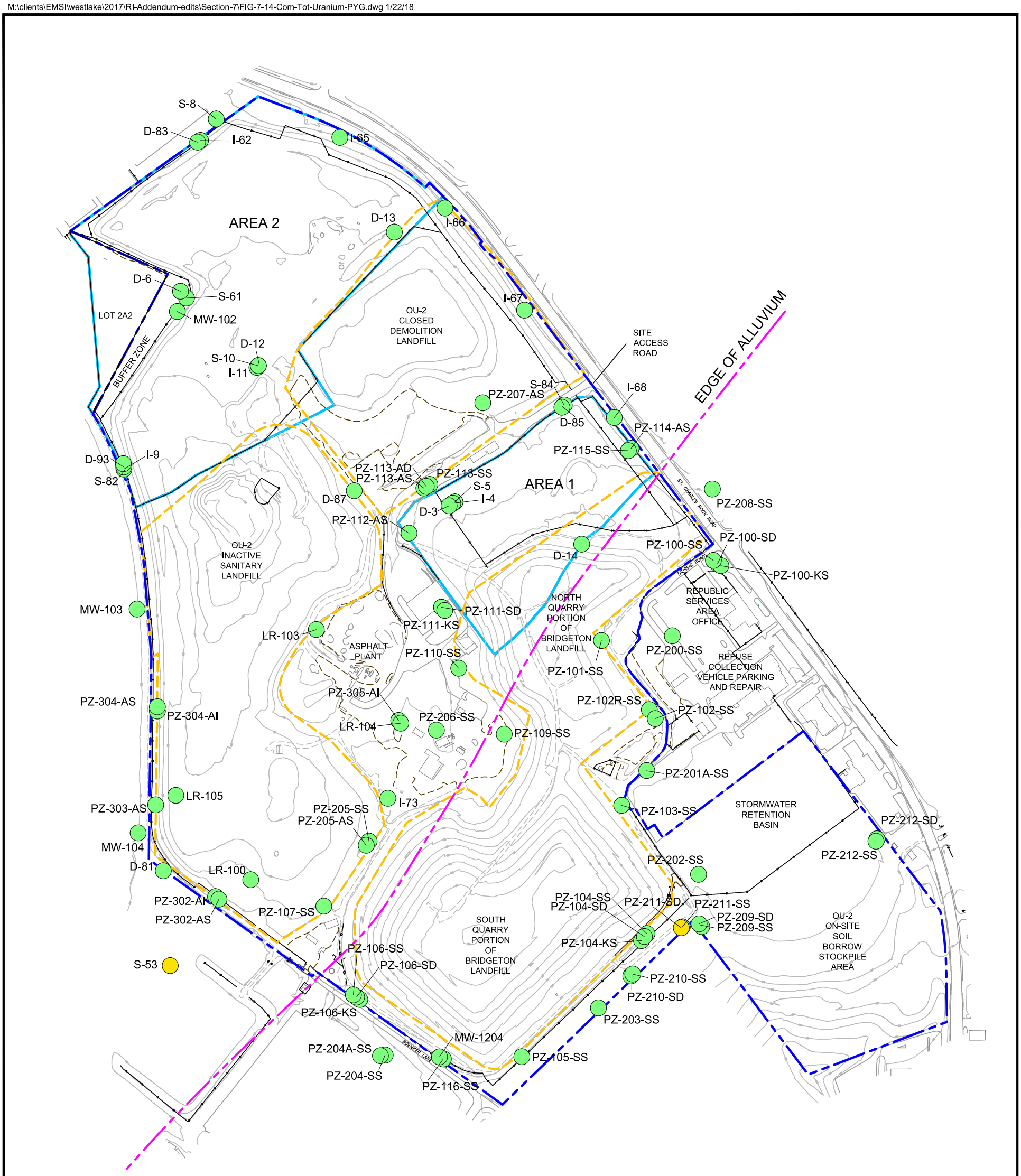
Figure 7-13

Combined Dissolved Thorium-230 + 232 in Groundwater, August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-7\FIG-7-14-Com-Tot-Uranium-PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

URANIUM EXPLANATION

- Total Uranium greater than the Maximum Contaminant Level of 30 µg/L [converted to mass from Uranium-234, Uranium-235 and Uranium-238 activities] (all sampling dates)
- Total Uranium greater than the Maximum Contaminant Level of 30 µg/L [converted to mass from Uranium-234, Uranium-235 and Uranium-238 activities] (at least one sampling date but not all sampling dates)
- Total Uranium greater than the Maximum Contaminant Level of 30 µg/L [Less than converted to mass from Uranium-234, Uranium-235 and Uranium-238 activities] (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

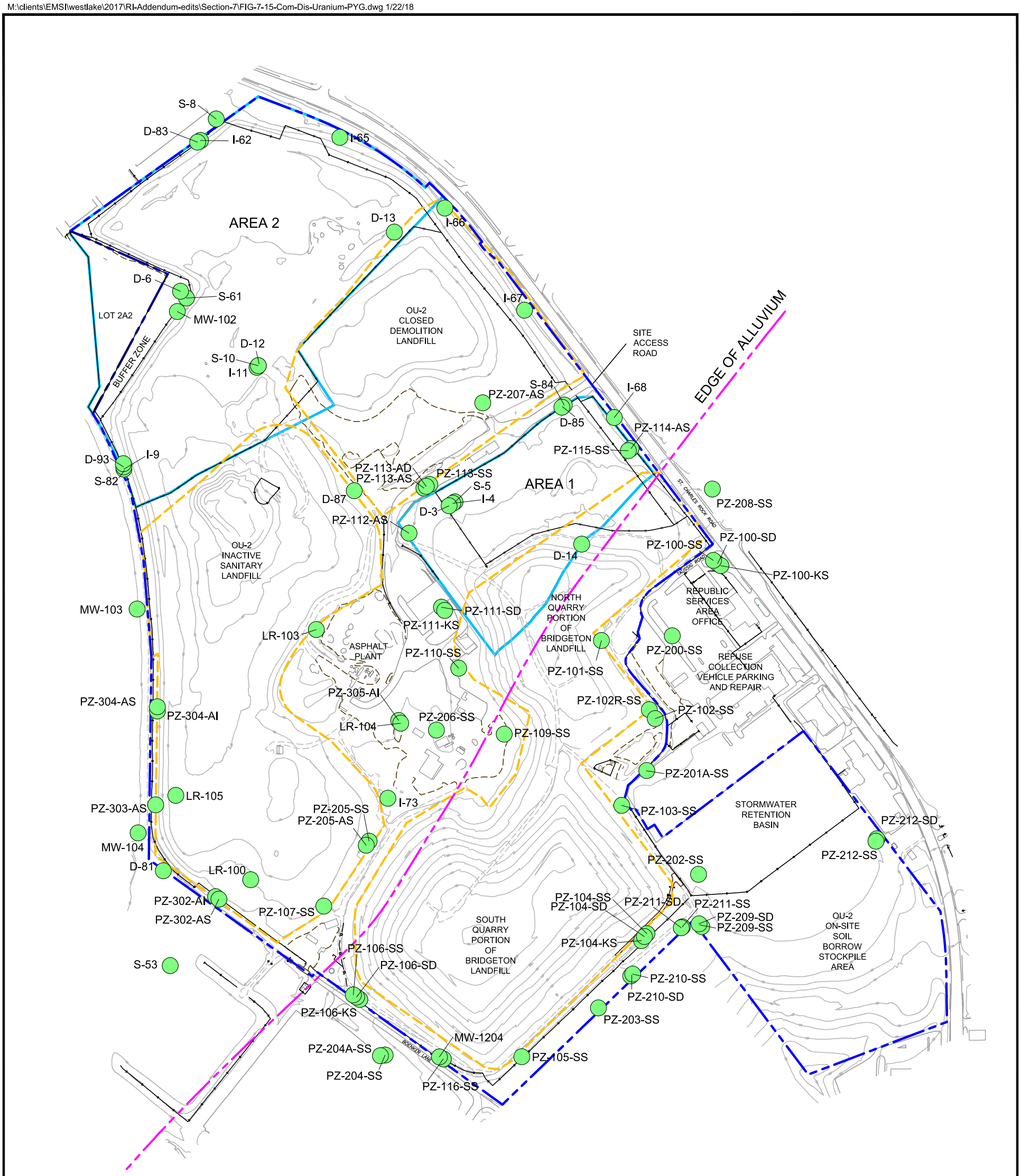
Figure 7-14

Total Uranium in Groundwater, August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-7\FIG-7-15-Com-Dis-Uranium-PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

URANIUM EXPLANATION

- Dissolved Uranium greater than the Maximum Contaminant Level of 30 µg/L [converted to mass from Uranium-234, Uranium-235 and Uranium-238 activities] (all sampling dates)
- Dissolved Uranium greater than the Maximum Contaminant Level of 30 µg/L [converted to mass from Uranium-234, Uranium-235 and Uranium-238 activities] (at least one sampling date but not all sampling dates)
- Dissolved Uranium greater than the Maximum Contaminant Level of 30 µg/L [Less than converted to mass from Uranium-234, Uranium-235 and Uranium-238 activities] (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

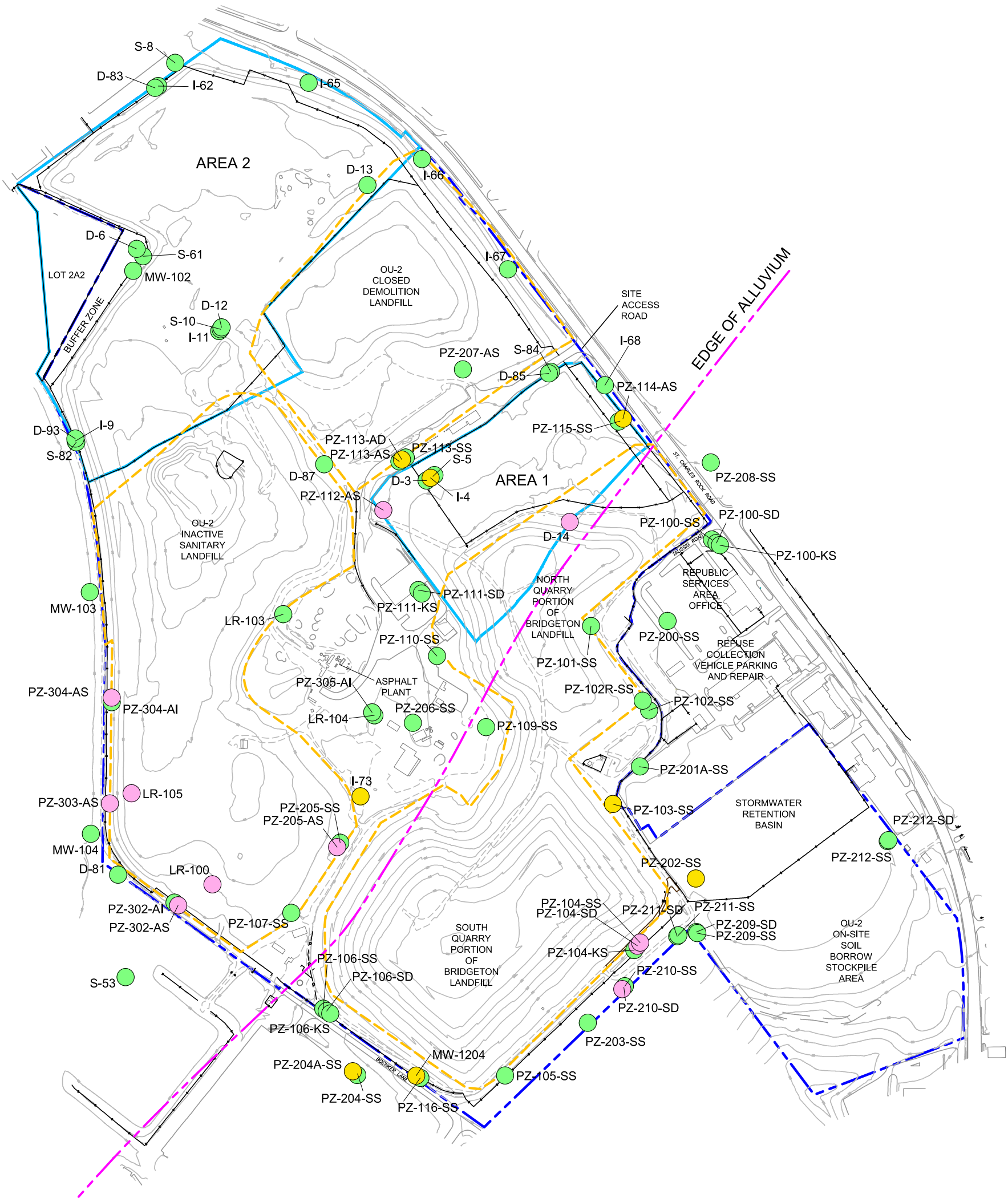
Figure 7-15

Combined Dissolved Uranium 234 + 235 + 238 in Groundwater, August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-1-Hist-Benz-PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

BENZENE EXPLANATION

- Benzene greater than the Maximum Contaminant Level of 5 µg/L for Benzene (all sampling dates)
- Benzene greater than the Maximum Contaminant Level of 5 µg/L for Benzene (at least one sampling date but not all sampling dates)
- Benzene less than the Maximum Contaminant Level of 5 µg/L for Benzene (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

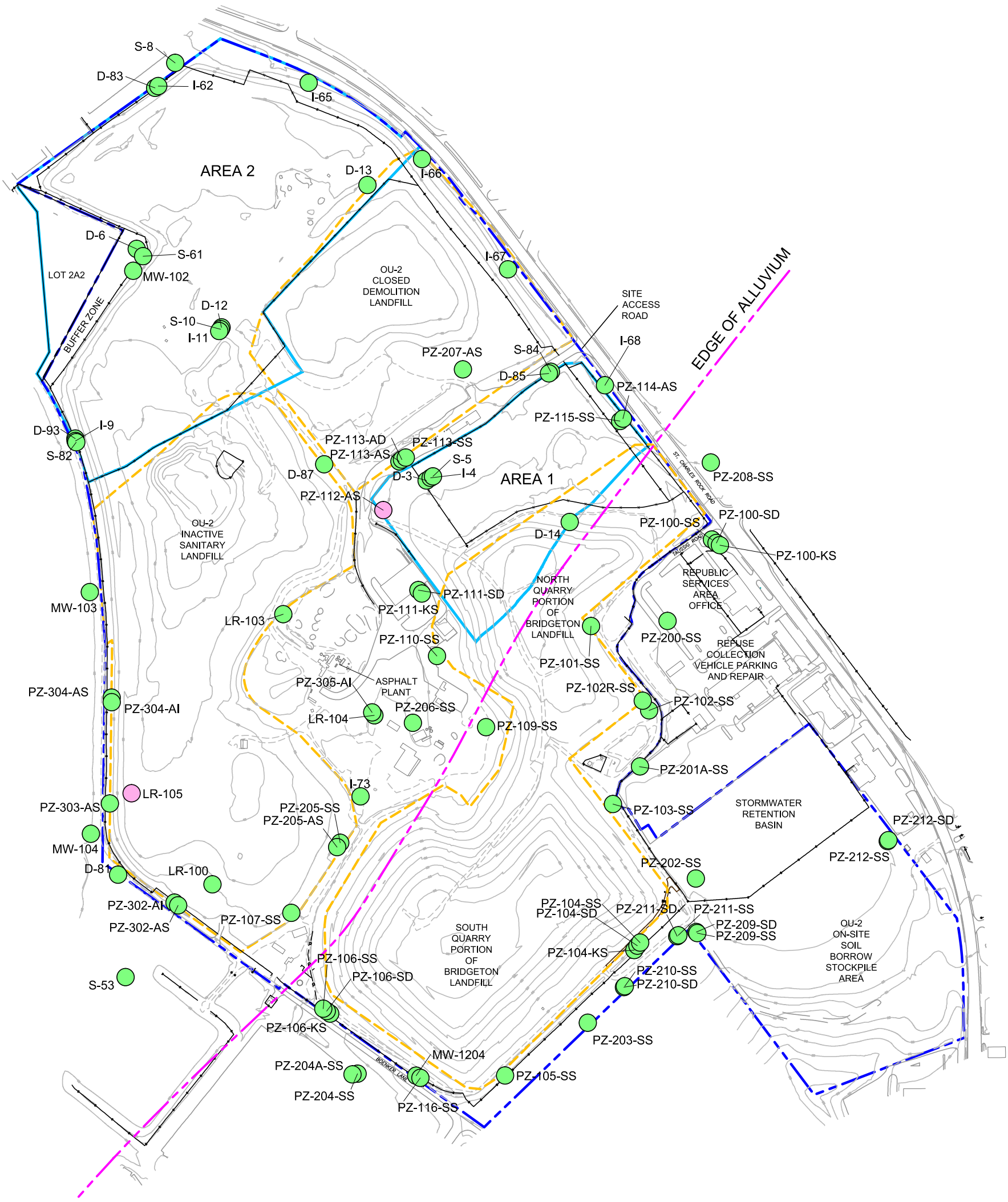
Figure 8-1

Benzene in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-2-Hist-Chlorobenzene_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

CHLOROBENZENE EXPLANATION

- Total Chlorobenzene greater than the Maximum Contaminant Level of 100 µg/L for Chlorobenzene (all sampling dates)
- Total Chlorobenzene greater than the Maximum Contaminant Level of 100 µg/L for Chlorobenzene (at least one sampling date but not all sampling dates)
- Total Chlorobenzene less than the Maximum Contaminant Level of 100 µg/L for Chlorobenzene (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

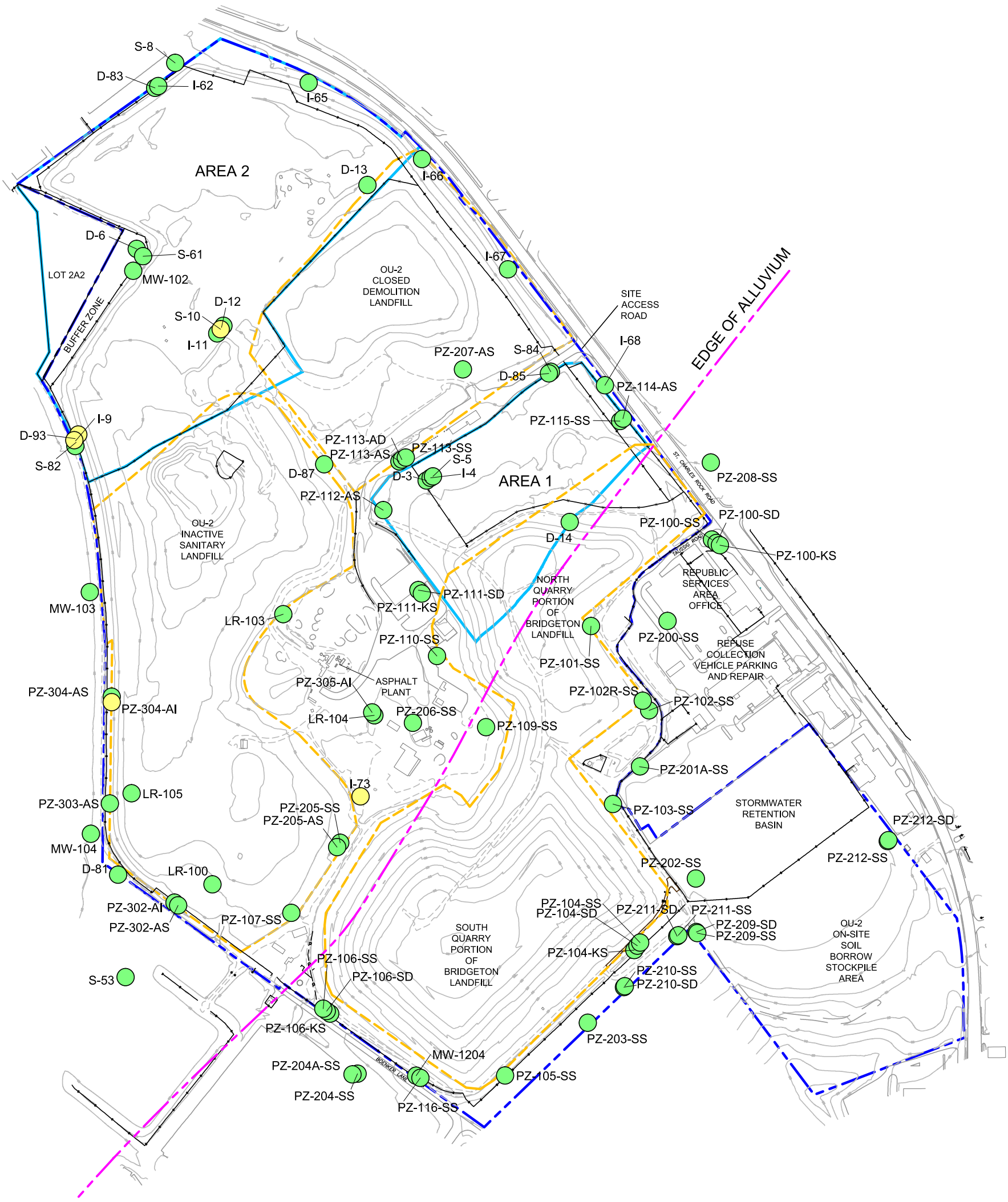
Figure 8-2

Chlorobenzene in Groundwater,
August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-3-Hist-Vinyl_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

VINYL CHLORIDE EXPLANATION

- Total Vinyl Chloride greater than the Maximum Contaminant Level of 2 µg/L for Vinyl Chloride (all sampling dates)
- Total Vinyl Chloride greater than the Maximum Contaminant Level of 2 µg/L for Vinyl Chloride (at least one sampling date but not all sampling dates)
- Total Vinyl Chloride less than the Maximum Contaminant Level of 2 µg/L for Vinyl Chloride (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

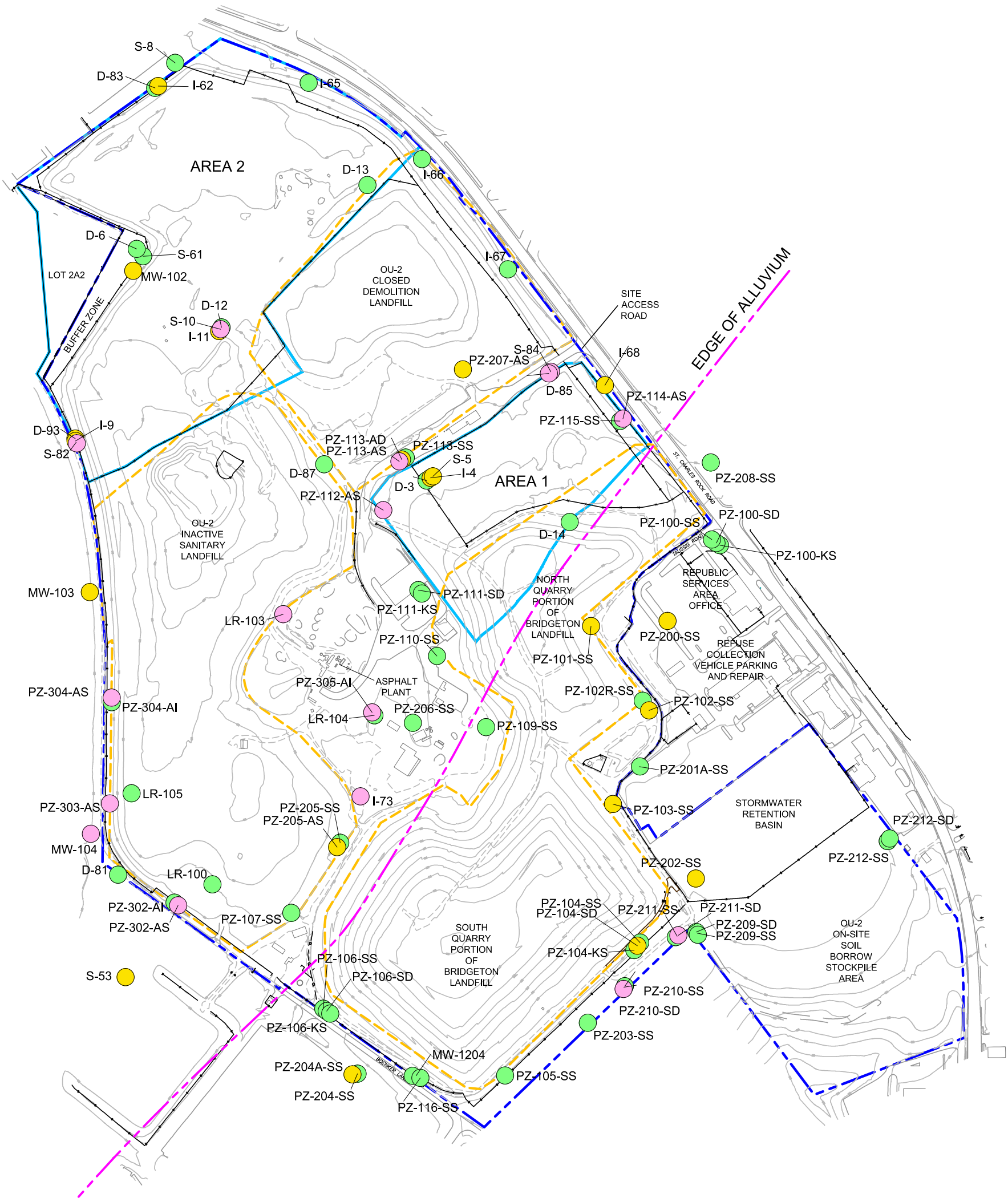
Figure 8-3

Vinyl Chloride in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-4-Hist-Arsenic_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

ARSENIC EXPLANATION

- Total Arsenic greater than the Maximum Contaminant Level of 10 µg/L for Arsenic (all sampling dates)
- Total Arsenic greater than the Maximum Contaminant Level of 10 µg/L for Arsenic (at least one sampling date but not all sampling dates)
- Total Arsenic less than the Maximum Contaminant Level of 10 µg/L for Arsenic (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

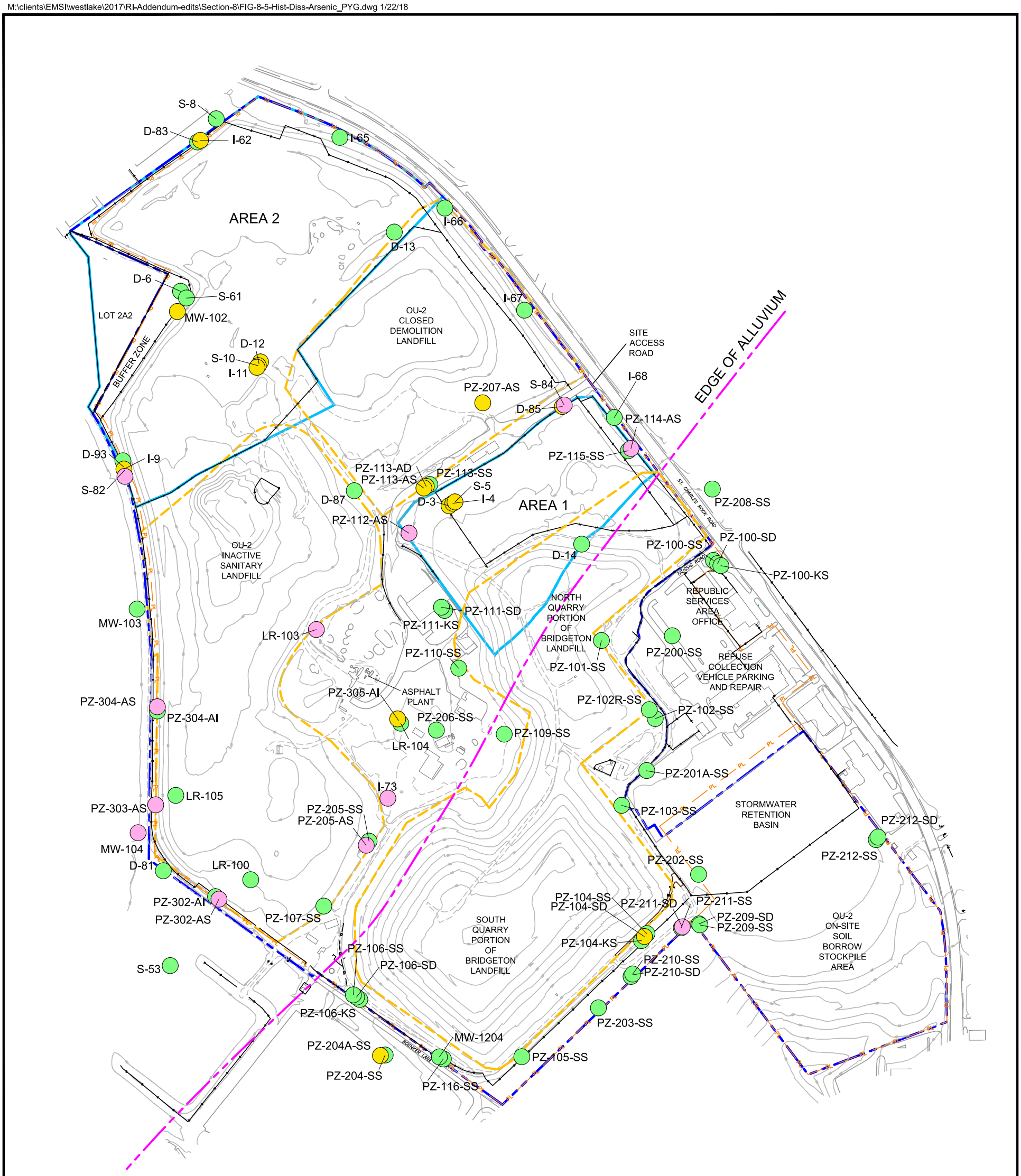
Figure 8-4

Total Arsenic in Groundwater,
August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-5-Hist-Diss-Arsenic_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

ARSENIC EXPLANATION

- Dissolved Arsenic greater than the Maximum Contaminant Level of 10 µg/L for Arsenic (all sampling dates)
- Dissolved Arsenic greater than the Maximum Contaminant Level of 10 µg/L for Arsenic (at least one sampling date but not all sampling dates)
- Dissolved Arsenic less than the Maximum Contaminant Level of 10 µg/L for Arsenic (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

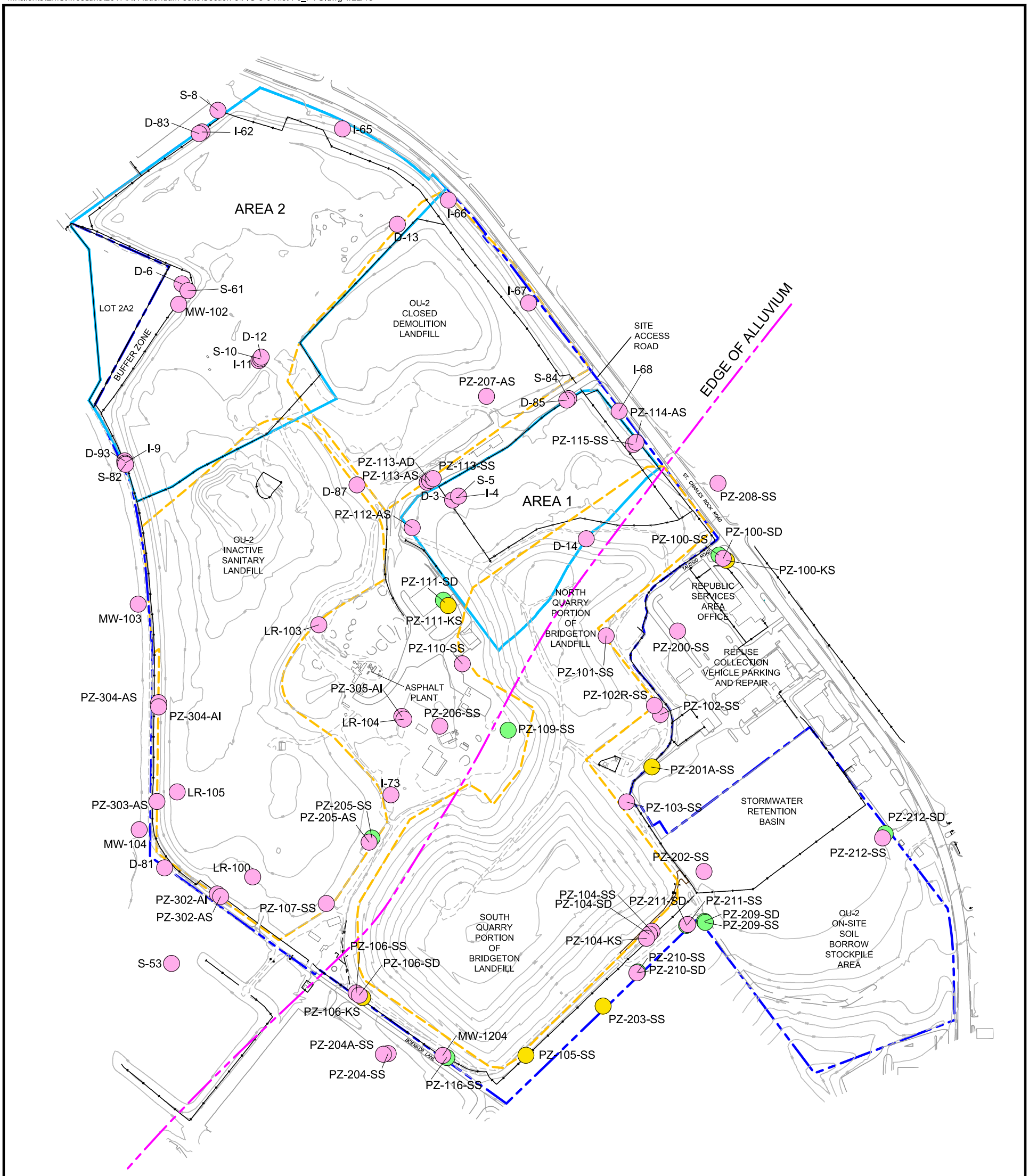
Figure 8-5

Dissolved Arsenic in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-6-Hist-Fe_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

IRON EXPLANATION

- Total Iron greater than the Secondary Maximum Contaminant Level of 300 µg/L for Iron (all sampling dates)
- Total Iron greater than the Secondary Maximum Contaminant Level of 300 µg/L for Iron (at least one sampling date but not all sampling dates)
- Total Iron less than the Secondary Maximum Contaminant Level of 300 µg/L for Iron (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

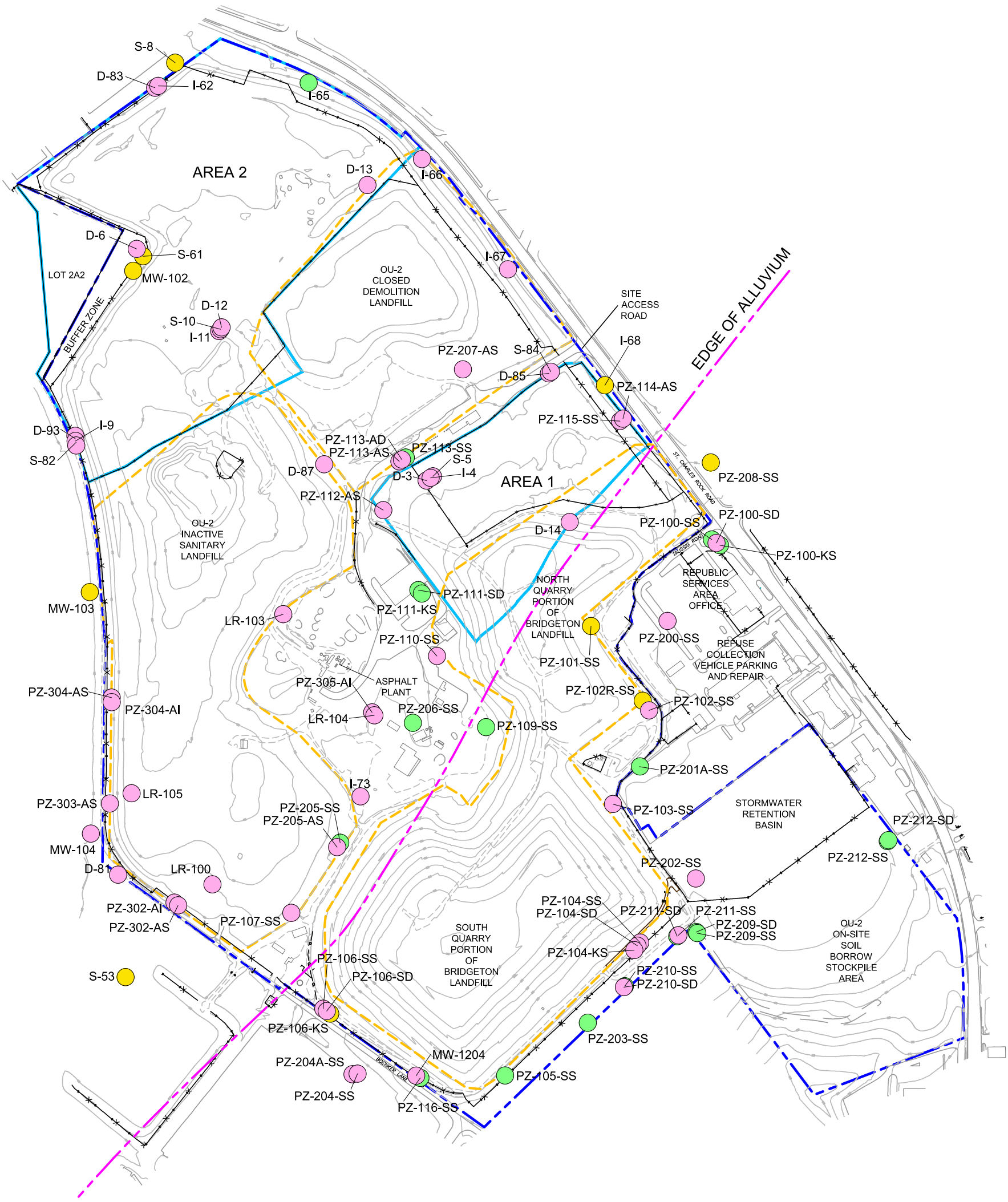
Figure 8-6

Total Iron in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-7-Hist-Diss-Fe_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

NORTH

0 250 500

SCALE IN FEET

IRON EXPLANATION

- Dissolved Iron greater than the Secondary Maximum Contaminant Level of 300 µg/L for Iron (all sampling dates)
- Dissolved Iron greater than the Secondary Maximum Contaminant Level of 300 µg/L for Iron (at least one sampling date but not all sampling dates)
- Dissolved Iron less than the Secondary Maximum Contaminant Level of 300 µg/L for Iron (all sampling dates)

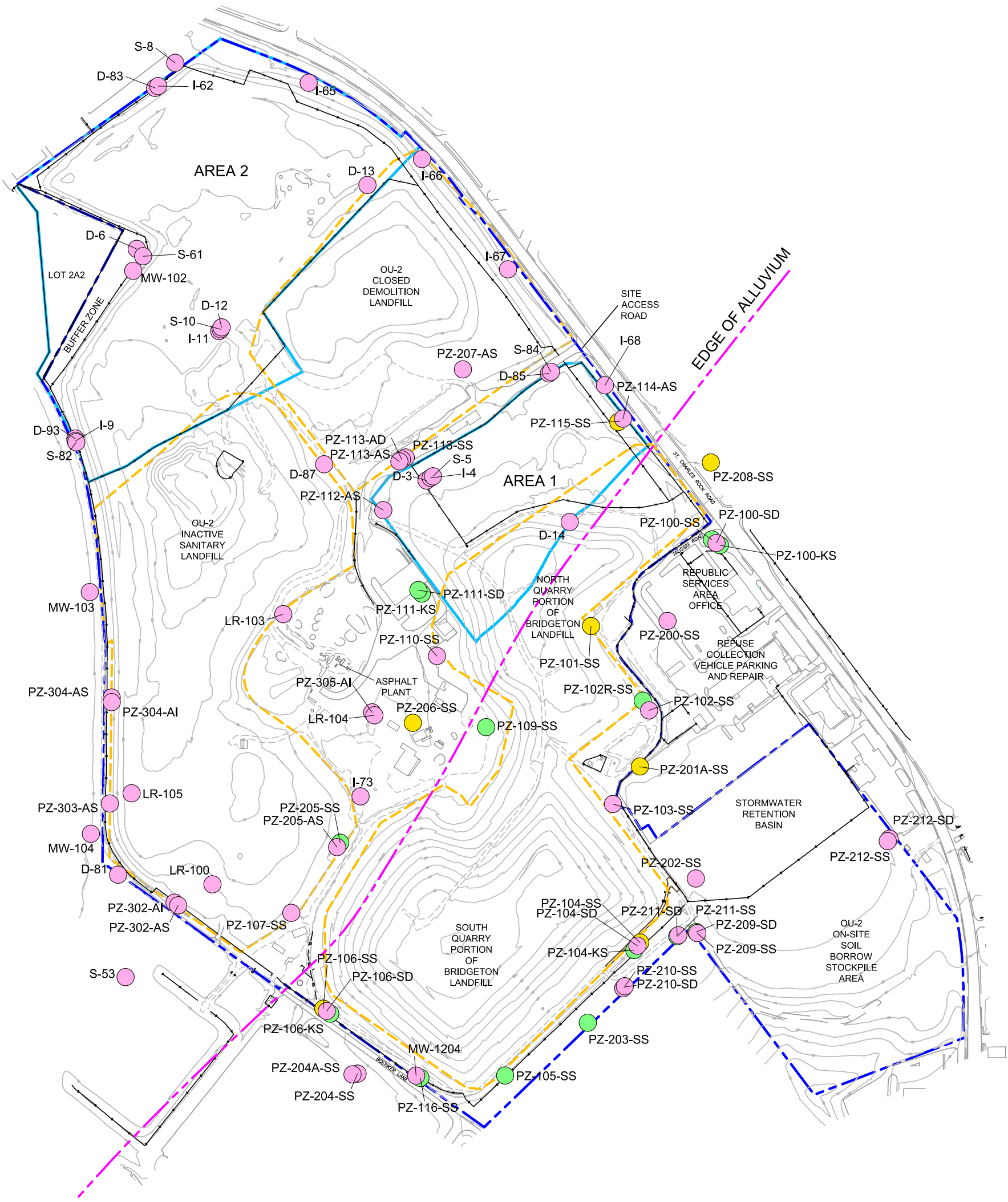
Figure 8-7

Dissolved Iron in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-8-Hist-Mang_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

NORTH

0 250 500

SCALE IN FEET

MANGANESE EXPLANATION

- Total Manganese greater than the Secondary Maximum Contaminant Level of 50 µg/L for Manganese (all sampling dates)
- Total Manganese greater than the Secondary Maximum Contaminant Level of 50 µg/L for Manganese (at least one sampling date but not all sampling dates)
- Total Manganese less than the Secondary Maximum Contaminant Level of 50 µg/L for Manganese (all sampling dates)

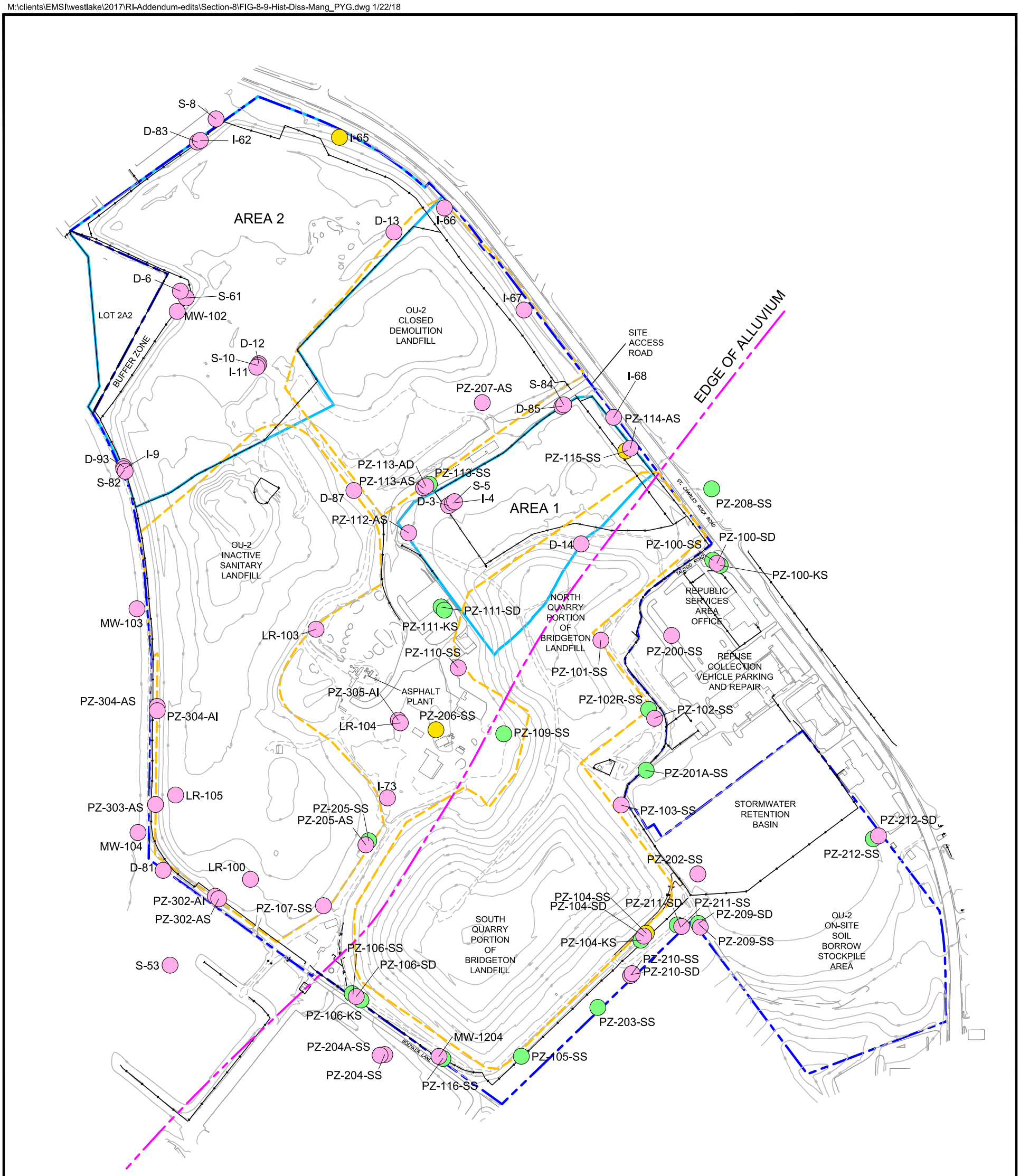
Figure 8-8

Total Manganese in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-9-Hist-Diss-Mang_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

MANGANESE EXPLANATION

- Dissolved Manganese greater than the Maximum Contaminant Level of 50 µg/L for Manganese (all sampling dates)
- Dissolved Manganese greater than the Maximum Contaminant Level of 50 µg/L for Manganese (at least one sampling date but not all sampling dates)
- Dissolved Manganese less than the Maximum Contaminant Level of 50 µg/L for Manganese (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

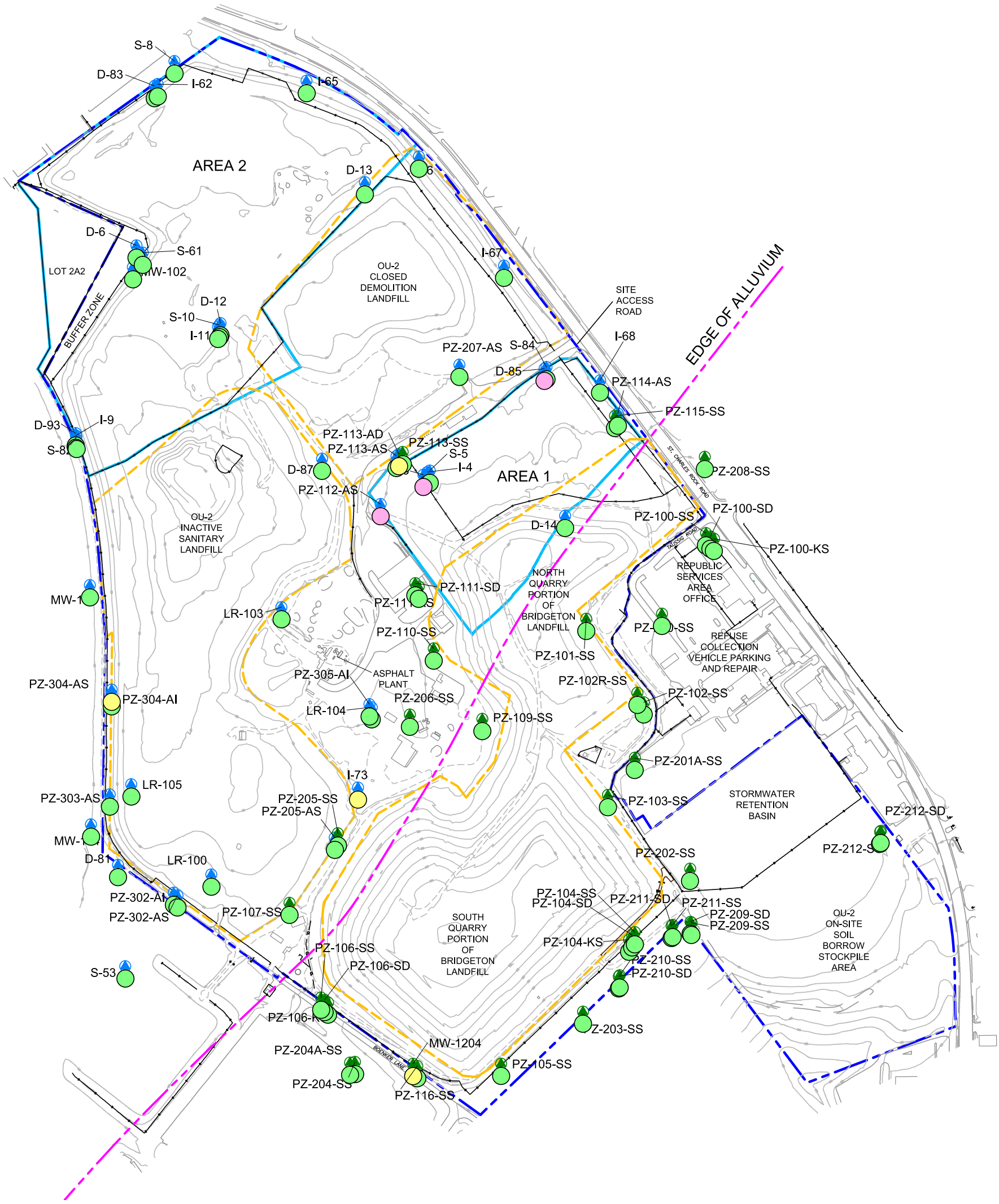
Figure 8-9

Dissolved Manganese in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-10-Hist-Total-Barium_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

BARIUM EXPLANATION

- Total Barium greater than the Maximum Contaminant Level of 2,000 µg/L for Barium (all sampling dates)
- Total Barium greater than the Maximum Contaminant Level of 2,000 µg/L for Barium (at least one sampling date but not all sampling dates)
- Total Barium less than the Maximum Contaminant Level of 2,000 µg/L for Barium (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

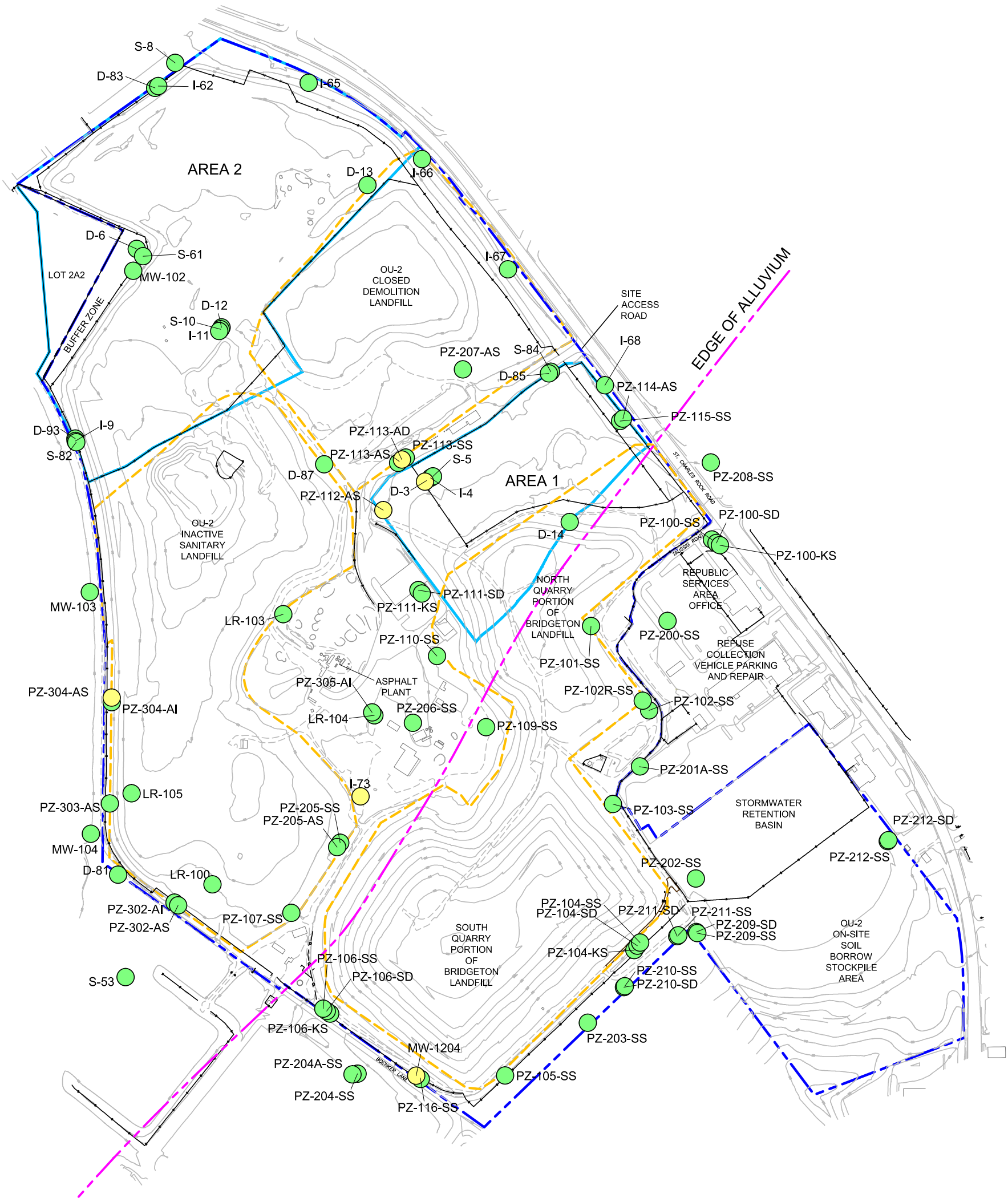
Figure 8-10

Total Barium in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-11-Hist-Diss-Barium_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

NORTH

0 250 500

SCALE IN FEET

BARIUM EXPLANATION

- Dissolved Barium greater than the Maximum Contaminant Level of 2,000 µg/L for Barium (all sampling dates)
- Dissolved Barium greater than the Maximum Contaminant Level of 2,000 µg/L for Barium (at least one sampling date but not all sampling dates)
- Dissolved Barium less than the Maximum Contaminant Level of 2,000 µg/L for Barium (all sampling dates)

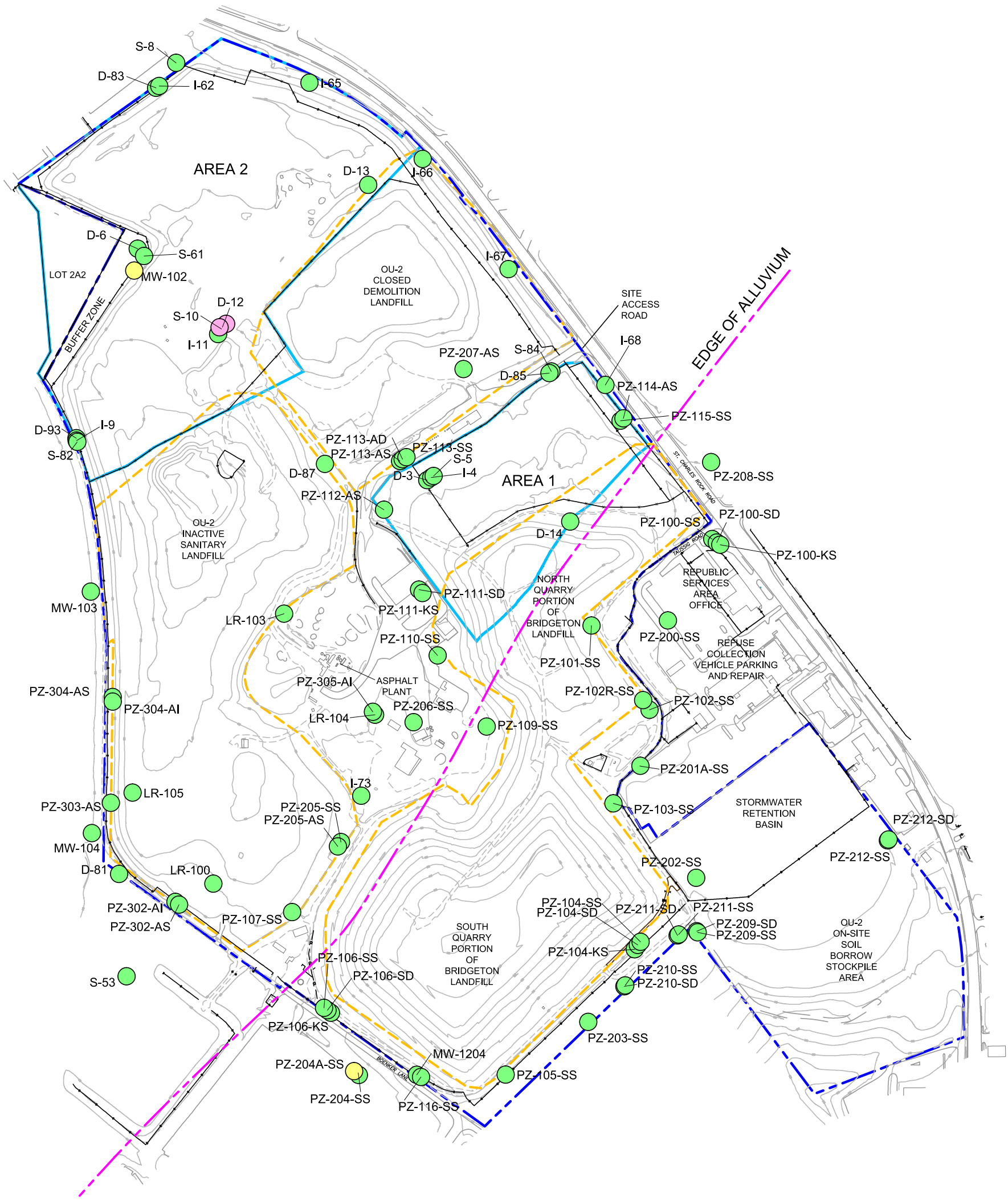
Figure 8-11

Dissolved Barium in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-12-Hist-Sulfate_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW:	Undifferentiated
S or AS:	Alluvial Shallow Well
I or AI:	Alluvial Intermediate Well
D or AD:	Alluvial Deep Well
SS:	St. Louis Formation Well
SD:	Salem Formation Well
KS:	Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

NORTH

0 250 500

SCALE IN FEET

SULFATE EXPLANATION

- Total Sulfate greater than the Secondary Maximum Contaminant Level of 250 mg/L for Sulfate (all sampling dates)
- Total Sulfate greater than the Secondary Maximum Contaminant Level of 250 mg/L for Sulfate (at least one sampling date but not all sampling dates)
- Total Sulfate less than the Secondary Maximum Contaminant Level of 250 mg/L for Sulfate (all sampling dates)

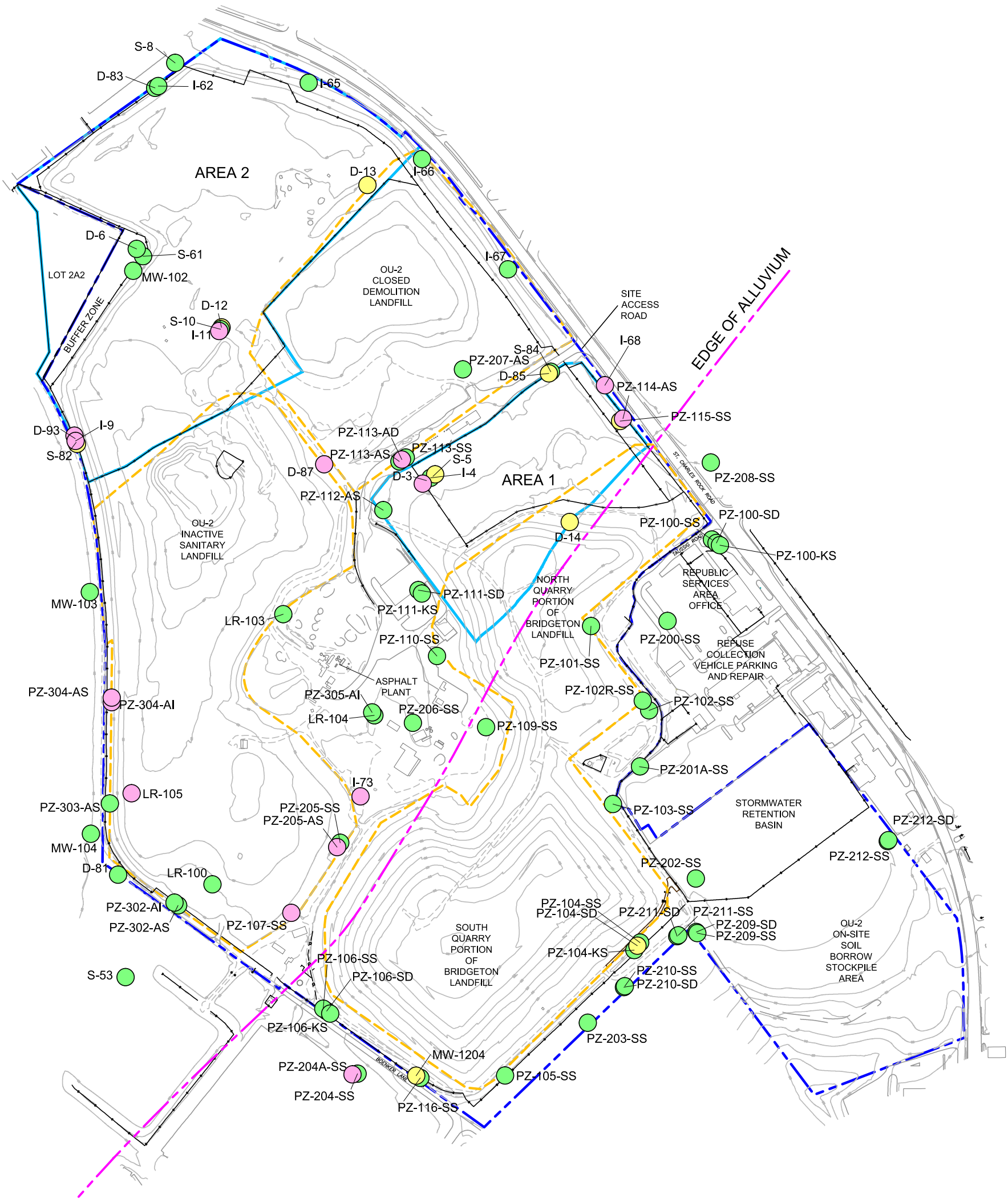
Figure 8-12

Sulfate in Groundwater, August 2012 Through November 2013

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

M:\clients\EMSI\westlake\2017\RI-Addendum-edits\Section-8\FIG-8-13-Hist-Chloride_PYG.dwg 1/22/18



LEGEND

- Landfill Boundary
- OU-1 Area Boundary
- OU-2 Area Boundary
- 480 Index Contour
- Paved Road
- Unpaved Road
- Building
- Fence

WELL FORMATION DESIGNATIONS

LR or MW: Undifferentiated
S or AS: Alluvial Shallow Well
I or AI: Alluvial Intermediate Well
D or AD: Alluvial Deep Well
SS: St. Louis Formation Well
SD: Salem Formation Well
KS: Keokuk Formation Well

NOTES:

1. Horizontal Coordinates Based on State Plane Missouri East Zone NAD 27
2. Elevations Based on U.S.G.S. Datum.
3. Existing Grade Contours are from the Aerial Survey Completed by the Sanborn Mapping Company on July 20, 2011.
4. Base Map Prepared by Aquaterra Environmental Solutions, Inc.

CHLORIDE EXPLANATION

- Chloride greater than the Secondary Maximum Contaminant Level of 250 mg/L for Chloride (all sampling dates)
- Chloride greater than the Secondary Maximum Contaminant Level of 250 mg/L for Chloride (at least one sampling date but not all sampling dates)
- Chloride less than the Secondary Maximum Contaminant Level of 250 mg/L for Chloride (all sampling dates)

NORTH

0 250 500

SCALE IN FEET

Figure 8-13

Chloride in Groundwater,
August 2012 Through February 2014

West Lake Landfill OU-1 RI Addendum

EMSI Engineering Management Support, Inc.

NORTH

0 100 200 425 850

Scale in Feet
Graphic Scale: 1 inch = 425 feet

EXPLANATION

LIQUID WASTE PRESENT IN ONLY ONE YEAR

LIQUID WASTE PRESENT IN TWO OR MORE YEARS

Notes:

1. Potential liquid waste disposal areas have been inferred by the EPA, based on review of the Historic Aerial Photographs.

2. Potential liquid wate disposal areas shown on this figure exclude standing liquids related to stormwater accumulation or quarry dewatering.

MASSEY AVENUE

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

OPERABLE UNIT 1 AREA 1

ENTRANCE STATION

ST. CHARLES ROCK ROAD

ACTIVE SANITARY LANDFILL PERMIT No.118912

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

CLOSED DEMOLITION LANDFILL

CONCRETE PLANT

ASPHALT PLANT

BORROW AREA

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY

OPERABLE UNIT 1 AREA 2

INACTIVE LANDFILL

CLOSED LEACHATE RETENTION POND

OU-1 ST. CHARLES ROCK ROAD

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 1-6
Potential Liquid Disposal Areas Inferred by EPA

NORTH

0 100 200 425 850

Scale in Feet
Graphic Scale: 1 Inch = 425 feet

EXPLANATION

SLUDGE WASTE

Notes:

1. Potential sludge disposal areas have been inferred by the EPA, based on review of the Historic Aerial Photographs.

2. Potential sludge disposal areas shown on this figure exclude concrete sludge disposal areas.

TAUSSIG AVENUE

BRIDGETON ACTIVE SANITARY LANDFILL BOUNDARY

BRIDGETON, ACTIVE SANITARY LANDFILL BOUNDARY

OPERABLE UNIT 1 AREA 1

ENTRANCE STATION

ST. CHARLES ROCK ROAD

ACTIVE SANITARY LANDFILL PERMIT No.118912

CLOSED DEMOLITION LANDFILL

ASPHALT PLANT

CONCRETE PLANT

BORROW AREA

LEACHATE LAGOONS (ABANDONED)

AUTO REPAIR FACILITY

APPROXIMATE LOCATION OF EDGE OF ALLUVIAL VALLEY

OPERABLE UNIT 1 AREA 2

INACTIVE LANDFILL

OLD ST. CHARLES ROCK ROAD

CLOSED LEACHATE RETENTION POND

EARTH CITY INDUSTRIAL PARK STORM WATER RETENTION POND

EARTH CITY INDUSTRIAL PARK

© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757

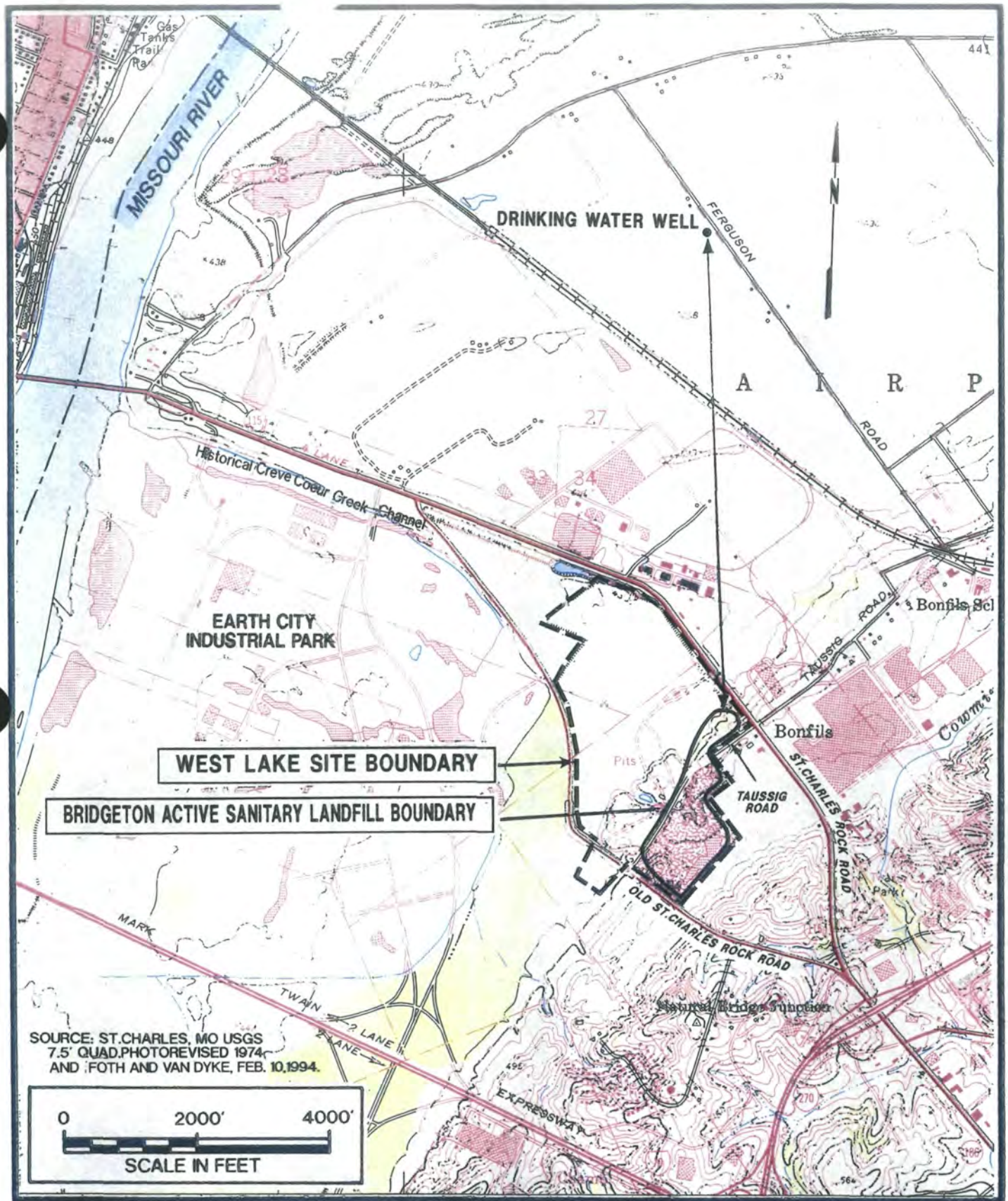
HIRST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 1-7
Potential Sludge Disposal Areas

APPENDIX V

NEARBY RECEPTORS



Golder Associates — Denver, Colorado

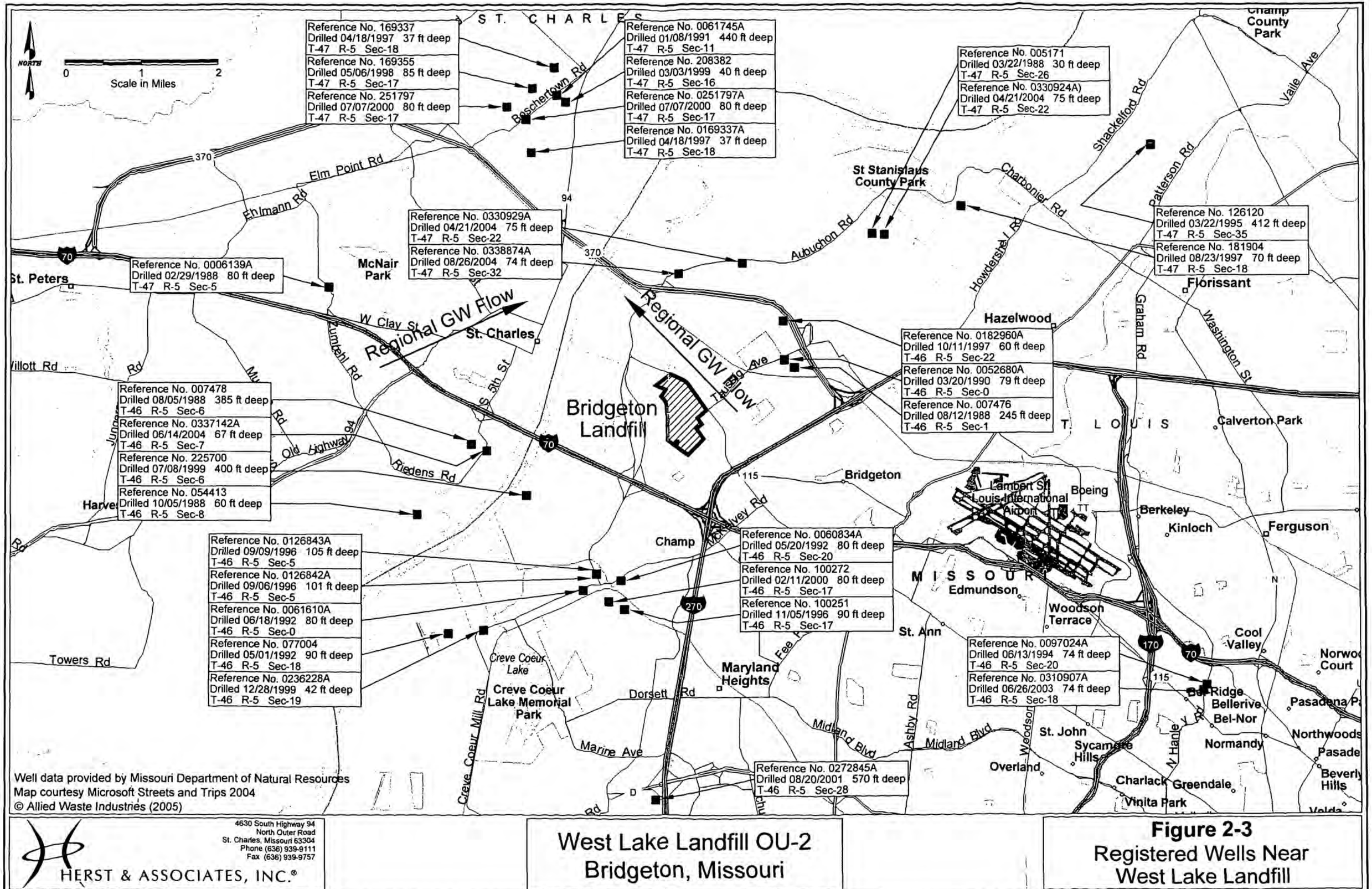
TITLE

CLOSEST DRINKING WATER WELL LOCATION

CLIENT/PROJECT

LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

DRAWN BDL	DATE AUG 1996	JOB NO. 953-2848
CHECKED CER	SCALE 1:24,000	DWG NO./REV. NO.
REVIEWED WEH	FILE NO.	FIGURE NO. 2-1



Well data provided by Missouri Department of Natural Resources
Map courtesy Microsoft Streets and Trips 2004
© Allied Waste Industries (2005)

4630 South Highway 94
North Outer Road
St. Charles, Missouri 63304
Phone (636) 939-9111
Fax (636) 939-9757
HERST & ASSOCIATES, INC.®

West Lake Landfill OU-2
Bridgeton, Missouri

Figure 2-3
Registered Wells Near
West Lake Landfill

APPENDIX W

PRELIMINARY MONITORING WELL INVENTORY PHOTO-DOCUMENTATION

Photo 1. Monitoring Well D-13

Photo 2. Monitoring Well I-65

Photo 3. Monitoring Well I-66

Photo 4. Monitoring Well D-12

Photo 5. Monitoring Well S-10

Photo 6. Monitoring Well D-6

Photo 7. Monitoring Well I-9 (mislabeled)

Photo 8. Monitoring Well S-82

Photo 9. Monitoring Well D-93 (mislabeled)

Photo 10. Monitoring Well MW-103

Photo 11. Monitoring Well I-62

Photo 12. Monitoring Well D-83

Photo 13. Monitoring Well D-3

Photo 14. Monitoring Well I-4

Photo 15. Monitoring Well S-5

Photo 16. Monitoring Well D-89

Photo 17. Monitoring Well D-81

Photo 18. Monitoring Well D-87

Photo 19. Clustered Monitoring Wells D-12, I-11, and S-10

APPENDIX X

STATISTICAL EVALUATION

DRAFT Statistical Narrative for Sample Size Requirement Estimation

Historical data collected during OU-1 and OU-2 investigations between 1986 to 2016 were used to estimate the number of samples required to compute 95% Upper Prediction Limits (UPLs) for the mean concentration of radionuclides at West Lake Landfill. The historical samples were taken from eight wells (D-81, I-50, MW-106, MV-107, PZ-300-AD, PZ-300-AS, S-53, and S-80) in alluvial areas and from 3 wells (PZ-212-SD, PZ-212-SS, and PZ-300-SS) in bedrock. A summary of the data can be found in Table 1.

For each analyte presented in Table 1, Goodness-of-fit tests, such as the Shapiro-Wilk for Normal, Lognormal, and Gamma distributions, were performed when at least 5 detected values were collected. Concentrations in Radium 228 Dissolved, Uranium 235_236 Dissolved, and Uranium 235_236 Total were found to have an underlying normal distribution. Concentrations in Radium 228 Total, Thorium 230 Dissolved, Thorium 232 Dissolved, Uranium 234 Dissolved, Uranium 234 Total, and Uranium 238 Dissolved were found to have Lognormal underlying distributions. No underlying distribution for all other analytes could be identified as one of the three considered. As such, any limit calculation for those analytes would have to rely on non-parametric equations.

Because non-parametric UPLs cannot be inverted to calculate sample size requirements, one could assume an underlying normal distribution to calculate an Upper Confidence Limit (UCL) at 95% confidence. However, one would have to keep in mind that the UCL will have a harder time achieving the required confidence level the more skewed that underlying distribution is. In addition, with lightly to moderately skewed data, 95% UCLs, 95% UPLs, and 95% Upper Tolerance Limits (UTLs) have the following relationship: $UCL95(\mu) \leq UPL95(\mu) \leq UTL95\text{-}95$. Therefore, in most cases, it is recommended to determine sample size requirements based on UTL calculations.

In order to calculate UTLp-(1-α) such that $(p \times 100\%)$ of the data will be less than the UTLp-(1-α) with $(1-\alpha)100\%$ confidence, a number *r*, with $1 \leq r \leq n$, is chosen with the aim that the cumulative binomial probability becomes as close as possible to (1 – α). Depending upon the sample size, p, and $(1-\alpha)$, the largest, the second largest, the third largest, and so forth order statistic is used to estimate the UTL (USEPA 2015). For a given data set of size n, the rth order statistic, $x(r)$, may or may not achieve the specified confidence level, $(1-\alpha)$. With the sample size for each radionuclide ranging from 4 to 51 (Table 1), a 95% confidence would only be attainable using the nth order statistics to calculate UTL95-95 (Table 2). However, a 95% confidence could be achieved using the nth to (n-2)th order statistics if computing UTL90-95. For specified values of p and $(1-\alpha)$, an approximate minimum sample size can be computed using Scheffe and Tukey (1944) given by equation (3-12) in ProUCL 5.1 Technical guide (USEAP, 2015). Table 3 presents the different sample size requirements to compute a UTLp-(1-α) using this formula.

Using the nth order statistic, a 90% to 95% confidence with 90% probability using 22 to 29 samples, and a 90% to 95% confidence with 95% probability using 45 to 59 samples (Table 3) could be achieved. For this reason, quarterly sampling for two years at a total of 6 wells in alluvial areas and 6 wells in bedrock is proposed. This sampling schedule would provide data from $6 \times 4 = 24$ samples in alluvial areas and 24 samples in bedrocks during the first year, and 48 samples in each stratum by the end of the second year.

These minimum sample size estimates only provide approximations of the sample size requirement based on UTLs. But UTLs based upon order statistics often do not achieve the desired confidence level, especially when the data are lightly to moderately skewed and a non-parametric approach must be undertaken. One might address this issue by calculating a 95% UPL based on the Chebyshev inequality. While it should be noted that 95% Chebyshev UPLs tend to yield higher estimates of Background Threshold Values (BTV) than various other methods, ProUCL 5.1 Technical Guide (2015) highly recommends the use of Chebyshev UPL95 as BTV, since it helps achieve the desire coverage with smaller samples and skewed distributions.

Therefore, after data from the eight sampling events are collected we propose to:

(1) Provide a table summarizing the data similar in format to Table 1,
(2) Identify if the underlying distribution for the concentration of each analyte of interest at each well follow a normal, lognormal, or gamma distribution, using goodness-of-fit tests such as Shapiro-Wilk tests, and accordingly provide parametric or nonparametric 95% UPL for each analyte, taking into account the presence of any non-detected concentrations, the underlying distribution, and any sample size requirements.
(3) Test for evidence of a difference in the means (or medians) concentration of analytes between the alluvial and bedrock strata, with consideration to normality and homoscedasticity assumptions.
(4) If possible, establish a strata-dependent 95% UPL for each analyte of interest, if it can be demonstrated that the data collected in each stratum come from the same population.

References:

U.S. Environmental Protection Agency (EPA). 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530-R-09-007.

U.S. Environmental Protection Agency (EPA). 2015. ProUCL Version 5.1 Technical Guide: Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. EPA 600-R-07-041, October 2015.

Table 1. Summary Statistics for Each Analyte.
n.D: Number of Detects; D: Detects; FOD: Frequency of Detects

Analyte	n	n.D	mean.D	std.dev.D	min.D	max.D	n.ND	min.ND	max.ND	FOD
Radium 226 Dissolved	48	31	6.810	24.375	0.069	130	17	0.120	50.800	64.58%
Radium 226 Total	49	35	1.891	6.150	0.06	36.8	14	0.140	31.300	71.43%
Radium 228 Dissolved	43	15	1.709	0.891	0.462	3.14	28	0.320	63.100	34.88%
Radium 228 Total	43	17	2.107	1.517	0.39	5.4	26	0.400	48.500	39.53%
Thorium 228	43	23	2.891	5.763	0.1	20	20	0.110	1.650	53.49%
Thorium 228 Dissolved	39	5	1.007	0.998	0.254	2.1	34	0.100	1.500	12.82%
Thorium 230	51	39	1.861	4.322	0	19.6	12	0.110	2.900	76.47%
Thorium 230 Dissolved	45	31	0.491	0.564	0.09	2.63	14	0.110	1.640	68.89%
Thorium 232	46	25	2.675	5.402	0.1	19.1	21	0.110	351.000	54.35%
Thorium 232 Dissolved	42	9	0.123	0.036	0.09	0.21	33	0.110	225.000	21.43%
Thorium 234 Dissolved	8	1	0.880	NA	0.88	0.88	7	108.000	258.200	12.50%
Thorium 234, Total	5	1	0.990	NA	0.99	0.99	4	120.000	353.000	20.00%
Uranium 234, Dissolved	42	39	3.022	3.164	0.18	13.62	3	0.431	1.320	92.86%
Uranium 234, Total	44	40	6.035	9.949	0.2	45.3	4	0.405	1.120	90.91%
Uranium 235, Dissolved	35	20	0.526	0.412	0.2	1.7	15	0.160	87.470	57.14%
Uranium 235, Total	37	25	1.371	3.044	0.14	11.4	12	0.150	133.000	67.57%
Uranium 235_236, Dissolved	15	6	0.255	0.169	0.062	0.5	9	0.100	1.000	40.00%
Uranium 235_236, Total	12	5	0.230	0.089	0.1	0.32	7	0.100	1.200	41.67%
Uranium 238, Dissolved	43	39	1.903	1.591	0.15	5.14	4	0.100	1.000	90.70%
Uranium 238, Total	45	40	4.843	11.435	0.15	53.5	5	0.100	1.000	88.89%
Uranium, Total	4	4	15.775	14.983	2.2	34	NA	NA	NA	100.00%

Table 2. Cumulative Binomial Probabilities Associated with Order $\mathbf{r}$ of the Statistic $\mathbf{x(r)}$ to Compute UTLp-(1 - α), such that $(\mathbf{p} \times \mathbf{100}\%)$ of the Data will be less than the UTLp-(1-α) with $(\mathbf{1-\alpha})\mathbf{100}\%$ Confidence

n	p95.x(n)	p95.x(n-1)	p90.x(n)	p90.x(n-1)	p90.x(n-2)
4	1	0.1855	1	0.3439	0.0523
9	1	0.3698	1	0.6126	0.2252
14	1	0.5123	1	0.7712	0.4154
20	1	0.6415	1	0.8784	0.6083
25	1	0.7226	1	0.9282	0.7288
30	1	0.7854	1	0.9576	0.8163
35	1	0.8339	1	0.9750	0.8776
41	1	0.8779	1	0.9867	0.9261
46	1	0.9055	1	0.9921	0.9520
51	1	0.9269	1	0.9954	0.9691

Table 3. Approximate Minimum Sample Size Required To Compute UTLp-(1-α) Using Scheffe and Tukey's (1944) Formula Presented in ProUCL 5.1 Technical Guide (USEAP, 2015).

		x(n)							x(n-1)							x(n-2)						
	CC	0.7	0.75	0.8	0.85	0.9	0.95	0.99	0.7	0.75	0.8	0.85	0.9	0.95	0.99	0.7	0.75	0.8	0.85	0.9	0.95	0.99
p	0.8	6	7	8	9	11	14	21	12	13	14	16	19	22	31	18	19	21	23	25	30	39
	0.85	8	9	10	12	15	19	29	16	18	19	22	25	30	42	24	26	28	31	34	40	53
	0.9	12	14	16	19	22	29	44	24	27	29	33	38	46	64	36	39	42	46	52	61	81
	0.95	24	28	32	37	45	59	90	49	54	59	67	77	94	130	72	78	85	94	105	124	165
	0.99	120	138	161	189	230	299	459	244	269	299	337	388	473	662	361	392	427	471	531	628	838