SULLIVAN, MO LANDFILL CLOSURE

FINAL CONSTRUCTION REPORT

VOLUME I

Prepared for:

SULLIVAN LANDFILL PRP GROUP

Prepared by:

ABB Environmental Services, Inc.
Portland, ME

Project No. 8960-02

July 1995

ABB Environmental Services, Inc.

ASEA BROWN BOVERI

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SULLIVAN, MISSOURI

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1.0 INTRODUCTION

Construction of the Sullivan, Missouri, Landfill Closure was completed during the period May 1994 through March 1995. ABB Environmental Services, Inc., (ABB-ES) provided design services. Construction was completed by O'Brien & Gere Technical Services (OBGT). Construction oversight and "third party" quality assurance services were also provided by ABB-ES. The work was conducted for the Sullivan Landfill PRP Group.

The work completed under the construction contract included construction of a leachate collection system and placement of a low permeability cover system over this municipal solid waste landfill. The conceptual landfill closure design was documented in the Closure Plan (ABB-ES, 1993a) and the Supplemental Closure Plan (ABB-ES, 1993b), which were approved by the Missouri Department of Natural Resources (MDNR, 1993). The solid waste landfill design features satisfy requirements described in the State of Missouri Solid Waste regulation 10 CSR 80-2.030.

The landfill cover extent is approximately 26.7 acres; approximate limits of waste were developed based upon geophysical surveys completed in November, 1991, and on test pits in March and November 1993. Items in the construction contract included structural reinforcement of a sinkhole geologic formation located adjacent to the landfill limits, and collection and disposal of leachate seep liquid at various locations at the landfill perimeter.

After a competitive bid process, the construction contract was awarded by the PRP Group on May 9, 1994 to OBGT of Syracuse, New York. The contractor mobilized during the week of May 30, 1994. The Certificate of Substantial Completion was issued on January 26, 1995. ABB-ES provided full-time construction oversight and office support during the entire project.

Section 2.0 provides a detailed description of items included in the construction project. Section 3.0 describes the quality control procedures implemented during construction. The chronology of construction activities are detailed in Section 4.0. Section 5.0 provides a discussion of facility operation and maintenance. Section 6.0 describes construction documentation.

2.0 BACKGROUND

The project included construction of a composite (soil and geomembrane) cover over the landfill; collection and disposal of leachate seep liquid during and after cover construction from seeps at the landfill perimeter; constructing a geosynthetic reinforcing system at a sinkhole geologic formation adjacent to the landfill; appurtenant storm drainage and roadway construction; environmental protection during and after construction; and restoration of disturbed surfaces.

2.1 PROJECT REQUIREMENTS

OBG Tech completed the following items:

a) A survey by a registered land surveyor to locate the coordinates of the cover system and related features.
b) Relocation of the existing decontamination pad.
c) Clearing of trees and brush, and removal of existing miscellaneous structures from the work area.
d) Construction of a perimeter gravel roadway.
e) Erection of a six- foot high perimeter chain link fence.
f) Excavation of overburden at the sinkhole area and construction of the geosynthetic reinforcing system.
g) Installation of 10 temporary settlement platforms, and monitoring during construction.
h) Installation of silt fence, haybales, and stone check dams for erosion control.
i) Installation of the landfill cover system including:
   * A 12-inch gas venting layer (approximately 107,000 sy) with 4-inch gas vent risers.
   * An 18-inch hydraulic barrier soil (clay) layer (approximately 122,000 sy).
   * A 40-mil Very-Low Density Polyethylene(VLDPE) geomembrane (approximately 123,000 sy).
   * A 12-inch drainage layer with perforated perimeter drainage pipes (approximately 107,000 sy).
   * Installation of 5,400 linear feet of perforated and solid perimeter drainage pipe.

* A 12-inch vegetative soil layer (approximately 132,000 sy). Seed, mulch, and fertilize the vegetative soil layer.

j) Construction and installation of seven permanent settlement platforms in the cover system.

k) Collection of existing seep liquid at eight perimeter locations, with disposal at the St. Louis Metropolitan Sewer District (MSD) wastewater treatment facility.

l) Construction of the leachate collection system:
* Approximately 2,700 linear feet of gravity trench.
* Three pump station units.
* Approximately 1,600 linear feet of 1 1/2-inch dia. force main.
* One 10,000 gallon underground steel storage tank.

m) Construction of permanent drainage trenches and culverts.

n) Collection of residual leachate seep liquid from the storage tank, with disposal at the St. Louis MSD facility.

3.0 PERFORMANCE STANDARDS AND PROJECT PROCEDURES

Quality control (QC, by OBG Tech) and quality assurance (QA, by ABB-ES) performance standards for the soils and VLDPE geomembrane are described in the contract specifications dated March 1993. Pertinent specifications, attached in Appendix A, include Section 02221 - Excavation, Backfill, and Compaction,and Section 02777 Very Low Density Polyethylene (VLDPE) Geomembrane.

The QA/QC activities performed for other work items (e.g., ground survey and geosynthetics) are also described in the specifications. Documentation of these other activities is stored with the project submittals in ABB-ES' Portland, Maine office. The remainder of this section describes the QA/QC activities for the work items covering the majority of the construction effort, i.e. cover soils and geomembrane.

As part of the bid package, OBG Tech submitted a borrow study for each of the cover soils. Borrow study requirements were described in the Special Provisions section of the contract specifications.

During construction, OBG Tech subcontracted an independent QC soil testing and inspection service, Stack and Associates of St. James, Missouri. Samples of the gas vent and drainage soil layers were shipped to ABB-ES laboratory in Portland, Maine for QA permeability testing. During placement of the hydraulic barrier soil, ABB-ES mobilized a technician and laboratory for on-site permeability testing. Table 1 summarizes QA/QC testing requirements for the cover soils. QC testing results are included in Appendix B. QA testing results are included in Appendices C, D, and E.

Testing performed during the deployment of the VLDPE geomembrane is described in contract specifications Section 02777. ABB-ES subcontracted Golder Construction Services, Inc. (GCS) to perform QA testing during this portion of the work. The results of their work are presented in Appendix F.

TABLE 1

SUMMARY OF QA/QC REQUIREMENTS FOR COVER SOILS

CONTRACTOR - PROVIDED (QC) TESTING			
TEST REQUIRED	**GAS VENT AND DRAINAGE SOIL**	**HYDRAULIC BARRIER SOIL**	**VEGETATIVE SOIL**
Natural Moisture Content	1 per 5,000 c.y.	1 per 5,000 c.y.	--
Gradation	1 per 5,000 c.y.	1 per 5,000 c.y.	1 per 5,000 c.y.
Moisture-Density Relationship	1 per source or change in gradation	1 per 10,000 c.y. or 1 per change in source or gradation	
Remolded Permeability (U.S. Army Corps of Engineers)	1 per 10,000 c.y. or 1 per change in source or gradation	1 per 15,000 c.y. or 1 per change in source or gradation	
Atterberg Limits	--	1 per 10,000 c.y. or 1 per change in source or gradation	
In Place Compaction/Density & Moisture	5 per acre per lift	5 per acre per lift	
Material Thickness	Daily logs & in place survey	Daily logs & in place survey	In place survey
Owner - Provided (QA) Testing			
Remolded Permeability	5 per acre	5 per acre	--

4.0 CHRONOLOGY OF CONSTRUCTION ACTIVITIES

Weekly Construction Reports were prepared for the period from May 31, 1994 to January 27, 1995 and are presented in Appendix G.

A Pre-Construction Conference was held on May 31, 1994 in OBG Tech's St. Louis, MO office. Site clearing and grubbing began during the week of June 6th. During the next two weeks (June 13-24) OBGT began installation of the chain link fence, erosion control devices, and preparation of the landfill cover subgrade surface.

During the next two weeks the contractor made improvements to the access road, installed temporary settlement platforms, and began placement of the gas vent soil.

On July 26, 1994 placement of the geogrid system over the sinkhole was completed and placement of cover soils began.

During this period of time, samples of the gas vent soil were shipped to ABB-ES' geosciences laboratory in Portland, Maine for permeability testing. ABB-ES mobilized an on-site technician and field laboratory in preparation of placement of the hydraulic barrier soil.

Placement of the hydraulic barrier soil began on August 2. For the next two weeks the contractor concentrated on placement of the clay and gas vent soils. OBG Tech began installation of the leachate collection system on August 15th, first setting Manhole #1 and then continuing up the north side of the landfill with 4-inch perforated collection piping. In conjunction with this activity the contractor began removal of leachate from the perimeter seeps.

OBG Tech chose SLT North America (SLT) as their subcontractor for installation of the VLDPE. SLT mobilized during the week of September 26 with deployment starting on September 29th. As part of the QA plan, ABB-ES subcontracted GCS to monitor deployment of the VLDPE. On October 5, OBGT began to deploy the 12-oz. geotextile cushion and place the drainage soil layer.

Placement of hydraulic barrier soil was completed on October 7. For the next three weeks OBG Tech concentrated on deployment of the VLDPE, placement of the drainage soil, installation of the gas vent risers, maintenance of the erosion control devices, and management of the leachate collection system.

The 10,000 gallon leachate storage tank was set on October 26. During this time OBGT was continuing installation of the 4-inch leachate transport line. On November 3rd they began installation of the 1-1/2-inch force main. On November 11th both SLT and GCS demobilized from the site, having completed their on-site work.

Placement of the vegetative soil layer began on November 29, 1994. The leachate collection system became fully operational on December 7th. Placement of the drainage soil layer and the associated common borrow soil layer was completed on January 12, 1995.

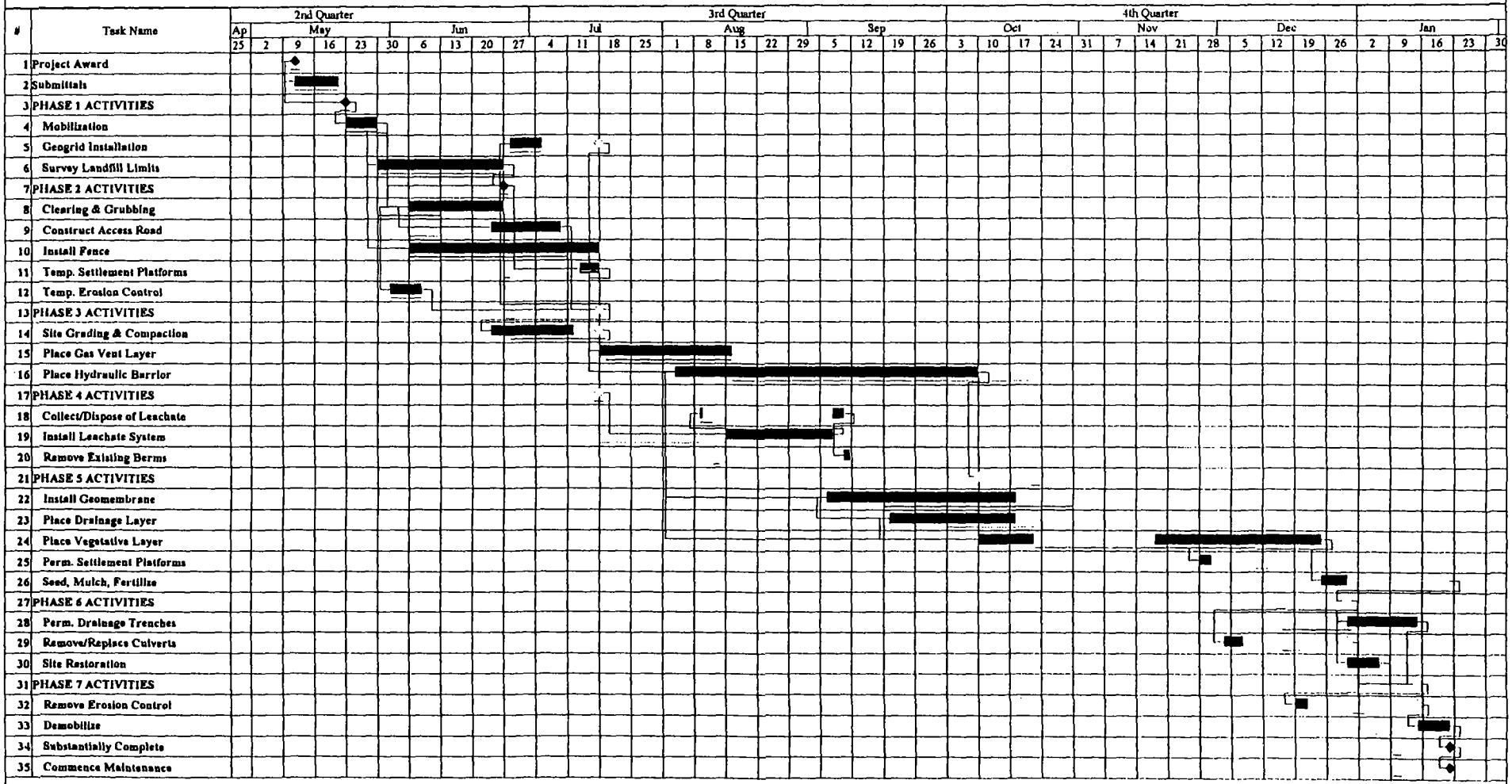
OBGT reached substantial completion on January 26, 1995 by completing the vegetative soil and mulching the site. It was agreed upon by the involved parties to wait until spring to permanent seed and remulch the site. This activity took place during the week of March 20th, 1995.

A record construction schedule is shown in Figure 1.

Figure 1

Project Name: SULLIVAN LANDFILL CLOSURE

Record Construction Schedule



Prepared by:

O'BRIEN & GERE TECHNICAL SERVICES, INC.

5.0 FACILITY OPERATION AND MAINTENANCE

The primary components of the facility requiring post-closure maintenance are the landfill cover and the leachate collection system. OBGT is responsible for maintaining the landfill closure components and appurtenant features until January 25, 1996. Maintenance of the facility will be the responsibility of the PRP Group after that date.

The Operation and Maintenance Plan for the Sullivan Landfill Closure (ABB-ES, 1995) is a separate document which describes the activities necessary to maintain the landfill cover and operate the leachate collection system. The Plan also includes a detailed facility description and a checklist to be used for documenting the periodic inspections that are an essential part of the maintenance program.

6.0 CONSTRUCTION DOCUMENTATION

Throughout project construction, OBGT was required to have available on call services of a registered land surveyor. As layers of the cover were completed, horizontal and vertical survey control was maintained and recorded to be used for preparation of project Record Drawings. Record Drawings, which are presented in Appendix H, document actual final locations and elevations as constructed (e.g. final alignment and depth of the leachate collection system).

In addition to Record Drawings, ABB-ES compiled photographic documentation. Selected representative photos are included in Appendix I to show key features and stages of the construction project.

REFERENCES

ABB Environmental Services, Inc., (ABB-ES), 1993a. Sullivan Landfill Closure Plan; October 1993.

ABB Environmental Services, Inc., (ABB-ES), 1993b. Sullivan Landfill Supplemental Closure Plan Report; October 1993.

ABB Environmental Services, Inc., (ABB-ES), 1995. Sullivan Landfill Closure Operation and Maintenance Plan; June 1995.

Missouri Department of Natural Resources (MDNR), 1993. Letter of Approval from Steven W. Sturgess to Andrew J. McCusker of ABB Environmental Services, Inc. (ABB-ES); November 2, 1993.

SULLIVAN, MO LANDFILL CLOSURE

FINAL CONSTRUCTION REPORT

VOLUME II
APPENDICES A AND B

Prepared for:

SULLIVAN LANDFILL PRP GROUP

Prepared by:

ABB Environmental Services, Inc.
Portland, ME

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July 1995

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CONTRACT SPECIFICATION SECTIONS 02221 AND 02777

SECTION 02221

EXCAVATION, BACKFILL, AND COMPACTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE:

A. Existing Utilities and Underground Structures: Section 02016
B. Clearing and Grubbing: Section 02102
C. Dewatering: Section 02140
D. Rock Removal: Section 02229
E. Erosion Control: Section 02271
F. Very Low Density Polyethylene (VLDPE) Geomembrane: Section 02277
G. Geosynthetics: Section 02278

1.02 DESCRIPTION OF WORK:

A. Work Included:
   1. Trench excavation in earth and rock.
   2. Quality Control Testing for all materials to be used during the construction phase.
   3. Earthwork for site work and subgrade preparation.
   4. Install reinforcing system for remediation of on site sinkhole.
   5. Backfilling in trenches and other excavations.
   6. Subgrade Materials for the landfill.
   7. Furnish, install, survey, monitor, and remove temporary settlement platforms.
   8. Furnish, install, and survey permanent settlement platforms.
   9. Report settlement data to the Engineer.
   10. Regrade subgrade Material and landfill cover soils after settlement observations.
   11. Subgrade preparation for access roadways.
   12. Surface material for roadways.
   13. Compaction of all fill and backfill materials.
   14. Gas Collection and Drainage Layer construction.
   15. Hydraulic Barrier Layer construction.
   16. Vegetative Material installation.
   17. Access road construction.

1.03 QUALITY CONTROL:

A. Codes and Standards:
   1. The Contractor shall perform work in compliance with applicable requirements of governing authorities having jurisdiction.
B. Contractor Provided Source Testing:
   1. The Contractor shall provide an independent soil testing and inspection service for quality control source testing during the construction phase. Testing service shall be approved in writing by the Engineer prior to performing work described in this Section. Testing service must demonstrate geotechnical testing experience and shall have sufficient facilities to perform the required quantity of tests at a rate commensurate with the proposed work schedule. The testing service shall provide

access to the Engineer for observation of the facilities and methods used in the geotechnical testing.

2. Provide source testing of all soil materials proposed for use to the Engineer, in writing, prior to conducting quality control work. Sampling and testing shall be performed by the Contractor's testing service.
3. Prepare source quality control plans for all soil borrow materials and submit to the Engineer in writing for approval prior to conducting quality control work. These plans shall specifically address:
   a. Quality control sampling locations and depths within the area necessary to meet the required frequencies.
   b. Tests proposed for each sample.
   c. Estimated length of time between sampling and submittal of written test results.
   d. Delineation of borrow volumes represented by each sample.
   e. Description of the method used to track borrow volumes represented by each sample from excavation through processing, transportation, and placement.
   f. Proposed schedule for testing, excavation, and placement of borrow.
4. Collect samples at the borrow source(s) during the construction phase for determination of the following parameters and demonstration of specification compliance by the Contractor's testing service:
   a. Landfill Subgrade Material and Vegetative Material:
      - Natural Moisture Content (ASTM D 2216) for Subgrade Material at a frequency of one test per 5,000 cubic yards.
      - Gradation (ASTM C 117 and C 136) at a frequency of one test per 5,000 cubic yards, or portion thereof, of borrow material from each borrow source.
      - Moisture-density relationship for Subgrade Materials as determined by ASTM D 698 at a frequency of one per change in source, or gradation, or as requested by Engineer.
   b. Gas Collection Layer and Drainage Layer:
      - Natural Moisture Content (ASTM D 2216) at a frequency of one test per 5,000 cubic yards.
      - Gradation (ASTM C 117 and C 136) at a frequency of one test per 5,000 cubic yards.
      - Moisture-density relationship (ASTM D 698) at a frequency of one per change in source, or gradation, or as requested by Engineer.
      - Remolded permeability as determined by the constant or falling head method described in the US Army Corps of Engineers Engineering Manual 1110-2-1906 (Appendix VII, Chapters 3 and 4). Testing frequency of one test per 10,000 cubic yards or one per source area or gradation change.
   c. Hydraulic Barrier Layer:
      - Natural Moisture Content (ASTM D 2216) at a frequency of one test per 5,000 cubic yards.
      - Gradation (ASTM D 422) at a frequency of one test per 5,000 cubic yards.
      - Moisture-density relationship (ASTM D 698) at a frequency of one per 10,000 cubic yards or one per change in gradation or source area.

- Remolded permeability as determined by ASTM D 5084. Samples will be prepared with an initial dry density equal to 95% of the maximum dry density determined by ASTM D 698. Testing frequency of one test per 15,000 cubic yards or one per change in gradation or source area.
- Atterberg Limits (ASTM D 4318) at a frequency of one test per 10,000 cubic yards or one per change in gradation or source area.

d. Initial source testing to be performed on these materials to determine suitability for use at the site is described in the borrow study portion of SP-23 in this document.

5. Source testing shall be performed on all other soil materials specified herein.
   a. Source testing to determine material suitability for use at the site shall consist of a minimum of two (2) Gradation Tests (ASTM D 422) per source area and a minimum of one (1) Moisture-density relationship (ASTM D 698) per change in gradation or source area.
   b. Testing during material placement will be conducted at a frequency of one (1) Gradation Test (ASTM D 422) per each 2,000 cubic yards installed. Moisture-density relationship tests (ASTM D 698) will be required at a frequency of one (1) per gradation change or as specified by the Engineer.

C. Contractor Provided Field Testing and Inspection:
   1. The Contractor shall provide an independent soil testing and inspection service for quality control testing during construction of the landfill cover. Testing and inspection service shall be approved by the Engineer in writing prior to performing construction activities. Testing and inspection service must demonstrate geotechnical testing experience and shall have sufficient facilities to perform the required quantity of tests at a rate commensurate with the proposed work schedule. The testing and inspection service shall provide access to the Engineer for observation of the facilities and methods used in the geotechnical testing.
   2. Material Thickness:
      a. The Contractor shall maintain daily logs of measurements of lifts, soil characteristics, and other observations. Installation of a layer measured at 90 percent or less of the required thickness will not be accepted. A running average of 100 percent of the required thickness shall be maintained. Thickness of Subgrade Material, Gas Collection Layer, Hydraulic Barrier Layer, Drainage Layer, and Vegetative Material shall be checked at 100 feet grid intervals. Thickness of crushed limestone access roadway materials shall be checked at a minimum once per 100 linear feet of material placed. Thickness of sinkhole reinforcement bedding material shall be checked at a minimum once per 500 square feet of material placed.
   3. Compaction/Density Testing:
      a. The Contractor shall maintain daily logs of in-place density measurements for the review of the Engineer.
      b. The Contractor shall measure compaction as in-place density using ASTM D 2922-81. Perform the density tests as described in Article 3.04.
      c. Additional testing locations will be selected at random by the Engineer in writing prior to performing surveying work.
      d. Additional measurements may be required at no cost to the Owner if, in the Engineer's opinion, significant variability in results are encountered.

4. Moisture Content:
   a. The Contractor shall measure moisture content at the locations chosen for density testing and at other locations deemed appropriate by the Engineer.
   b. Moisture content shall be measured by nuclear methods (ASTM D 3017).
   c. Additional measurements may be required at no cost to the Owner if, in the Engineer's opinion, significant variability in results are encountered.

D. Contractor Provided Registered Land Surveyor or Professional Engineer:
   1. Registered Land Surveyor or Professional Engineer to perform survey work shall be approved by the Engineer in writing prior performing survey work.
   2. Surveys for location and for elevations of the work including settlement platforms shall be performed and sealed by a Registered Land Surveyor or Professional Engineer in the State of Missouri.

1.04 QUALITY ASSURANCE

A. Owner Provided Soil Testing and Inspection Service:
   1. The Owner will provide testing service to verify source testing and construction placement including measurement of permeability of materials placed.
   2. Contractor shall provide split samples as requested by the Engineer for quality assurance testing. Additional sampling may be required if, in the Engineer's opinion, significant variability in borrow characteristics is encountered.
   3. The Contractor shall provide source site access to the testing service to allow the required quantity of tests to be performed at a rate commensurate with the proposed work schedule.
   4. Quality assurance verification testing will be conducted by the Owner's testing service on borrow materials. Should any test results fail, the Contractor shall conduct additional tests and submit result at no cost to the Owner.

B. Owner Provided Field Quality Assurance:
   1. General:
      a. The Engineer will inspect, test, and approve subgrades and fill layers before further construction work is performed thereon.
      b. The Contractor shall cooperate and assist with Field Quality Assurance in-place testing and sampling for laboratory and field testing as described below.
   2. Permeability:
      a. The Engineer will measure the permeability of remolded samples taken from the Drainage Layer, Gas Collection Layer, and undisturbed samples in-place from the Hydraulic Barrier Layer.
         i. The Contractor shall cooperate and assist in access and shall obtain samples.
         ii. Gas Collection Layer - For each acre the mean of the 5 required permeability tests must equal or be greater than $5x10^{-3}$ cm/sec with no test less than $1x10^{-3}$ cm/sec.
         iii. Drainage Layer - For each acre the mean of the 5 required permeability tests must equal or be greater than $1x10^{-2}$ cm/sec with no test less then $5x10^{-2}$ cm/sec.
         iv. Hydraulic Barrier Layer - For each acre the mean of the 5 required permeability tests must equal or be less than $1x10^{-6}$ cm/sec with no test greater then $5x10^{-5}$ cm/sec.

b. Testing Frequency and Type:
   i. At the rates of five tests/acre, the Engineer will analyze samples for laboratory permeability. Sample locations will be randomly selected by the Engineer from each lift. Remolded permeability of the Drainage Layer and Gas Collection Layer samples shall be determined by the constant head or falling head method described in U.S. Army Corps of Engineers Engineering Manual 1110-2-1906 (Appendix VII, Chapters 3 and 4). Permeability of undisturbed Hydraulic Barrier Layer samples shall be determined by ASTM D 5084.

3. Compaction/Density Testing:
   a. Additional measurements may be required at no cost to the Owner if, in the Engineer's opinion, significant variability in results are encountered .
4. Moisture Content:
   a. Additional measurements may be required at no cost to the owner if, in the Engineer's opinion, significant variability in results are encountered.
5. Deficient Areas of Work:
   a. If, in the opinion of the Engineer, based on reports by the Contractor's testing and inspection service or Owner's testing and inspection service, the subgrade or fills do not meet specified density or thickness, or are outside the specified permeability range, the Contractor shall undertake necessary corrective actions at his expense. Rejected areas may be retested prior to the Contractor undertaking additional corrective actions. If the reworked area fails testing again, the Contractor shall remove the rejected area and reconstruct it with new material at no cost to the Owner.
   b. Reworking and removal of Drainage Layer above the geomembrane must be done with extreme care under full time observation of the Engineer.

1.05 SUBMITTALS:

A. Source test results on all borrow materials to be used on the project as described in Article 1.03B.

B. The Contractor shall submit the following items:
   1. Prior to removal of material from Contractor supplied borrow source:
      a. Documentation of mining and/or other borrow site permits as required by regulatory agencies having jurisdiction.
      b. Estimated available and required volume of specified soil.
      c. A borrow source quality control plan, described Article 1.03, outlining the method proposed to track material represented by each source quality control sample, from excavation through processing, storage, transportation, and placement.
   2. Prior to earthwork operations for Contractor supplied borrows:
      a. Laboratory test results - 2 copies of the results of the borrow source tests described in the Article 1.03B. Test results shall be submitted by the Contractor prior to earthwork operations involving material from the source being tested.
   3. During earthwork operations:
      a. Daily logs - 3 copies of the daily logs kept by the Contractor and described in the Article 1.03C. Daily logs shall be submitted on a weekly basis, at minimum.

b. Field Soils Testing - 3 copies of the results of the field test reports described in Article 1.03C. Test results shall be submitted by the Contractor prior to earthwork operations involving material being tested.

4. During subgrade placement and settlement period:
   a. Surveyed Settlement: 3 copies of Registered Land Surveyor or Professional Engineer's field records and computed settlement measurements in format acceptable to the Engineer submitted within three calendar days after each survey.

1.06 ENGINEER'S APPROVAL:

A. The Engineer will review all test results submitted by the Contractor for conformance with materials requirements given in Article 2.02. Earthwork operations involving the use of materials from a particular borrow source will not be allowed until the Contractor receives written notification by the Engineer indicating that the source has been accepted for use.

B. No soil or waste materials may be taken off-site without prior approval by the Engineer.

1.07 JOB CONDITIONS:

A. Existing Utilities:
   1. Locate underground utilities in the area of work.
   2. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
   3. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions.
   4. Cooperate with the Engineer and utility companies in keeping respective services and facilities in operation.
   5. Repair damaged utilities to satisfaction of the utility owner.
   6. Do not interrupt existing utilities serving facilities except when permitted in writing by the Engineer, and then only after acceptable temporary utility services have been provided.

B. Protection of Persons and Property:
   1. Barricade open excavations occurring as part of this work and post with warning lights.
   2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

PART 2 - PRODUCTS

2.01 DEFINITIONS:

A. Cohesionless Soil Materials: Gravels, sand-gravel mixtures, sands, and gravelly-sands.

B. Cohesive Soil Materials: Clayey and silty gravels, and sand-clay mixtures, gravel-silt mixtures, clayey and silty sands, sand-silt mixtures, clays silts.

C. Unsatisfactory Soil Materials: Peats, highly organic soils, and soils which are too wet to compact.

2.02 SOIL MATERIALS:

A. Landfill Subgrade Material:
   1. Earth, suitable for embankment construction, maximum 6-inch stone size.
   2. Free of frozen material, perishable rubbish, peat, organics, and other unsuitable material.
   3. Moisture Content: Sufficient to provide the required compaction and stable embankment.

B. Gas Collection Layer:
   1. Soil for the Gas Collection Layer shall be rounded, well graded sand or gravel free from vegetative matter, lumps or balls of clay, and other deleterious substances.
   2. Provide a minimum permeability of $5x10^{-3}$ cm/sec.
   3. Meet the following gradation requirements:

Screen Size Square Openings	Percent by Weight Passing
3/4 inch	100
½ inch	70-100
No. 4	40-90
No. 40	0-35
No. 200	0-5

C. Hydraulic Barrier Layer:
   1. Inorganic material containing no roots and no stones larger than the 3/4-inch sieve size, at least 35 percent of the particle size by weight passing the No. 200 sieve size, and a maximum permeability of $1x10^{-6}$ cm/sec when placed and compacted to 95% of its maximum dry density (ASTM D 698).

D. Drainage Layer:
   1. Well graded sand or gravel free from vegetative matter, lumps, or balls of clay and other deleterious substances.
   2. Provide a minimum permeability of $1x10^{-2}$ cm/sec.
   3. Meet the following gradation requirements:

Screen Size Square Openings	Percent by Weight Passing
3/4 inch	100
½ inch	70-100
No. 4	40-90
No. 40	0-35
No. 200	0-5

E. Vegetative Material:
   1. Good quality fertile friable loamy soil, free of stones over 2 inches in size and a fines content passing the 200 size sieve between 35 and 70 percent capable of supporting a vegetative growth of grass.

2. Free from clay lumps, stones, brush, objectionable stumps, roots, litter, toxic substances, and other material or substances which may be harmful to plant growth or be a hindrance to grading, planting, and maintenance operations.
3. Organic content greater than 1.5% by weight and no soluble salt greater than 500 parts per billion.

F. Tank, Pipe Bedding and Structure Backfill Material - "River Run" Gravel:
1. The material shall be clean, durable, and sound quartz or chert type material such as creek or river run gravel.
2. Crushed limestone shall not be used.
3. The material shall contain no more than 5 percent of dirt, sand, clay, or rock fines.
4. The screened material shall be well graded within the gradation limits, with a maximum particle size of 2 inches, 95% passing the 1 inch sieve and 95% retained on the number 4 sieve.
5. Acceptance of quality and size of material may be made by visual inspection at the job site.
6. Structures include manholes, pump stations, and any other subsurface structures installed as part of the leachate collection system.

G. Backfill For Trenches:
1. Backfill for trenches shall consist of natural material excavated during the course of construction, excluding trash, debris, pieces of pavement, organic matter, topsoil, all wet or soft muck, peat, or clay, all excavated ledge material, and all rocks over 6 inches in the largest dimension, or any material which will not provide sufficient support or maintain the completed construction in a stable condition. All material will be subject to approval by the Engineer.
2. Borrow Soil:
   a. Clean granular material consisting of fine, hard durable particles resulting from the natural disintegration of rock.
   b. Free from organic matter.
   c. Wear: Not more than 60 percent.
   d. Meeting the following gradation:

Screen Size Square Openings	Percent by Weight Passing
1 inch	100
3/4 inch	80-100
No. 4	50-100
No. 40	10-55
No. 200	0-15

H. Perimeter Access Roadway Materials:

1. Roadway Base Material shall be 2 1/2 inch oversized limestone meeting the following gradation requirements:

Screen Size Square Openings	Percent by Weight Passing
2 1/2 inch	100
1 inch	20-40
No. 40	0-6

2. Roadway Surface Material shall be MSSHC 1007.2, Type 1 Crushed Limestone meeting the following gradation requirements:

Screen Size Square Openings	Percent by Weight Passing
1 in.	100
1/4 in.	60-100
No. 4	40-60
No. 40	15-35
No. 200	0-4

I. Sinkhole Reinforcement Bedding Material:

1. Sinkhole Reinforcement Bedding Material shall conform to MSSHC 1007.2, Type 2 Aggregate, Gradation A.
2. Material shall consist of crushed stone, sand, and gravel, or chert to conform to the requirements of the following gradation:

Screen Size Square Openings	Percent by Weight Passing
1 inch	100
1/2 inch	60-90
No. 4	40-60
No. 40	15-35
No. 200	0-5

PART 3 - EXECUTION

3.01 PREPARATION:

A. Examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work.

B. Prior to beginning of excavation, grading, and landfill cap operations, perform all necessary grubbing.

C. Settlement Platforms:
   1. Temporary Settlement Platforms:
      a. Prior to placing Subgrade Material, install temporary settlement platforms at locations as shown on the Drawings.
      b. Initial survey elevations shall be taken at the base of the platform and at the top of the riser pipe, prior to placing Subgrade Material, after installing settlement platforms.
      c. Monitoring of the temporary settlement platforms shall be conducted once per week during placement of the Subgrade Material, Gas Collection Layer and Hydraulic Barrier Layer.
      d. Prior to placing the geomembrane, the riser pipes associated with the temporary settlement platforms shall be removed and the hole grouted with bentonite grout in accordance with the Drawings. Grouting activities will be subject to approval by the Engineer.
   2. Permanent Settlement Platforms:
      a. During placement of the cover Drainage Layer, install permanent settlement platforms at the locations shown on the Drawings.
      b. Initial survey elevations shall be taken at the base of the platform and the top of the riser pipe, prior to placement of the remaining cover soils after installing settlement platforms.
      c. No monitoring of the permanent settlement platforms is required.
   3. General:
      a. All survey activities specified here in shall be performed by the Contractor's Registered Land Surveyor or Professional Engineer registered in the State of Missouri.
      b. All surveyed elevations shall be within a tolerance of 0.01 feet.
      c. Submit the Registered Land Surveyor or Professional Engineer's field records and computed measurements which have been sealed to the Engineer as specified in Article 1.05 of this section.

3.02 EXCAVATION:
A. Classifications:
   1. Earth Excavation: Removal and disposal of concrete slabs and other obstructions visible on ground surface, material of any classification indicated on the Drawings, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
   2. Rock Excavation:
      a. Removal and disposal of materials encountered that cannot be excavated without continuous and systematic drilling and blasting or continuous use of a ripper or other special equipment except such materials that are classed as earth excavation.
      b. Typical Materials: Boulders 3 cu. yds. or more in volume, solid rock, and rock-hard cementitious aggregate deposits.
      c. Intermittent drilling performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
   3. Unauthorized Excavation:
      a. Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer.

b. Backfill and compact unauthorized excavation as specified for authorized excavations of same classification, unless otherwise directed by the Engineer.
c. Any unauthorized excavation conducted by the Contractor at the site will not be paid for by the Owner.

B. Stability of Excavations:
1. Slope sides of excavations to comply with local codes and ordinances having jurisdiction.
2. Sheet, shore, and brace where sloping is not possible either because of space restrictions or stability of material excavated.
3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
4. Stability of excavations is the responsibility of the Contractor.

C. Material Storage:
1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill.
2. Place, grade, and shape stockpiles for proper drainage.

D. Removal of Unsatisfactory Soil Materials:
1. Any soil materials contaminated with leachate shall be spoiled within the limits of the landfill.
2. Excavate unsatisfactory soil materials encountered that extend below required elevations, to additional depth directed by the Engineer.
3. Such additional excavation, provided it is not due to fault or neglect of Contractor, will be measured as directed by the Engineer and paid for under the appropriate bid item.
4. Remove unsatisfactory soil and dispose off-site as directed by the Engineer.

E. Cold Weather Protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 °F.
2. Do not place fill or backfill on frozen soil or use frozen material for backfill.

3.03 BACKFILL AND FILL:

A. General:
1. Prior to placement of cover materials, remove temporary settlement platform riser pipes. Settlement platforms shall not be dismantled without prior approval by the Engineer.
2. Backfill and fill to contours, elevations, and dimensions indicated. Compact each lift before placing overlying lift.

B. Backfilling excavations as promptly as work permits, but not until completion of the following:
1. Acceptance by the Engineer of construction below finish grade.
2. Removal of sheeting, shoring and bracing, and backfilling of voids with satisfactory materials.

C. Ground Surface Preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface in conformance with Section 02102, Clearing and Grubbing prior to placement of fills. Grubbing is not required within landfill limits.
2. Break up the existing ground surface, pulverize, moisture-condition, and compact by proof rolling.

D. Placement (all backfill and fill materials):
   1. Place backfill and fill materials in lifts having a loose thickness such that when compacted, the lifts will have the following maximum thicknesses:
      a. Subgrade Material: 12 inch
      b. Vegetative Material: 9 inches
      c. Drainage and Gas Collection Layers: 12 inches
      d. Hydraulic Barrier Layer: 9 inches
   2. Before compaction, moisten or aerate each lift as necessary to provide the moisture content required to meet the specified permeability and compaction requirements.
   3. Do not place backfill or fill materials on surfaces that are muddy, frozen, or contain frost or ice.
   4. Place backfill and fill materials evenly adjacent to structures, to required elevations.
   5. Place the material uniformly around the structure to approximately the same elevation in each lift.
   6. No fill materials with maximum dimension exceeding 6 inches shall be placed within 2 feet of the finished subgrade elevation.
   7. The Contractor shall be responsible for providing the required compaction for all materials.
   8. Trenches and excavations for structures shall provide a minimum clearance of 1 foot horizontally and 6 inches vertically as required by structures.

E. The hydraulic barrier layer shall be covered within 3 days of placement. Approval of the permeability and compaction requirements will be dependent on the results of the laboratory QA testing. Failing tests will result in reworking of material to provide samples meeting the requirements. At all times it will be the Contractor's responsibility to prevent dessication cracking and drying of the surface of the hydraulic barrier layer.

3.04 COMPACTION:

A. General:
   1. Control soil compaction during construction to meet required density for each soil and/or condition.

B. Moisture Requirements:
   1. Provide moisture control to the extent that the soil mix remains in a workable state during placement.
   2. Where subgrade or layer of soil material must be moisture-conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material at such a rate as to avoid free water from appearing on surface during or subsequent to compaction operations.
   3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
   4. Excessively wet soil that has been removed may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing or pulverizing, until moisture content is reduced to a satisfactory value, as determined by moisture-density relation tests.

C. Density Requirements:

1. The Contractor will measure compaction as in-place density according to the following schedule:

MATERIAL	TEST METHOD	REQUIRED PERCENT OF MAXIMUM DRY DENSITY	MINIMUM FREQUENCY
a. Hydraulic Barrier Layer	(ASTM D 698-82 ASTM D 2922-81)	Min. 95%	5 per acre/ per lift
b. Drainage Layer	(ASTM D 698-82 ASTM D 2922-81)	As required to achieve permeability	5 per acre/ per lift
c. Gas Collection Layer	(ASTM D 698-82 ASTM D 2922-81)	As required to achieve permeability	5 per acre/ per lift
d. Access Roadway Subgrade	(ASTM D 698-82 ASTM D 2922-81)	95%	1/100 linear feet
e. Sinkhole Reinforcement Bedding Material	(ASTM D 698-82 ASTM D 2922-81)	95%	1/2000 square feet

2. Landfill Subgrade Material shall be compacted with a roller making a minimum of 4 passes per lift.
3. Drainage Layer: Drainage Layer shall be compacted to an in-place density such that it meets the permeability requirements. The compaction requirements will be established prior to placement.
4. Gas Collection Layer: Gas Collection Layer shall be compacted to an in-place density such that it meets the permeability requirements. The compaction requirements will be established prior to placement.
5. Hydraulic Barrier Layer: Hydraulic Barrier Layer shall be compacted using a sheepsfoot roller to an in-place density such that it meets the permeability requirements. The compaction requirements will be verified through borrow study and source testing prior to placement. The moisture content during placement of the Hydraulic Barrier Layer shall be held to within minus one to plus four percent of the optimum moisture content determine by Proctor testing.
6. If, in the opinion of the Engineer, based on testing and inspection, subgrade or fills do not satisfy specified density or thickness, provide additional compaction or undertake necessary corrective actions and testing at no additional expense to the Owner.

3.05 GRADING:

A. General:
   1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas, and in conformance to the Drawings.
   2. Smooth finish surface, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
   3. Grade areas to drain and to prevent ponding.
   4. Elevations shall be within ± 0.10 feet.

B. Regrading:
   1. After the settlement observation period for subgrade, common borrow material will be added as necessary.
   2. The requirements under 3.05A will apply to regrading.

3.06 VEGETATIVE MATERIAL:

A. Deposit on prepared areas to obtain a reasonable, uniform compacted depth as shown on the Drawings. Spread and till, raking out all pieces of sod, roots, and grass.

B. Compact into an even, uniform layer by rolling to prepare for liming, fertilizing, and seeding.

3.07 MAINTENANCE:

A. Protection of Graded Areas:
   1. Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
   2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas:
   1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.08 DISPOSAL OF WASTE MATERIALS:

A. Remove trash, debris, and waste materials from the site and legally dispose of it in a lawful and acceptable manner, at no additional cost to the Owner.

B. Do not dispose in designated flood plain or wetlands area.

C. No materials may be taken off-site without prior approval by the Engineer.

END OF SECTION

SECTION 02271

EROSION CONTROL

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE:
- A. Excavation, Backfill, and Compaction: Section 02221
- B. Dewatering: Section 02140

1.02 DESCRIPTION:
- A. Work Included: It is the Contractor's responsibility to provide and install all materials, equipment, and labor necessary for the control of surface water and as required to provide silt and erosion control structures as specified herein or as directed by the Engineer.
- B. Permanent Control: Furnish and place mulch or matting on surfaces prepared and seeded under other items, at locations shown on the Drawings.
- C. Temporary Control:
  1. When the use of hay bales is specified, furnish and place hay bales as a temporary erosion and sediment control device at locations shown on the Drawings.
  2. When siltation fence is specified, install siltation fence at locations shown on the Drawings.
  3. When seeding is specified, sow seed of the type specified on the areas as directed by the Engineer.
  4. Install stone check dams at locations shown on the Drawings and as directed by the Engineer.
  5. Matting for erosion control in drain ditches and as directed by the Engineer.

1.03 SEDIMENT CONTROL GUIDELINES:
- A. U.S. Environmental Protection Agency Publication 430/9-73-007 Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity.
- B. U.S. Department of Agriculture Soil Conservation Service Publication dated July 1975, Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas.

1.04 REVIEW AND/OR INSPECTION OF SEDIMENTATION CONTROL MEASURES: All construction under this project shall be subject to review and/or inspection by the appropriate State and Federal agencies responsible for ensuring the adequacy of sedimentation control measures.

PART 2 - PRODUCTS

2.01 MATERIALS:
- A. Mulch:
  1. Late cut, matured, and cured straw or hay.
  2. When air-dried in the loose state, the contents of a representative bale shall lose not more than 15 percent of the resulting air-dry weight of the bale.

3. Free from primary noxious weed seeds as stated in the Missouri Seed Law.

B. Matting for Erosion Control:
   1. Plastic Netting:
      a. The netting shall consist of green degradable polypropylene extended oriented plastic net with bonded joints having openings not to exceed 4-1/2 square inches with either dimension not to exceed 3 inches.
   2. Excelsior Mat:
      a. Wood excelsior, with approximately 80 percent if the fibers having a minimum length of 6 inches.
      b. The wood from which the excelsior is cut shall be properly cured to achieve adequately curled and barbed fibers.
      c. The blanket shall be of consistent thickness, with fibers evenly distributed over the entire area of the blanket.
      d. The blanket shall be covered on the top side with a netting having a maximum mesh size of 1-1/2 x 3 inches composed of cotton cord, twisted Kraft paper yarn, or degradable extended plastic. The netting shall be entwined with the excelsior mat for maximum strength and ease of handling.
      e. The blanket shall be made smolder resistant with a treatment that shall be nonleaching, non-toxic to vegetation, and shall not be toxic or injurious to humans. In dry-air conditions, the blanket shall not flame or smolder for a distance of more than 12 inches from where alighted cigarette is placed on the surface.
      f. The blanket shall weigh at least 0.75 pounds per square yard.
   3. Other Types of Matting: Those accepted by the Engineer as equal in effectiveness to one of those specified above.

C. Staples: No. 11 (or heavier) ungalvanized steel wire, made from lengths of at least 6 inches each.

D. Seed for Erosion Control:
   1. For Temporary Control: Annual winter ryegrass.

E. Hay Bales:
   1. Consist of rectangular-shaped bales of hay or straw weighing at least 50 pounds per bale with a minimum size of 1.0 ft.x1.5 ft.x3.0 ft.
   2. Free from primary noxious weed seeds and rough or woody materials.

F. Siltation Fence: Envirofence as manufactured by Mirafi Inc. or comparable siltation fence by Advanced Drainage Systems, Inc. (ADS), American Engineering Fabrics, Inc. or approved equal.

PART 3 - EXECUTION

3.01 PERFORMANCE:

A. Diverting Surface Water:
   1. Build, maintain, and operate all channels, flumes, sumps, and other temporary diversion and protection works needed to divert surface water through or around the construction site and away from the construction work while construction is in progress.
   2. Unless otherwise specified, stream diversion must discharge into the same natural drainageway in which its headworks are located.

B. Erosion Control Provisions:
   1. Construct all haul roads of a durable coarse granular surface material sufficiently protected from erosion through water and wind action by channeling water flow around the structure, protecting side slopes with riprap or fiber mats or by using straw bale dikes or stone check dams.
   2. Protect areas where existing bankings are to be excavated by constructing straw dikes at the top of slope to divert storm runoff from the disturbed area or at the toe of the slope to retain sediments, as conditions permit.
   3. Straw bale dikes may be required parallel to the drain channels in order to contain sediments from the excavation operation.
   4. Prior to removal of all sediment control dikes remove all retained silt or other materials at no additional cost to the Owner.

C. Mulch:
   1. Undertake immediately after each area has been properly prepared.
   2. When seed for erosion control is sown prior to placing the mulch, place on the seeded areas within 48 hours after seeding.
   3. Apply straw that has been thoroughly fluffed at approximately 2 tons per acre unless ordered otherwise.
   4. Blowing chopped mulch will be permitted when authorized.
   5. Authorization will be given when it can be determined that the mulch fibers will be of such length and applied in such a manner that there will be a minimum amount of matting that would retard the growth of plants.
   6. Straw mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see ground through the mulch.
   7. Remove matted mulch or bunches.
   8. Employ a light covering of loose branches, a system of pegs and strings, or other approved method and remove prior to the acceptance of the project.
   9. Dispose of all baling wire or rope outside the limits of the project in approved areas.

D. Matting:
   1. Preparation:
      a. Surfaces of Ditches and Slopes:
         (1) Conform to grades and cross sections shown on the Drawings.
         (2) Finish to a smooth and even condition with all debris, roots, stones, and lumps raked out and removed.
         (3) Loosen soil surface to permit bedding of the matting.
         (4) Unless otherwise directed, apply seed prior to placement.
   2. Excelsior:
      a. Unroll in the direction of the flow of water.
      b. Where strips are laid end to end, butt adjoining ends.
      c. When adjoining rolls are laid parallel to one another, butt matting snugly.
   3. Laying and Joining:
      a. Except where matting is turned down, spread evenly and smoothly in close contact with the ground.
      b. Cutout bulging seams and make joints as described above.
      c. When ordered, additional seed shall be spread over matting, particularly at those locations disturbed by building the slots. Matting shall then be pressed onto the ground with a light lawn roller or by other satisfactory means.

d. Drive staples vertically into the ground flush with the surface.
e. On slopes flatter than 4:1, space staples not more than 3 feet apart in three rows for each strip, with one row along each edge and one row, alternately spaced, down the center.
f. On grades 4:1 or steeper, place staples in the same three rows, but spaced 2 feet apart.
g. On all overlapping or butting edges, double the number of staples, with the spacing halved; all ends of the matting and all required check slots shall likewise have staples spaced every foot.
h. Matting Placed Adjacent to Boulders or Other Obstructions: Staple with no space between the staples, to eliminate any loose edges of matting.
i. The above specified spacing of staples may be changed as ordered, depending upon varying factors such as the season of the year or the amount of water encountered or anticipated.
j. In driving the staples, take care so as not to form depressions or bulges in the surface of the matting.

5. Other Matting: Approved, alternate matting shall be applied in accordance with the recommendations of the manufacturer and as directed.

E. Seed for Erosion Control:
1. Temporary Seeding: Seed with a winter ryegrass sown at the rate of approximately 50 pounds per acre on the pure live seed basis.

F. Siltation Fence:
1. Install per manufacturer's requirements and in locations shown on the Drawings and as directed by the Engineer.

G. Stone Check Dams: Install where shown on Drawings. Upon completion, dams may be spread out evenly to supplement rip-rap protection.

3.02 MAINTENANCE:
A. If any staples become loosened or raised, or if any matting becomes loose, torn, or undermined, make satisfactory repairs immediately.
B. Maintain areas mulched or matted, with no extra compensation, until the completion of the Contract.

3.03 HAY BALES FOR EROSION CONTROL:
A. Place as ordered to provide for temporary control of erosion or pollution or both.
B. Stake with the required stakes.
C. Upon acceptance of the Contract, the bales shall be left in place unless released to the Contractor.

3.04 REMOVAL OF TEMPORARY WORKS:
A. Remove or level and grade to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

END OF SECTION

CONTRACTOR SUPPLIED TESTING & SURVEY DATA

COMPILED SOIL TESTING
AND
SURVEYED AS-BUILT DATA
FOR
SULLIVAN MUNICIPAL LANDFILL CLOSURE
SULLIVAN, MISSOURI
FEBRUARY 1995

STACK & ASSOCIATES, INC.
Engineers, Architects & Surveyors
120 S. Jefferson
St. James, Missouri 65559

Project No. 4425.010

STACK & ASSOCIATES, INC.
Engineers • Architects • Surveyors
314-265-3751

February 15, 1995

Mr. Mark Spraul
O'Brien & Gere Technical Services
5000 Cedar Plaza Parkway
St. Louis, MO 63128

RE: Final Report For Sullivan Municipal Landfill Closure

Dear Mark:

The following is the final report for the surveying and materials testing services provided by Stack and Associates, Inc. from May 1994 through February 1995 on the Sullivan Municipal Landfill closure project.

The compiled data in this report is categorized by the layer of material to which the data pertains. For instance, the hydraulic barrier section contains separate divisions for laboratory soil tests on the clay material, in-place clay density tests and topographic survey data of the in-place clay layer. This is typical of each layer of material placed and the subgrade. Any survey data which does not pertain to any particular layer can be found in the Miscellaneous Survey Data section of this report.

Thank you for the opportunity to serve you. Should you have any questions or need further assistance, please contact our office.

Sincerely,

Terris L. Cates, P.E.
Project Manager

120 South Jefferson, P.O. Box 297, St. James, MO 65559

MIDWEST TESTING & ENVIRONMENTAL SERVICES

A STACK & ASSOCIATES COMPANY

Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear
  - Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

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111 East Hardy Street, P.O. Box 297 St. James, Missouri 65559 314-265-5695

SUBGRADE

A. TOPOGRAPHIC SURVEY DATA

B. SINKHOLE COORDINATES

C. WASTE LIMIT BACKHOE PIT COORDINATES

TOPOGRAPHIC SURVEY DATA

TOPOGRAPHIC SURVEY DATA
OF ORIGINAL SITE CONTOURS

SLAND1.TXT

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103,2106.376571,2181.071381,893.651286,161 GRND SHOT
104,2056.564130,2189.052451,887.311005,161 GRND SHOT
105,2009.390298,2199.700704,882.173580,161 GRND SHOT
106,1992.043352,2199.830395,880.599592,21.67 FENCE
107,1995.324084,2155.198753,884.191564,161 GRND SHOT
108,2042.458312,2148.570162,888.614429,161 GRND SHOT
109,2087.013265,2140.266849,894.181910,161 GRND SHOT
110,2123.137651,2135.305292,898.575445,161 GRND SHOT
111,2162.264901,2128.669020,902.964217,161 GRND SHOT
112,2205.989679,2121.610894,907.393661,161 GRND SHOT
113,2206.600465,2312.250923,901.215257,165 BRK SLOPE
114,2183.113458,2274.023841,899.647701,165 BRK SLOPE
115,2177.104144,2227.657886,900.769301,165 BRK SLOPE
116,2170.952529,2188.043228,901.097009,165 BRK SLOPE
117,2341.891611,2090.145109,910.993654,165 BRK SLOPE
118,2300.875349,2084.267332,909.173170,165 BRK SLOPE
119,2257.263496,2083.683174,907.962504,165 BRK SLOPE
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121,2165.809558,2073.505635,902.805280,165 BRK SLOPE
122,2120.574138,2067.958281,899.207181,165 BRK SLOPE
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125,2145.937878,2091.884345,901.826207,161 GRND SHOT
126,2102.012249,2098.770896,897.484469,161 GRND SHOT
127,2059.113027,2090.562223,893.082019,161 GRND SHOT

129,2021.198046,2030.333583,888.889008,161 GRND SHOT
130,2070.179505,2042.669611,893.980806,161 GRND SHOT
131,2087.571530,2054.234248,894.856908,168 TOE SLOPE
132,2133.283566,2062.547315,898.565737,168 TOE SLOPE
133,2189.720952,2063.034497,900.668087,168 TOE SLOPE
134,2226.678891,2021.925196,894.541662,165 BRK SLOPE
135,2179.652714,2017.539355,894.597555,165 BRK SLOPE
136,2138.554410,2018.572990,895.059471,165 BRK SLOPE
137,2090.898942,2014.450236,893.669009,165 BRK SLOPE
138,2099.811277,2001.056383,890.297487,21.67 FENCE
139,2097.045415,2000.473766,890.164301,168 TOE SLOPE
140,2138.752594,1999.132019,889.807637,168 TOE SLOPE
141,2185.273757,2000.503608,890.149845,168 TOE SLOPE
142,2224.600862,2004.020258,889.553091,168 TOE SLOPE
143,2199.770290,1966.123181,886.202089,21.67 FENCE
144,2300.003891,2087.835031,910.024200,17 REBAR

SLAND6.TXT

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5,2261.359275,2022.302818,893.455885,165   BRK SLOPE
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9,2296.621382,1973.112759,889.490759,169.22  TOP BANK
10,2329.041601,1979.146190,889.532948,169.22  TOP BANK
11,2316.200895,1958.523162,887.148953,168   TOE SLOPE
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13,2259.626844,1964.745631,883.310210,168   TOE SLOPE
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27,2598.910051,1971.140871,911.381240,161   GRND SHOT
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45,2574.780163,2002.643332,909.520770,168   TOE SLOPE
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59,2423.993654,2175.813137,913.973122,161   GRND SHOT
60,2472.236193,2197.071021,915.336010,161   GRND SHOT
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89,2681.969678,2066.053571,922.254649,161 GRND SHOT
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91,2756.586095,2137.697892,922.477755,161 GRND SHOT
92,2257.122693,2587.100630,898.087792,9 HUB\TACK

SLAND7.TXT

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5,3115.420101,2024.887584,908.147351,179.4  W. EDGE RD
6,3065.637972,2022.089735,911.791362,179.4  W. EDGE RD
7,3014.351600,2021.737318,914.889814,179.4  W. EDGE RD
8,2964.333909,2022.536360,917.722726,179.4  W. EDGE RD
9,2909.058478,2021.676222,920.284135,179.4  W. EDGE RD
10,2855.987501,2020.334443,921.651936,179.4  W. EDGE RD
11,2805.342195,2018.224967,921.184616,179.4  W. EDGE RD
12,2809.797945,2049.260497,922.208531,178.3  E. EDGE RD
13,2861.204470,2036.479071,921.726315,178.3  E. EDGE RD
14,2914.016856,2037.473547,920.316765,178.3  E. EDGE RD
15,2914.052309,2037.455159,920.314539,178.3  E. EDGE RD
16,2968.646115,2038.161800,917.807432,178.3  E. EDGE RD
17,3020.069922,2037.258932,914.920545,178.3  E. EDGE RD
18,3072.530495,2037.478781,911.205676,178.3  E. EDGE RD
19,3199.590489,2041.364891,904.079258,178.3  E. EDGE RD
20,3260.407819,2038.497471,901.936315,178.3  E. EDGE RD
21,2809.689407,2099.742240,924.158347,170.23  TOP BANK
22,2833.238676,2147.373517,924.350466,170.23  T[illegible]
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43,2757.400652,2306.871131,913.303589,161  GRND SHOT
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48,2655.825586,1948.277869,915.125408,161  GRND SHOT
49,2707.499978,1945.748834,916.416553,161  GRND SHOT
50,2731.008508,1988.740503,919.010066,161  GRND SHOT
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SLAND8.TXT

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3,2502.134460,2921.301971,896.405286,124   WELL
4,2491.283745,2925.247097,895.858622,124   WELL
5,2092.175270,2690.160980,879.342354,18    "X"
6,2092.812191,2691.224480,882.010287,124   WELL
7,2740.350082,2984.008562,904.636333,17    REBAR
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1,3098.160000,2441.800000,918.459000,17    REBAR
2,3305.431622,2220.380035,896.503323,18    "X"
3,2828.585169,2081.783133,925.479601,17    REBAR
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TOPOGRAPHIC SURVEY DATA OF AS-BUILT SUBGRADE

SUBGRADE ELEVATIONS
SGASBLT.TXT

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00451,2900.09079,2849.91891,910.72346,7     LATHE
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00453,3000.01410,2849.90973,906.94316,7     LATHE
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00411,3049.95391,2800.26374,907.34458,7     LATHE
00412,2999.95100,2800.12947,909.00176,7     LATHE
00413,2949.97464,2800.07176,910.60920,7     LATHE
00414,2900.01662,2799.98780,911.99788,7     LATHE
00415,2850.03104,2799.94652,911.83757,7     LATHE
00416,2800.02161,2799.93809,910.23594,7     LATHE
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00019,2950.06985,2049.98929,919.82326,7 LATHE
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SINKHOLE COORDINATES

SINKHOLE COORDINATES

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22,2820.013859,2296.839904,916.983623,161 GRND SHOT
23,3082.922331,2385.433903,919.645161,9 HUB\TACK

WASTE LIMIT BACKHOE PIT COORDINATES

BACKHOE PITS TO DETERMINE WASTE LIMITS IN THE SOUTHWEST CORNER
JULY, 1994

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1,2828.085000,2067.910000,923.297000,9     HUB\TACK
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3,2744.336784,2973.361020,905.095351,9     HUB\TACK
4,2739.817430,2068.568174,919.479359,60    TEST PIT
5,2675.378876,2057.820065,916.443787,60    TEST PIT
6,2698.425206,2144.445572,917.473414,60    TEST PIT
7,2744.335131,2973.331020,905.109196,9     HUB\TACK
8,2740.466720,2984.052096,904.814328,17    REBAR
9,3082.840671,2385.366820,919.578968,9     HUB\TACK
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GAS VENT LAYER

A. LABORATORY SOIL TEST DATA

B. IN-PLACE DENSITY DATA

C. TOPOGRAPHIC SURVEY DATA

LABORATORY SOIL TEST DATA

MOISTURE CONTENTS

PROJECT NAME OBG Tech - Sullivan Landfill DATE OF TEST July 18, 19[illegible]

PROJECT NO. 4425.030 TESTED BY J. Medows

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	HP/TS
	1	4"	Grab	Sandy Gravel	2104.0	1987.7	12	87.6	6.1	
	2	4"	Grab	Sandy Gravel	2196.0	2065.7	G1	91.0	6.6	
	3	4"	Grab	Sandy Gravel	2162.0	2013.3	A2	89.5	7.7	

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

GRAIN SIZE ANALYSIS-MECHANICAL

Data Sheet 6

Project OBG Tech - Sullivan Landfill Job No. 4425.030

Location of Project _____ Boring No. _____ Sample No. 1

Description of Soil Sandy Gravel Depth of Sample 4"

Tested By Lance Stack Date of testing July 18, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 sieve	200
No. 4 sieve	500
3/4 in.	1500

Wt. of dry sample + container	2930.5
Wt. of container	210.8
Wt. of dry sample, W_t	2719.6

Sieve analysis and grain shape

Sieve no.	Diam. (mm)	Wt. retained	% retained	% passing
3	0	0	0	100
1 1/2	312.33	312.33	11.49	88.51
3/4	663.40	975.73	35.89	64.11
3/8	511.96	1487.69	54.72	45.28
4	415.66	1903.35	70.01	29.99
8	297.89	2201.24	80.97	19.03
16	178.11	2379.35	87.52	12.48
30	149.00	2528.35	93.00	7.00
50	141.73	2670.08	98.22	1.78
100	33.21	2703.29	99.44	.56
200	8.80	2712.09	99.76	.24
PAN	6.46	2718.55	100.00	-0-

% passing = 100 − ∑ % retained.

MIDWEST TESTING
& ENVIRONMENTAL SERVICES
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(314) 265-5695

RELATIVE DENSITY

MINIMUM AND MAXIMUM DENSITY DETERMINATIONS

DATE July 19, 1994

PROJECT Sullivan Landfill 4425.030

BORING NO 1 SAMPLE NO 1

CLASSIFICATION

MOLD NO. A	MOLD DIAMETER, IN. = 6"	WEIGHT OF MOLD, W_m, LB = 7486 g
VOLUME OF MOLD, V_m, CU FT = .09765 ft^3		END AREA OF MOLD, A_m, SQ FT = 0.19635 ft^2

t = Plate Thickness = 0.497"

MINIMUM DENSITY

Amplitude			0.004 5%	0.008 12%	0.012 20%	0.016 100%
WEIGHT LB	MOLD (OR TARE) AND SOIL, DRY g	w	12063.5	12097	12096	12106
	MOLD (OR TARE) g	w_m	7486	7486	7486	7486
	SOIL, DRY g	w_s	4577.5	4611	4610	4620
MIN DRY DENSITY, LB/CU FT = w_s/V pcf		γ_d	103.35	104.10	104.08	104.30
MIN DRY DENSITY, AVERAGE			104.0 LB/CU FT			

MAXIMUM DENSITY

METHOD USED

TRIAL NO:			1	2	3	4
HEIGHT, IN.	LEFT DIAL READING	h_L	.076	0.121	0.217	.2835
	RIGHT DIAL READING	h_R	.086	0.108	0.169	.3065
	AVERAGE DIAL = $(h_L + h_R)/2$	h_{avg}	0.081	0.1145	0.1928	0.295
	INITIAL DIAL READING	h_o				
	HEIGHT CHANGE = $h_o - h_{avg}$ $h_{avg}+t$	Δh	.578	.6115	0.6898	0.792
VOL CU FT	VOLUME CHANGE = $(\Delta h/12) * A_m$	Δv	0.009458	0.01001	0.01129	0.1206
	VOLUME OF SOIL = $V_m - \Delta v$	v	0.08819	0.08764	0.08636	0.08469
WEIGHT LB	MOLD (OR TARE) AND SOIL, DRY g	w	12063.5	12097	12096	12106
	MOLD (OR TARE) g	w_m	7486	7486	7486	7486
	SOIL, DRY g	w_s	4577.5	4611	4610	4620
MAX DRY DENSITY, LB/CU FT = w_s/V pcf		γ_d	114.43	115.99	117.68	120.27
MAX DRY DENSITY, AVERAGE			117.1 LB/CU FT			

REMARKS

TECHNICIAN J. Medows COMPUTED BY J. Medows CHECKED BY T. Cates

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& ENVIRONMENTAL SERVICES
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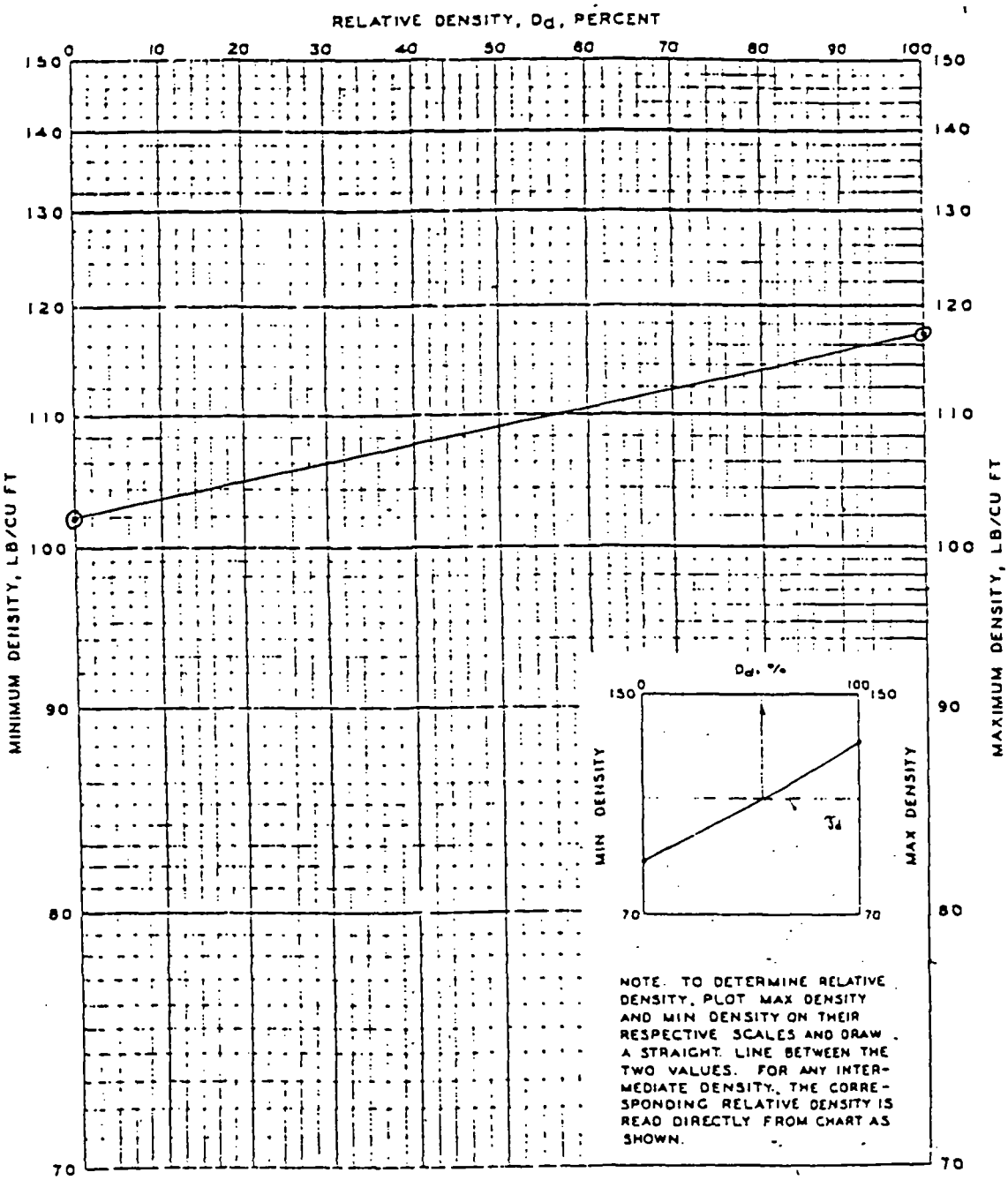
RELATIVE DENSITY

DATE July 19, 1994

PROJECT Sullivan Landfill 4425.030

BORING NO _____ SAMPLE NO. 1



Graphical determination of relative density

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

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(314) 265-5695

GRAIN SIZE ANALYSIS-MECHANICAL

Data Sheet 6

Project: OBG Tech - Sullivan Landfill Job No. 4425.030

Location of Project: _____ Boring No. _____ Sample No. 2

Description of Soil: Sandy Gravel Depth of Sample: 4"

Tested By: Lance Stack Date of testing: July 18, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 sieve	200
No. 4 sieve	500
3/4 in.	1500

Wt. of dry sample + container	2888.0
Wt. of container	221.8
Wt. of dry sample, W_1	2666.2

Sieve analysis and grain shape

Sieve no.	Diam. (mm)	Wt. retained	% retained	% passing
3	0	0	0	100
1 1/2	251.18	251.18	9.43	90.57
3/4	242.48	493.66	18.53	81.47
3/8	415.16	908.82	34.11	65.89
4	534.36	1443.18	54.16	45.84
8	431.88	1875.06	70.37	29.63
16	302.48	2177.54	81.72	18.28
30	245.99	2423.43	90.95	9.05
50	189.39	2612.82	98.05	1.95
100	38.28	2651.10	99.49	.51
200	8.54	2659.64	99.81	.19
PAN	5.02	2664.66	100.00	-0-

% passing = $100 - \sum$ % retained.

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& ENVIRONMENTAL SERVICES
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RELATIVE DENSITY

MINIMUM AND MAXIMUM DENSITY DETERMINATIONS

DATE July 19, 1994

PROJECT Sullivan Landfill 4425.030

BORING NO 2 SAMPLE NO. 2

CLASSIFICATION

MOLD NO. A	MOLD DIAMETER, IN. = 6"	WEIGHT OF MOLD, W_m, LB = 7486 g
VOLUME OF MOLD, V_m, CU FT = 0.09765 ft^3		END AREA OF MOLD, A_m, SQ FT = 0.19635 ft^2

t = Plate Thickness = 0.497"

MINIMUM DENSITY

Amplitude				0.004 5%	0.008 12%	0.012 20%	0.016 100%
WEIGHT LB	MOLD (OR TARE) AND SOIL, DRY	g	W	12021	12055	12105	12089
	MOLD (OR TARE)	g	W_m	7486	7486	7486	7486
	SOIL, DRY	g	W_s	4535	4569	4619	4603
MIN DRY DENSITY, LB/CU FT = W_s/V		pcf	γ_d	102.39	103.15	104.28	103.92
MIN DRY DENSITY, AVERAGE				103.44 LB/CU FT			

MAXIMUM DENSITY

METHOD USED

TRIAL NO:				1	2	3	4
HEIGHT, IN.	LEFT DIAL READING		h_L	0.017	0.151	.137	0.1915
	RIGHT DIAL READING		h_R	0.0115	0.196	.141	0.262
	AVERAGE DIAL = $(h_L + h_R)1/2$		h_{avg}	0.01425	0.1735	.139	0.2267
	INITIAL DIAL READING		h_o				
	HEIGHT CHANGE = $h_{avg} + t$		Δh	0.51125	0.693	0.636	0.7237
VOL CU FT	VOLUME CHANGE = $(\Delta h/12) * A_m$		Δv	0.008365	0.01134	0.010406	0.01184
	VOLUME OF SOIL = $V_m - \Delta v$		v	0.08928	0.8631	0.8724	0.08581
WEIGHT LB	MOLD (OR TARE) AND SOIL, DRY	g	W	12021	12055	12105	12089
	MOLD (OR TARE)	g	W_m	7486	7486	7486	7486
	SOIL, DRY	g	W_s	4535	4569	4619	4603
MAX DRY DENSITY, LB/CU FT = W_s/V		pcf	γ_d	111.98	116.71	116.72	118.26
MAX DRY DENSITY, AVERAGE				117.2 LB/CU FT			

REMARKS Trial 1 data not used in average due to precision.

TECHNICIAN J. Medows COMPUTED BY J. Medows CHECKED BY

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& ENVIRONMENTAL SERVICES
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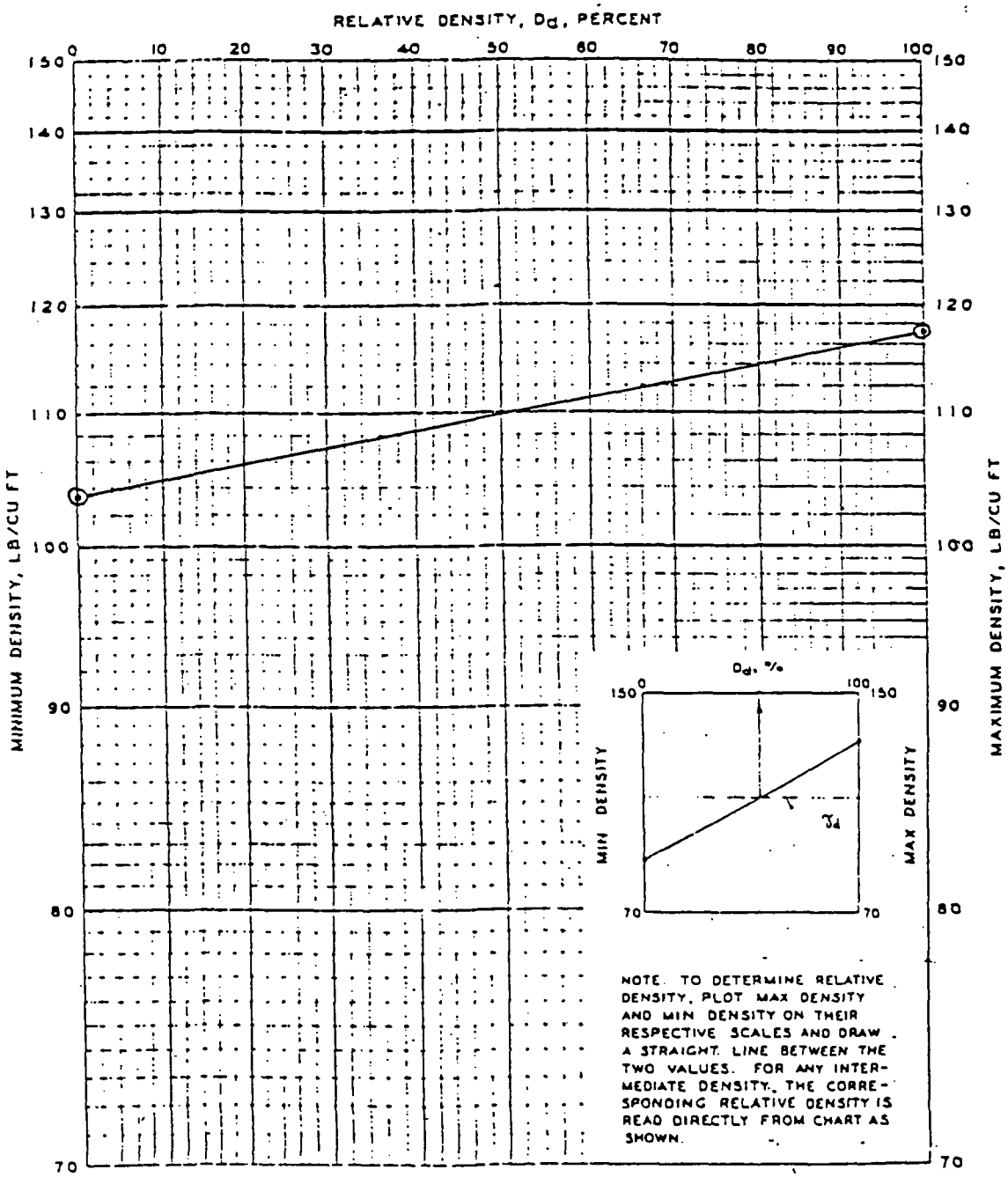
RELATIVE DENSITY

DATE July 19, 1994

PROJECT Sullivan Landfill 4425.030

BORING NO

SAMPLE NO. 2



Graphical determination of relative density

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

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GRAIN SIZE ANALYSIS-MECHANICAL Data Sheet 6

Project OBG Tech - Sullivan Landfill Job No. 4425.030

Location of Project _____ Boring No. _____ Sample No. 3

Description of Soil Sandy Gravel Depth of Sample 4"

Tested By Lance Stack Date of testing July 18, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 sieve	200
No. 4 sieve	500
3/4 in.	1500

Wt. of dry sample + container	2708
Wt. of container	208.3
Wt. of dry sample, W_s	2499.7

Sieve analysis and grain shape

Sieve no.	Diam. (mm)	Wt. retained	% retained	% passing
3	0	0	0	100
1 1/2	52.50	52.50	2.1	97.90
3/4	689.12	741.62	29.67	70.33
3/8	557.28	1298.90	51.97	48.03
4	445.83	1744.73	69.80	30.20
8	299.10	2043.83	81.77	18.23
16	188.79	2232.62	89.32	10.68
30	149.83	2382.45	95.32	4.68
50	79.94	2462.39	98.52	1.48
100	21.21	2483.60	99.36	.64
200	7.70	2491.30	99.67	.33
PAN	8.18	2499.48	100.00	-0-

% passing = $100 - \sum$ % retained.

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RELATIVE DENSITY

MINIMUM AND MAXIMUM DENSITY DETERMINATIONS

DATE July 19, 1994

PROJECT Sullivan Landfill 4425.030

BORING NO 3 SAMPLE NO 3

CLASSIFICATION

MOLD NO. A	MOLD DIAMETER, IN. = 6"	WEIGHT OF MOLD, W_m, LB = 7486 g.
VOLUME OF MOLD, V_m, CU FT = 0.09765 ft^3	END AREA OF MOLD, A_m, SQ FT = 0.19635 ft^2	

t = Plate Thickness = 0.497"

MINIMUM DENSITY

Amplitude				0.004 5%	0.008 12%	0.012 20%	0.016 100%
WEIGHT LB	MOLD (OR TARE) AND SOIL, DRY	g	w	11841	11846	11816	11788
	MOLD (OR TARE)	g	w_m	7486	7486	7486	7486
	SOIL, DRY	g	w_s	4355	4360	4330	4302
MIN DRY DENSITY, LB/CU FT = w_s/V		pcf	γ_d	98.32	98.43	97.76	97.13
MIN DRY DENSITY, AVERAGE				97.9 LB/CU FT			

MAXIMUM DENSITY

METHOD USED

TRIAL NO:				1	2	3	4
HEIGHT, IN.	LEFT DIAL READING		h_L	-0.016	0.199	0.310	.375
	RIGHT DIAL READING		h_R	0.62	0.104	0.301	.219
	AVERAGE DIAL = $(h_L + h_R)/2$		h_{avg}	0.023	0.1515	0.3055	0.297
	INITIAL DIAL READING		h_o				
	HEIGHT CHANGE = $h_{avg} + t$		Δh	0.5200	0.6485	0.8025	0.7940
VOL CU FT	VOLUME CHANGE = $(\Delta h/12) * A_m$		Δv	0.008509	0.01061	0.01313	0.01299
	VOLUME OF SOIL = $V_m - \Delta v$		v	0.08914	0.08704	0.8452	0.08466
WEIGHT LB	MOLD (OR TARE) AND SOIL, DRY	g	w	11841	11846	11816	11788
	MOLD (OR TARE)	g	w_m	7486	7486	7486	7486
	SOIL, DRY	g	w_s	4355	4360	4330	4302
MAX DRY DENSITY, LB/CU FT = w_s/V		pcf	γ_d	107.71	110.44	112.95	112.03
MAX DRY DENSITY, AVERAGE				110.8 LB/CU FT			

REMARKS

TECHNICIAN J. Medows COMPUTED BY J. Medows CHECKED BY

MIDWEST TESTING
& ENVIRONMENTAL SERVICES
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(314) 265-5695

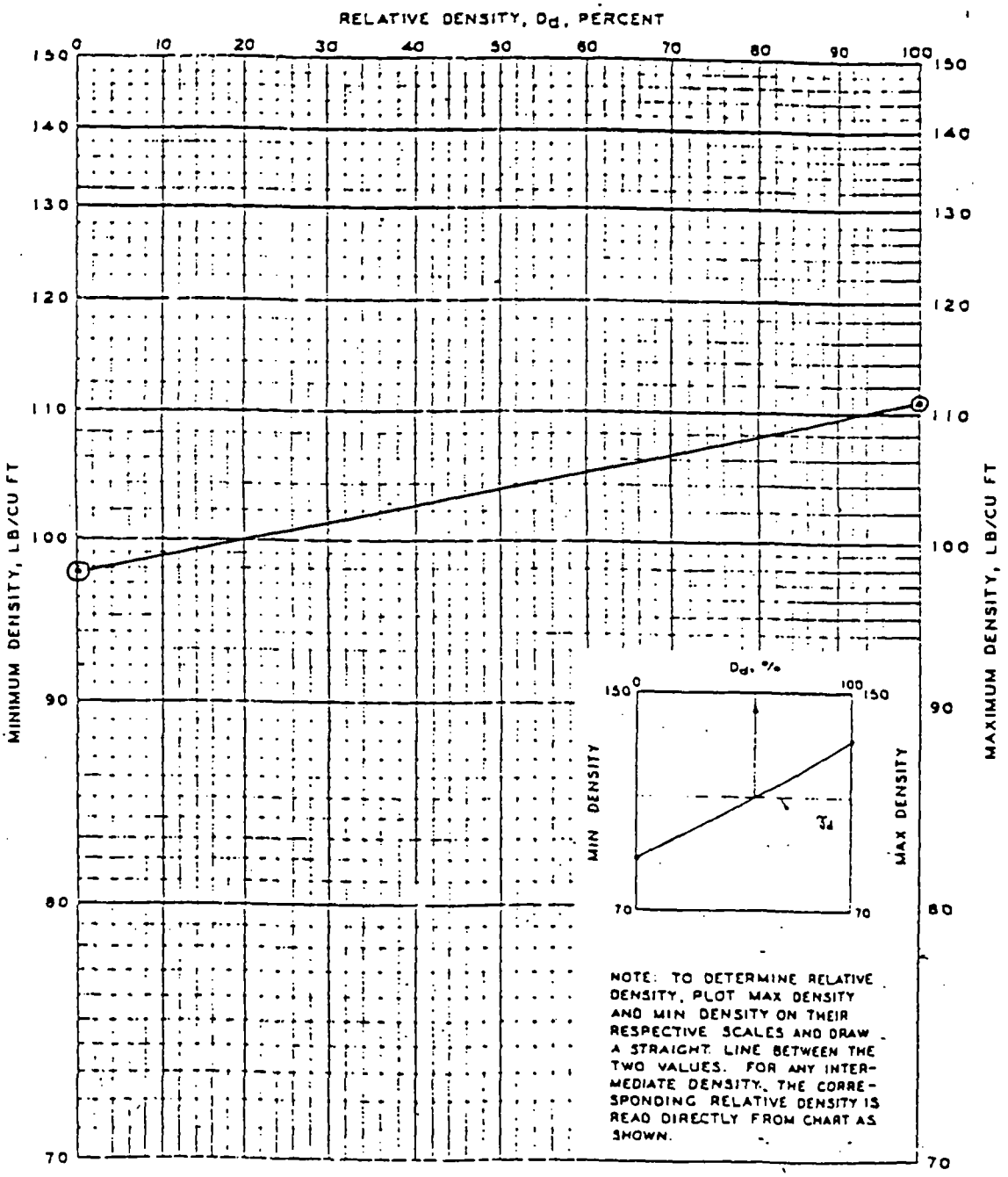
RELATIVE DENSITY

DATE July 19, 1994

PROJECT Sullivan Landfill 4425.030

BORING NO

SAMPLE NO 3



Graphical determination of relative density

MIDWEST TESTING & ENVIRONMENTAL SERVICES

A STACK & ASSOCIATES COMPANY

Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

PERMEABILITY RESULTS

Sample	Moisture Content (%)	Dry Density (lb/ft^3)	Permeability "K" (cm/sec)
1	6.4	105	358×10^{-4}
1	6.1	110.3	377×10^{-4}
2	7.0	106.3	340×10^{-4}
2	6.6	116.5	321×10^{-4}
3	7.9	105.2	401×10^{-4}
3	7.7	116.3	357×10^{-4}

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MOISTURE CONTENTS

PROJECT NAME Sullivan Landfill Closure DATE OF TEST August 9, 94

PROJECT NO. 4425.030 TESTED BY Jeff Medows

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	% Moist.
	4		Grab	Gravel	804.37	772.44	B2	92.26	4.7	4.7
	5		Grab	Gravel	618.67	589.16	A2	89.24	5.9	5.9

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL

Project: Sullivan Landfill Closure

Job No. 4425.030

Location of Project: Sullivan

Boring No. _____ Sample No. 4

Description of Soil: Sandy Gravel

Depth of Sample _____

Tested By: Lance Stack

Date of Testing August 12, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2887.5
Wt. of container	210.76
Wt. of dry sample, W_s	2676.74

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	0	0	0	100
3/4	553.91	553.91	20.73	79.27
3/8	623.96	1177.87	44.07	55.93
4	614.25	1792.12	67.05	32.95
8	402.35	2194.47	82.11	17.89
16	192.93	2387.40	89.33	10.67
30	128.18	2515.58	94.12	5.88
50	111.25	2626.83	98.29	1.71
100	34.05	2660.88	99.56	.44
200	5.84	2666.72	99.78	.22
PAN	5.92	2672.64	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL

Project: Sullivan Landfill Closure

Job No. 4425.030

Location of Project: Sullivan

Boring No. _____ Sample No. 5

Description of Soil: Sandy Gravel

Depth of Sample _____

Tested By: Lance Stack

Date of Testing August 12, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2167.5
Wt. of container	207.81
Wt. of dry sample, W_s	1959.69

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	112.07	112.07	5.72	94.28
3/4	231.53	343.6	17.54	82.46
3/8	435.62	779.22	39.78	60.22
4	432.45	1211.67	61.86	38.14
8	309.96	1521.63	77.69	22.31
16	175.82	1697.45	86.67	13.33
30	126.63	1824.08	93.13	6.87
50	97.68	1921.76	98.12	1.88
100	26.48	1948.24	99.47	.53
200	4.38	1952.62	99.69	.31
PAN	5.98	1958.60	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

A STACK & ASSOCIATES COMPANY

Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

PERMEABILITY RESULTS

Sample	Moisture Content (%)	Dry Density (lb/ft^3)	Permeability "K" (cm/sec)
4	4.7	105	270×10^{-4}
5	5.9	105	264×10^{-4}

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IN-PLACE DENSITY DATA

MIDWEST TESTING & ENVIRONMENTAL SERVICES

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DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan, MO Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2618	562
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST July 18 19 94

WEATHER 85 ° Partly Sunny

TESTED BY: J. Medows

CHECKED BY: T. Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	1	1	1	2	2	2	3	3	3	
OFFSET										
ELEVATION	12"	12"	12"	12"	12"	12"	12"	12"	12"	
MODE & DEPTH	4"	4"	4"	4"	4"	4"	4"	4"	4"	
DENS. CNT.	4091	4315	4053	4057	3945	3870	3914	3905	3750	
WET DENS.	111.1	108.6	111.6	111.5	112.8	113.7	113.2	113.3	115.2	
MSTRE. CNT.	76	76	80	89	80	86	91	93	97	
MOISTURE	6.2	6.2	6.6	7.6	6.6	7.3	7.8	8.0	8.5	
DRY DENS.	105.0	102.4	104.9	103.8	106.2	106.4	105.3	105.2	106.7	
% MOISTURE	5.9	6.0	6.3	7.3	6.2	6.8	7.4	7.6	8.0	
STD. DENS.										
OPT. MSTR.										
% COMP.										
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

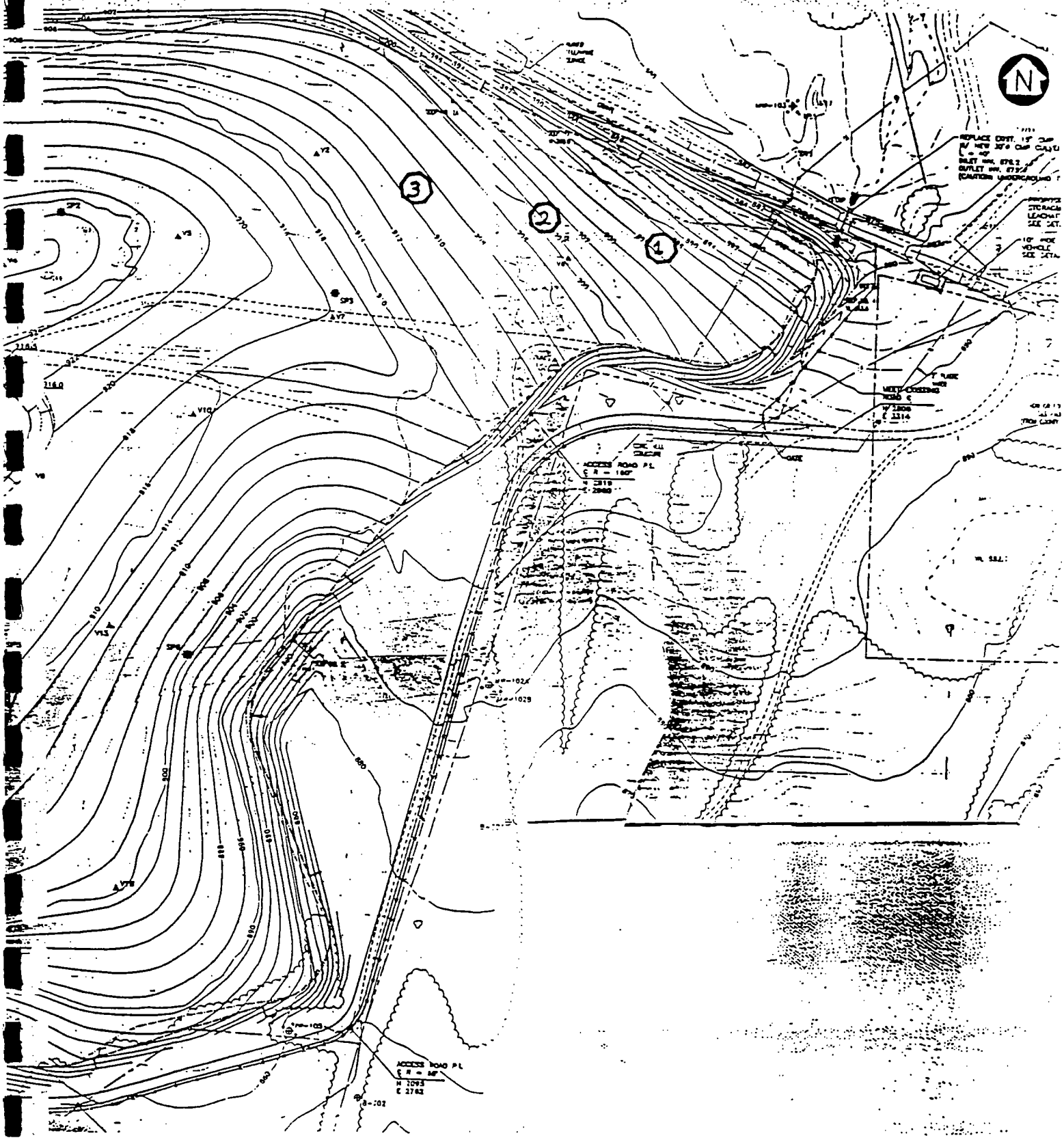
REMARKS There is no Proctor for this material.

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3


3
2
1
N

MIDWEST TESTING & ENVIRONMENTAL SERVICES

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(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan, MO Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2607	556
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST July, 27 19 94
WEATHER 70 ° Partly Cloudy
TESTED BY: J. Medows
CHECKED BY: T. Oates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	10	11	12	13	14	15	16			
OFFSET										
ELEVATION	12"	12"	12"	12"	12"	12"	12"			
MODE & DEPTH	Norm/4"	Norm/4"	Norm/4"	Norm/4"	Norm/4"	Norm/4"	Norm/4"			
DENS. CNT.	4427	3826	4284	4182	4288	3630	3779			
WET DENS.	109.4	114.0	108.7	109.8	108.7	116.4	114.5			
MSTRE. CNT.	73	92	85	84	86	123	118			
MOISTURE	5.9	8.0	7.3	7.2	7.4	11.5	10.9			
DRY DENS.	103.5	106.0	101.4	102.7	101.3	104.9	103.5			
% MOISTURE	5.7	7.6	7.2	7.0	7.3	11.0	10.6			
STD. DENS.										
OPT. MSTR.										
% COMP.										
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1			
2			
3			
4			
5			
6			
7			
8			
9			

MIDWEST TESTING & ENVIRONMENTAL SERVICES

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DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan, MO Landfill Closure

PROJECT NO.: 4425.010

TESTS PROVIDED FOR: OBG Technical Services

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS		
STANDARDIZATION LIMITS		

DATE OF TEST July 21 19 94
WEATHER 85 ° Partly Sunny
TESTED BY: J. Medows
CHECKED BY: T. Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	4	5	6	7	8	9				
OFFSET										
ELEVATION	12"	12"	12"	12"	12"	12"				
MODE & DEPTH	Norm/4"	Norm/4"	Norm/4"	Norm/4"	Norm/4"	Norm/4"				
DENS. CNT.	3845	3927	4242	4054	4200	3959				
WET DENS.	113.7	112.7	109.0	111.2	109.5	112.2				
MSTRE. CNT.	86	80	89	94	87	102				
MOISTURE	7.4	6.7	7.7	8.3	7.5	9.2				
DRY DENS.	106.3	106.0	101.3	102.9	102.0	103.1				
% MOISTURE	7.0	6.3	7.6	8.1	7.4	8.9				
STD. DENS.										
OPT. MSTR.										
% COMP.										
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

REMARKS There is no Proctor for this material.

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2603	567
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST August 3, 19 94
WEATHER 90 ° Sunny
TESTED BY: Jeff Medows
CHECKED BY: Terris Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	17	18	19	20	21	22	23	24	25	26
OFFSET										
ELEVATION	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"
MODE & DEPTH	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"
DENS. CNT.	4760	4078	4469	3490	3474	4200	4215	4083	4130	4011
WET DENS.	103.7	110.9	106.7	118.1	118.5	109.5	109.4	111.0	110.4	111.8
MSTRE. CNT.	78	98	83	140	106	95	85	74	75	80
MOISTURE	6.3	8.5	6.9	13.1	9.4	8.2	7.1	5.9	6.0	6.6
DRY DENS.	97.4	102.4	99.8	105.0	109.1	101.3	102.3	105.1	104.4	105.2
% MOISTURE	6.5	8.3	6.9	12.5	8.6	8.1	6.9	5.6	5.8	6.2
STD. DENS.										
OPT. MSTR.										
% COMP.										
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

REMARKS In Place Gravel/Gas Vent Layer.

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1			
2			
3			
4			
5			
6			
7			
8			
9			

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2603	567
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST August 3, 19 94
WEATHER 90 ° Sunny
TESTED BY: Jeff Medows
CHECKED BY: Terris Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	27	28								
OFFSET										
ELEVATION	12"	12"								
MODE & DEPTH	4"	4"								
DENS. CNT.	4259	4103								
WET DENS.	108.9	110.8								
MSTRE. CNT.	84	67								
MOISTURE	7.0	5.1								
DRY DENS.	101.9	105.6								
% MOISTURE	6.9	4.9								
STD. DENS.										
OPT. MSTR.										
% COMP.										
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1			
2			
3			
4			
5			
6			
7			
8			
9			

TOPOGRAPHIC SURVEY DATA

GAS VENT LAYER ELEVATIONS
GASVENT.TXT

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HYDRAULIC BARRIER LAYER

A. LABORATORY SOIL TEST DATA

B. IN-PLACE SOIL DENSITY DATA

C. TOPOGRAPHIC SURVEY DATA

LABORATORY SOIL TEST DATA

MOISTURE CONTENTS

PROJECT NAME Sullivan Landfill Closure DATE OF TEST August 9, 94

PROJECT NO. 4425.030 TESTED BY Jeff Medows

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	% Moist.
	1		Grab	Red Clay	340.48	302.38	AZ	89.22	17.9	17.9
	2		Grab	Brown Clay	441.35	412.83	P	149.53	10.8	
	2		Grab	Brown Clay	460.28	434.08	5	123.37	8.4	9.6
	3		Grab	Brown Silt Clay	450.12	420.79	Z	149.97	10.8	
	3		Grab	Brown Silt Clay	418.30	389.21	8	123.11	10.9	10.85

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL

Project: OBG Tech. Services

Job No. 4425.030

Location of Project: Sullivan Landfill

Boring No. _____ Sample No. 1

Description of Soil Red Clay

Depth of Sample _____

Tested By John Marshall

Date of Testing 8-17-94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

"Wet Sieve"

Wt. of dry sample + container	2295.17
Wt. of container	210.97
Wt. of dry sample, W_s	2084.20

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	17.20	17.20	82	99.2
3/8	25.21	42.41	2.03	97.97
4	38.17	80.58	3.86	96.14
10	30.45	111.03	5.32	94.68
20	26.96	137.99	6.62	93.38
40	18.74	156.73	7.52	92.48
60	16.14	172.87	8.29	91.71
140	15.98	188.85	9.06	90.94
200	2.98	191.83	9.20	90.80
PAN	1893.23	2085.06	100	0

% passing = 100 – Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

ATTERBERG LIMITS DETERMINATION

Project OBG Tech. Services Job No. 4425.030

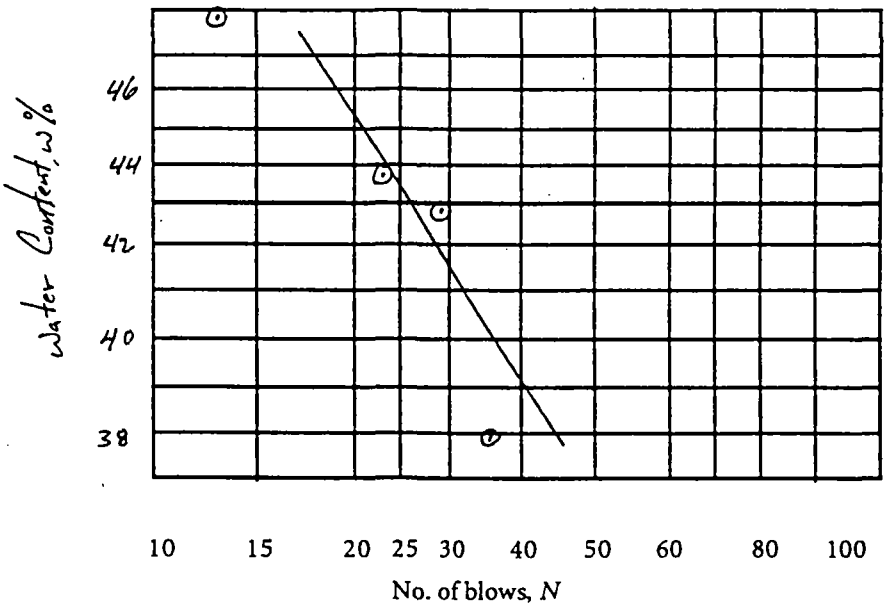
Location of Project Sullivan Landfill Boring No. _____ Sample No. 1

Description of Soil Red Clay

Depth of Sample _____ Tested By TLC Date 8-16-94

Liquid Limit Determination

Can no.	A4	1	10	3		
Wt. of wet soil + can	50.52	48.88	51.10	48.79		
Wt. of dry soil + can	45.27	43.87	45.33	43.49		
Wt. of can	31.44	32.16	32.16	32.43		
Wt. of dry soil	13.83	11.71	13.17	11.06		
Wt. of moisture	5.25	5.01	5.77	5.30		
Water content, *w*%	37.96	42.80	43.80	47.9		
No. of blows, *N*	36	29	23	13		



Flow index *Fi* = _____

Liquid Limit = 44

Plastic limit = 18

Plasticity index I_p = 26

Plastic Limit Determination				
Can no.	G	A		
Wt. of wet soil + can	21.03	20.88		
Wt. of dry soil + can	20.20	20.08		
Wt. of can	15.54	15.64		
Wt. of dry soil	4.66	4.44		
Wt. of moisture	.83	.80		
Water content, $w\% = w_p$	17.8	18.0		

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

COMPACTION TEST

Project OBG Tech. Services Job No. 4425.030

Location of Project Sullivan Landfill Boring No. _____ Sample No. 1

Description of Soil Red Clay

Test Performed By John Marshall Date of Test 8-17-94

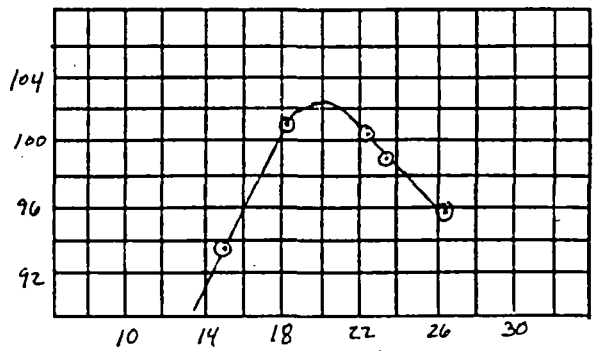
Blows/Layer 25 No. of Layers 3 Wt. of Hammer 5.5 lb

Mold dimensions: Diam. .33 ft. Ht. .38 ft. Vol. .0333 cu ft.

Water Content Determination

Sample no.	1		2		3		4		5		6		7	
Moisture can no	10	D2	12	B2	FR	A2	F	T	C1	A1				
Wt. of can + wet soil	996.37	1173.45	820.65	959.01	994.96	949.09	1119.72	1110.96	947.90	924.75				
Wt. of can + dry soil	912.56	1045.10	707.46	826.53	830.51	789.24	940.03	938.59	766.05	763.58				
Wt. of water	83.81	128.35	113.19	132.48	164.45	159.85	179.69	172.37	181.85	171.17				
Wt. of can	244.92	207.95	87.52	92.24	91.01	89.30	191.63	191.63	87.57	91.02				
Wt. of dry soil	567.64	837.15	619.94	734.29	739.50	699.94	748.40	746.96	678.48	662.56				
Water content, w%	14.8	15.3	18.2	18.0	22.2	22.8	24.0	23.1	26.8	25.8				

Density Determination							
Assumed water content	16	18	22	24	25		
Water content, w%	15.0	18.1	22.5	23.6	26.3		
Wt. of soil + mold	3699.7	3876.5	3929.0	3925.5	3905.7		
Wt. of mold	2074	2074	2074	2074	2074		
Wt. of soil in mold	1625.70	1802.50	1855.00	1851.50	1831.70		
Wet density, pcf	107.54	119.24	122.71	122.48	121.2		
Dry density, pcf	93.51	101.0	100.2	99.1	95.96		



Optimum moisture = 20.0 %

Maximum dry density = 102.3 pcf

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL

Project: Sullivan Landfill Closure

Job No. 4425.030

Location of Project: Sullivan

Boring No. _____ Sample No. 2

Description of Soil: Brown Clay

Depth of Sample _____

Tested By: John Marshall

Date of Testing August 9, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

"Dry Sieve"

Wt. of dry sample + container	2112.8
Wt. of container	345.0
Wt. of dry sample, W_s	1767.8

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	.8	.8	.04	99.96
4	31.2	32	1.8	98.2
10	170	202	11.4	88.6
20	563	765	43.3	56.7
40	383	1148	65.0	35.0
60	176	1321	74.8	25.2
140	186	1507	85.3	14.7
200	88	1595	90.3	9.7
PAN	171	1766	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

COMPACTION TEST

Project OBG Tech. Services Job No. 4425.030

Location of Project Sullivan Landfill Boring No. _____ Sample No. 2

Description of Soil Clay

Test Performed By John Marshall Date of Test August 5, 1994

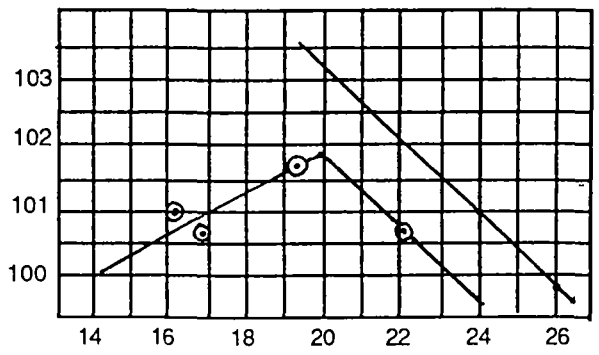
Blows/Layer 25 No. of Layers 3 Wt. of Hammer 5.5 lb

Mold dimensions: Diam. .33 ft. Ht. .38 ft. Vol. .0333 cu ft.

Water Content Determination

Sample no.	1		2		3		4		5		6		7	
Moisture can no	208	210	B1	A1	FR	AZ	G	D						
Wt. of can + wet soil	812.30	688.04	1001.60	916.00	878.66	853.25	1153.10	903.96						
Wt. of can + dry soil	703.70	601.00	886.66	822.24	768.54	739.15	1010.55	787.60						
Wt. of water	108.60	87.04	114.94	93.76	110.12	114.10	142.55	116.36						
Wt. of can	207.83	210.82	207.90	212.66	91.01	89.30	222.94	221.24						
Wt. of dry soil	495.87	390.18	678.76	609.58	677.53	649.85	787.61	566.36						
Water content, *w%*	21.9	22.3	16.9	15.4	16.2	17.6	18.1	20.5						

Density Determination							
Assumed water content	23%	16%	18%	20%			
Water content, *w%*	22.1	16.2	16.9	19.3			
Wt. of soil + mold (Kg)	3934.7	3851.3	3855.0	3909.3			
Wt. of mold (Kg)	2076	2076	2076	2076			
Wt. of soil in mold (kg)	1858.7	1775.3	1779.0	1833.3			
Wet density, pcf	122.95	117.4	117.7	121.3			
Dry density, pcf	100.7	101.0	100.7	101.7			



Optimum moisture = 19.9 % Maximum dry density = 101.8 pcf

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL

Project: Sullivan Landfill Closure

Job No. 4425.030

Location of Project: Sullivan

Boring No. _____ Sample No. 3

Description of Soil: Brown Silt Clay

Depth of Sample _____

Tested By: Lance Stack

Date of Testing August 10, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

"Dry Sieve"

Wt. of dry sample + container	2824.5
Wt. of container	346.51
Wt. of dry sample, W_s	2477.99

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	1.40	1.40	.058	99.94
4	197.90	199.30	8.07	91.93
10	760.40	959.7	38.87	61.13
20	539.93	1499.63	60.74	39.26
40	361.69	1861.32	75.39	24.61
60	177.59	2038.91	82.58	17.42
140	192.92	2231.83	90.40	9.6
200	96.18	2328.01	94.29	5.71
PAN	140.94	2468.95	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL

Project: OBG Tech. Services Job No. 4425.030

Location of Project: Sullivan Landfill Boring No. _____ Sample No. 3

Description of Soil Brown Silt Clay Depth of Sample _____

Tested By John Marshall Date of Testing 8-16-94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

"Wet Sieve"

Wt. of dry sample + container	2413.31
Wt. of container	210.99
Wt. of dry sample, W_s	2202.32

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	0
1	0	0	0	0
3/4	0	0	0	0
3/8	24.92	24.92	1.13	98.87
4	66.76	91.68	4.16	95.84
10	61.15	152.83	6.94	93.06
20	38.10	190.93	8.67	91.33
40	29.05	219.98	9.99	90.01
60	21.67	241.65	10.98	89.02
140	21.35	263.00	11.95	88.05
200	4.29	267.29	12.14	87.86
PAN	1933.90	2201.19	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

COMPACTION TEST

Project Sullivan Landfill Closure Job No. 4425.030

Location of Project Sullivan Boring No. _____ Sample No. 3

Description of Soil Brown Silt Clay

Test Performed By Lance Stack Date of Test August 10, 1994

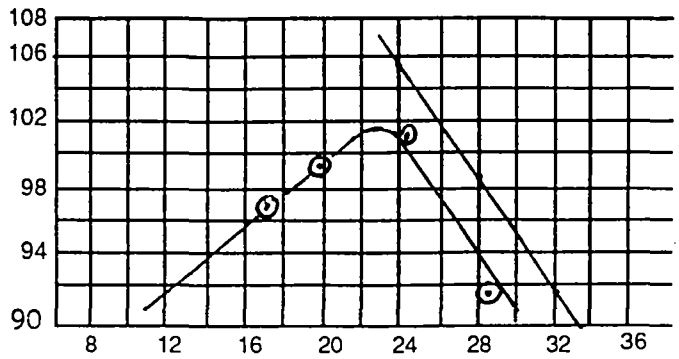
Blows/Layer 25 No. of Layers 3 Wt. of Hammer 5.5 lb

Mold dimensions: Diam. .33 ft. Ht. .38 ft. Vol. .0333 cu ft.

Water Content Determination

Sample no.	1		2		3		4		5		6		7	
Moisture can no	D4 (FR)	A2	8	5	12	B2	P	Z						
Wt. of can + wet soil	796.37	793.21	352.4	382.94	664.97	634.91	367.18	401.44						
Wt. of can + dry soil	637.03	640.34	314.16	339.97	552.13	528.76	334.87	364.84						
Wt. of water	159.34	152.87	38.24	42.97	112.84	106.15	32.31	36.60						
Wt. of can	91.05	89.62	123.10	123.33	87.57	92.27	149.52	149.97						
Wt. of dry soil	545.98	550.72	191.06	216.64	464.56	436.49	185.35	214.87						
Water content, *w%*	29.2	27.8	20.0	19.8	24.3	24.3	17.4	17.0						

Density Determination							
Assumed water content	27	21	24	18			
Water content, *w%*	28.5	19.9	24.3	17.2			
Wt. of soil + mold (Kg)	3.858	3.875	3.940	3.782			
Wt. of mold (Kg)	2.074	2.074	2.074	2.074			
Wt. of soil in mold (kg)	1.784	1.801	1.8997	1.708			
Wet density, pcf	117.99	119.12	125.64	112.96			
Dry density, pcf	91.82	99.35	101.08	96.38			



Optimum moisture = 22.7 % Maximum dry density = 101.6 pcf

MOISTURE CONTENTS

PROJECT NAME OBG Tech. Services DATE OF TEST 8-29-94

PROJECT NO. 4425.030 TESTED BY Larry Harmon

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	
	4	-	Grab	Yellow Gray Clay	432.25 g	387.37 g	T	191.56 g	22.9	

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Tech. Services Job No. 4425.030

Location of Project: Sullivan Landfill Boring No. _____ Sample No. 4

Description of Soil Yellow Gray Clay Depth of Sample _____

Tested By Larry Harmon Date of Testing 8-29-94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

WET SIEVE

Wt. of dry sample + container	2591.17
Wt. of container	222.01
Wt. of dry sample, W_s	2369.16

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	4.08	4.08	.17	99.83
10	423.30	427.38	18.03	81.97
20	617.19	1044.57	44.06	55.94
40	378.90	1423.47	60.04	39.96
60	161.34	1584.81	66.85	33.15
140	186.55	1771.36	74.72	25.28
200	87.94	1859.30	78.43	21.57
PAN	511.43	2370.73	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING
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COMPACTION TEST Data Sheet 9

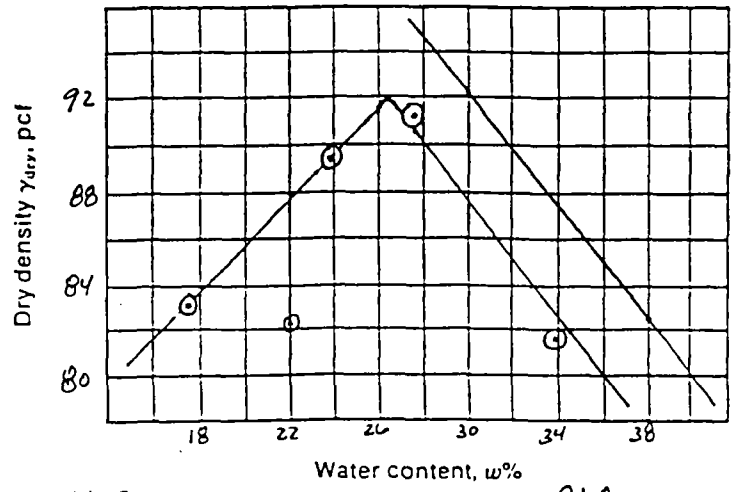
Project OBG Tech. Services Job No. 4425.030
Location of Project Sullivan Landfill Boring No. ____ Sample No. 4
Description of Soil Yellow Gray Clay
Test Performed By Larry Harmon Date of Test 8-29-94
Blows/Layer 25 No. of Layers 3 Wt. of Hammer 5.5 lb
Mold dimensions: Diam. 0.33 ft Ht. 0.38 ft Vol. 0.03333 cu ft

Water Content Determination

Sample no.	1		2		3		4		5		6	
Moisture can no.	12	FR	A2	F	B2	T	10	D	12	B2		
Wt. of can – wet soil	956.28	687.16	836.37	938.41	917.71	1024.73	1273.99	1043.67	837.74	893.07		
Wt. of can – dry soil	828.34	596.26	701.16	805.32	760.05	862.80	1072.38	864.06	646.94	691.69		
Wt. of water	127.94	90.90	135.21	133.09	157.66	161.93	201.61	179.61	190.75	201.38		
Wt. of can	87.50	91.04	98.25	191.60	92.34	191.61	344.77	221.62	88.73	92.23		
Wt. of dry soil	740.84	505.22	602.91	613.72	667.71	671.19	727.61	642.44	558.46	599.46		
Water content, w%	17.3	18.0	22.4	21.7	23.6	24.1	27.7	28.0	34.2	33.6		

Density Determination

Assumed water content	18	20	22	25	32	
Water content, w%	17.6	22.0	23.8	27.8	33.9	
Wt. of soil + mold Kg	3.545	3.581	3.738	3.829	3.715	
Wt. of mold Kg	2.066	2.066	2.066	2.066	2.066	
Wt. of soil in mold Kg	1.479	1.515	1.672	1.763	1.699	
Wet density, pcf	97.82	100.2	110.6	116.6	109.1	
Dry density γ, pcf	83.2	82.1	89.3	91.2	81.5	



Optimum moisture = 26.3 % Maximum dry density = 91.8 pcf

MIDWEST TESTING & ENVIRONMENTAL SERVICES

A STACK & ASSOCIATES COMPANY

Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear
  - Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

SULLIVAN LANDFILL CLOSURE
HYDRAULIC BARRIER PERMEABILITY RESULTS

Clay Sample	Moisture Content (%)	Permeability "K" (cm/sec)
4	22.9	2.8×10^{-8}

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MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Tech. Services

Job No. 4425.030

Location of Project: _____

Boring No. _____ Sample No. 5

Description of Soil Reddish Brown Clay

Depth of Sample _____

Tested By Larry G. Harmon

Date of Testing 9-16-94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

WET SIEVE

Wt. of dry sample + container	2123.63
Wt. of container	343.58
Wt. of dry sample, W_s	1780.05

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	24.3	24.3	1.36	98.64
3/4	0	24.3	1.36	98.64
3/8	17.2	41.5	2.32	97.68
4	82.2	123.7	6.92	93.08
10	253.6	377.3	21.12	78.88
20	317.7	695.0	38.90	61.10
40	284.7	979.7	54.84	45.16
60	171.8	1,151.5	64.45	35.55
140	144.2	1,295.7	72.52	27.48
200	29.3	1,325.0	74.16	25.84
PAN	461.6	1,786.6	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING
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COMPACTION TEST

Project OBG Tech. Services. Job No. 4425.030

Location of Project Sullivan Landfill Boring No. _____ Sample No. 5

Description of Soil Reddish Brown Clay

Test Performed By Larry G. Harmon Date of Test 9-16-94

Blows/Layer 25 No. of Layers 3 Wt. of Hammer 5.5 lb

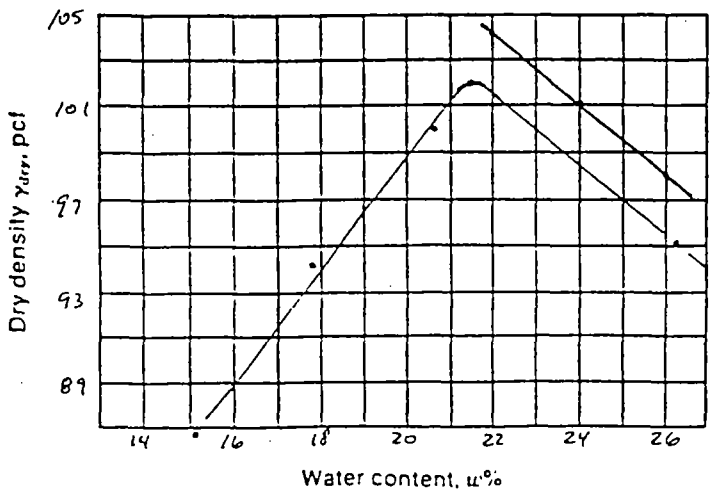
Mold dimensions: Diam. .33 ft Ht. .38 ft Vol. .0333 cu ft

Water Content Determination

Sample no.	1		2		3		4		5		6	
Moisture can no.	T	F	FR	12	10	1	F	T	B	D		
Wt. of can + wet soil	985.76	897.16	990.85	851.53	1130.69	1244.44	1132.65	1132.90	1098.75	1155.46		
Wt. of can + dry soil	880.73	802.54	852.43	737.70	998.00	1064.80	983.92	984.21	919.28	957.86		
Wt. of water	105.03	94.62	138.42	113.83	132.69	179.64	148.23	148.69	179.47	197.60		
Wt. of can	191.60	191.59	90.99	87.71	344.87	210.82	191.60	191.71	222.94	221.37		
Wt. of dry soil	689.13	610.95	759.44	649.99	653.13	853.98	791.82	792.50	696.34	736.49		
Water content, w%	15.2	15.5	18.2	17.5	20.3	21.0	18.8	18.8	25.77	26.83		

Density Determination

Assumed water content	14.5	18	20	22	24	
Water content, w%	15.35	17.85	20.65	18.8	26.3	
Wt. of soil + mold	3580.5	3744	3890	3961	3882	
Wt. of mold	2066	2066	2066	2066	2066	
Wt. of soil in mold	1514.5	1678	1824	1895	1816	
Wet density, pcf	100.2	110.98	120.64	125.36	120.1	
Dry density γ_d, pcf	86.9	94.2	100.0	105.52	95.1	



MIDWEST TESTING & ENVIRONMENTAL SERVICES

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ATTERBERG LIMITS DETERMINATION

Project OBG Technical Services Job No. 4425.030

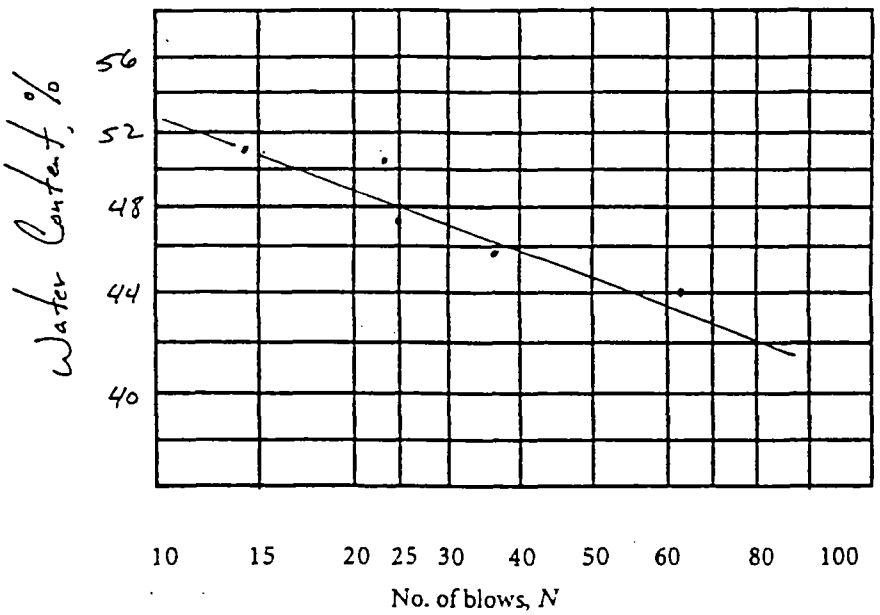
Location of Project Sullivan Landfill Boring No. _____ Sample No. 5

Description of Soil Reddish Brown Clay

Depth of Sample _____ Tested By Larry G. Harmon Date 9-16-94

Liquid Limit Determination

Can no.	A	B	C	E	F	
Wt. of wet soil + can	30.9	33.42	35.37	33.12	34.05	
Wt. of dry soil + can	26.22	27.86	29.04	27.24	27.74	
Wt. of can	15.59	15.47	15.63	15.63	15.41	
Wt. of dry soil	10.63	12.39	13.41	11.61	12.33	
Wt. of moisture	4.68	5.56	6.33	5.88	6.31	
Water content, w%	44.0	44.9	47.2	50.65	51.2	
No. of blows, N	63	37	25	24	14	



Flow index Fi = _____

Liquid Limit = 48

Plastic limit = 25

Plasticity index I_p = 23

Plastic Limit Determination				
Can no.	6	B2		
Wt. of wet soil + can	20.96	39.75		
Wt. of dry soil + can	19.89	38.20		
Wt. of can	15.47	32.06		
Wt. of dry soil	4.42	6.14		
Wt. of moisture	1.07	1.55		
Water content, $w\% = w_p$	24.2	25.2		

MOISTURE CONTENTS

PROJECT NAME OBG TECHNICAL SERVICES - SULLIVAN LANDFILL DATE OF TEST SEPT. 30, 19

PROJECT NO. 4425.030 TESTED BY LARRY G. HAR

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	HP/ TS
	6			ORANGE GRAY CLAY	389.54	346.56	FR	91.17	16.83	
	6			ORANGE GRAY CLAY	798.37	696.30	12	87.57	16.77	

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project: SULLIVAN LANDFILL Boring No. _____ Sample No. 6

Description of Soil ORANGE GRAY CLAY Depth of Sample _____

Tested By LARRY G. HARMON Date of Testing SEPTEMBER 30, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

"WET SIEVE"

Wt. of dry sample + container	2297.30
Wt. of container	210.83
Wt. of dry sample, W_s	2086.47

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	14.58	14.58	.70	99.30
3/8	55.36	69.94	3.35	96.65
4	110.99	180.93	8.67	91.33
10	122.24	303.17	14.53	85.47
20	76.42	379.59	18.19	81.81
40	59.49	439.08	21.04	78.96
60	97.62	536.70	25.71	74.29
140	113.98	650.68	31.18	68.82
200	52.55	703.23	33.69	66.31
PAN	1383.94	2087.17	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

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ATTERBERG LIMITS DETERMINATION

Project OBG TECHNICAL SERVICES Job No. 4425.030

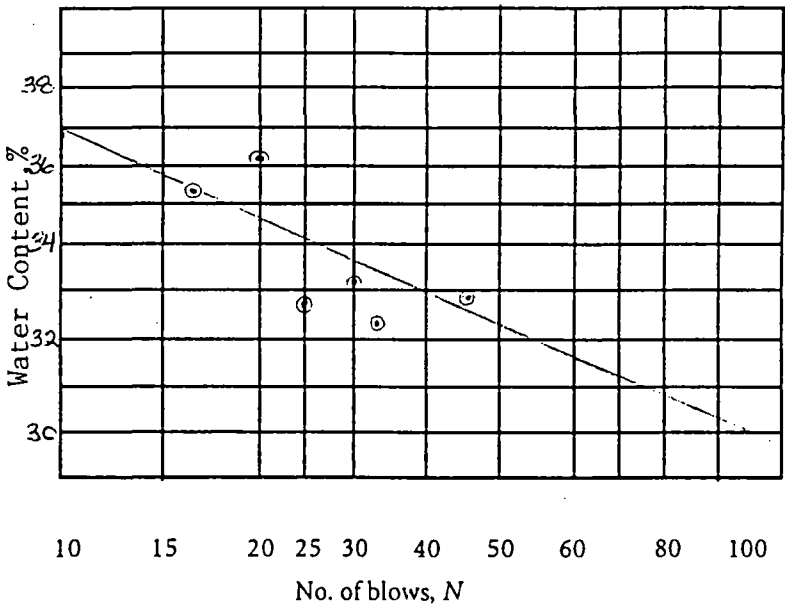
Location of Project SULLIVAN LANDFILL Boring No. _____ Sample No. 6

Description of Soil ORANGE GRAY CLAY

Depth of Sample _____ Tested By TERRIS CATES Date SEPT. 30, 1994

Liquid Limit Determination

Can no.	C	G	E	D	B-2	B
Wt. of wet soil + can	29.81	30.61	29.88	29.40	55.49	30.48
Wt. of dry soil + can	26.30	26.91	26.37	25.95	49.36	26.53
Wt. of can	15.63	15.47	15.64	15.53	32.06	15.59
Wt. of dry soil	10.67	11.44	10.73	10.42	17.30	10.94
Wt. of moisture	3.51	3.70	3.51	3.45	6.13	3.95
Water content, w%	32.90	32.34	32.71	33.11	35.43	36.11
No. of blows, N	46	33	25	30	17	20



Flow index Fi = _____

Liquid Limit = 34

Plastic limit = 16

Plasticity index I_p = 18

Plastic Limit Determination				
Can no.	A	F		
Wt. of wet soil + can	24.67	25.73		
Wt. of dry soil + can	23.50	24.30		
Wt. of can	15.60	15.45		
Wt. of dry soil	7.9	8.85		
Wt. of moisture	1.17	1.43		
Water content, $w\% = w_p$	14.8	16.2		

MIDWEST TESTING & ENVIRONMENTAL SERVICES 111 East Hardy; P.O. Box 297; (314) 265-5695 St. James, MO 65559

COMPACTION TEST

Project OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project SULLIVAN LANDFILL Boring No. ____ Sample No. 6

Description of Soil ORANGE GRAY CLAY

Test Performed By LARRY HARMON Date of Test SEPT. 30, 1994

Blows/Layer 25 No. of Layers 3 Wt. of Hammer 5.5 lb

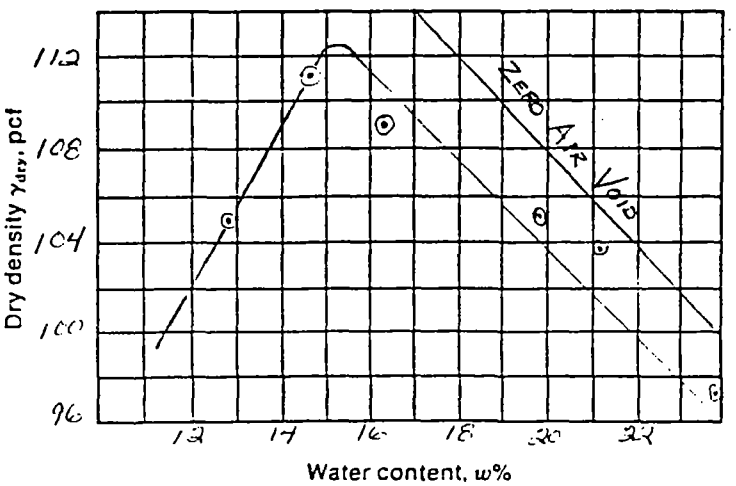
Mold dimensions: Diam. 1.33 ft Ht. .38 ft Vol. .0333 cu ft

Water Content Determination

Sample no.	1		2		3		4		5		6	
Moisture can no.	B2	A2	FR	10	12	1	7	T	12	A2	T	7(F)
Wt. of can + wet soil	1144.00	934.31	973.50	1354.94	815.23	1258.91	1192.54	1076.43	844.71	818.37	805.32	873.22
Wt. of can + dry soil	995.37	820.44	829.56	1184.09	675.14	1056.03	1016.58	923.28	747.13	735.46	734.57	797.36
Wt. of water	148.63	113.87	143.94	170.85	140.09	202.94	175.96	153.15	97.58	82.91	70.75	75.84
Wt. of can	92.37	89.24	91.01	344.05	87.54	212.19	192.81	191.68	87.64	89.27	191.66	192.19
Wt. of dry soil	903.00	731.40	738.55	839.14	587.60	845.24	823.77	731.60	659.49	646.19	542.91	604.61
Water content, w%	16.46	16.23	19.49	20.36	23.84	24.01	21.36	20.93	14.80	14.60	13.03	12.54

Density Determination

Assumed water content	17	20	23	21.5	15.2	12.14
Water content, w%	16.3	19.9	23.9	21.1	14.70	12.9
Wt. of soil + mold	3481.0	3972.5	3885.0	3965.0	3993.0	3856.5
Wt. of mold	2067.0	2067.0	2067.0	2067.0	2067.0	2067.0
Wt. of soil in mold	1914	1905.50	1818.0	1898.0	1926.0	1789.5
Wet density, pcf	126.74	126.18	120.36	125.68	127.42	118.49
Dry density γ, pcf	109.0	105.2	97.2	103.8	111.09	104.95



Optimum moisture = 15.3 % Maximum dry density = 112.5 pcf

MIDWEST TESTING & ENVIRONMENTAL SERVICES

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Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear
  - Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

SULLIVAN LANDFILL CLOSURE
HYDRAULIC BARRIER PERMEABILITY RESULTS

Clay Sample	Moisture Content (%)	Permeability "K" (cm/sec)
6	16.83	3.2×10^{-8}

111 East Hardy Street, P.O. Box 297 St. James, Missouri 65559 314-265-5695

MOISTURE CONTENTS

PROJECT NAME OBG TECHNICAL SERVICES SULLIVAN LANDFILL

DATE OF TEST Oct. 3, 199-

PROJECT NO. ______

TESTED BY TERRIS CATES

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	HP/TS
	7	–	GRAB	BROWN CLAY	427.43	381.18	P	149.51	19.9	

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: ORG TECHNICAL SERVICES Job No. 4425.030

Location of Project: SULLIVAN LANDFILL Boring No. _____ Sample No. 7

Description of Soil BROWN CLAY Depth of Sample _____

Tested By LANCE STACK Date of Testing OCTOBER 7, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

"WET SIEVE"

Wt. of dry sample + container	2342.29
Wt. of container	191.17
Wt. of dry sample, W_s	2151.12

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	13.00	13.00	.6	99.4
4	30.18	43.18	2.01	97.99
10	41.07	84.25	3.92	96.08
20	58.10	142.35	6.62	93.38
40	46.36	188.71	8.77	91.23
60	25.93	214.64	9.98	90.02
140	60.22	274.86	12.78	87.22
200	3.26	278.12	12.93	87.07
PAN	1873.29	2151.41	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

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(314) 265-5695

ATTERBERG LIMITS DETERMINATION

Project OBG TECHNICAL SERVICES Job No. 4425.030

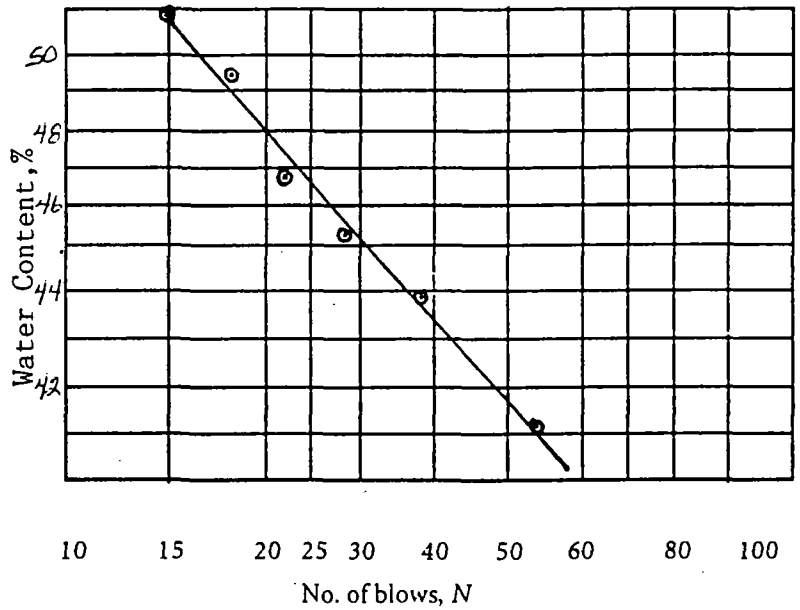
Location of Project SULLIVAN LANDFILL Boring No. _____ Sample No. 7

Description of Soil BROWN CLAY

Depth of Sample _____ Tested By LANCE STACK Date OCTOBER 7, 1994

Liquid Limit Determination

Can no.	A	D	E	F	B	C
Wt. of wet soil + can	30.32	30.42	28.34	28.39	30.80	28.22
Wt. of dry soil + can	25.72	26.07	24.46	24.26	25.77	24.01
Wt. of can	15.56	15.52	15.63	15.44	15.58	15.75
Wt. of dry soil	10.16	10.55	8.83	8.82	10.19	8.26
Wt. of moisture	4.60	4.35	3.88	4.13	5.03	4.21
Water content, *w*%	45.3	41.23	43.9	46.8	49.4	50.97
No. of blows, *N*	28	53	38	22	18	15



Flow index *Fi* = _____

Liquid Limit = 47

Plastic limit = 20

Plasticity index I_p = 27

Plastic Limit Determination				
Can no.	G	K		
Wt. of wet soil + can	23.47	21.49		
Wt. of dry soil + can	22.13	20.46		
Wt. of can	15.47	15.19		
Wt. of dry soil	6.66	5.27		
Wt. of moisture	1.34	1.03		
Water content, $w\% = w_p$	20.1	19.5		

MIDWEST TESTING & ENVIRONMENTAL SERVICES 111 East Hardy; P.O. Box 297; (314) 265-5695 St. James, MO 65559

COMPACTION TEST

Project OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project SULLIVAN LANDFILL Boring No. ____ Sample No. 7

Description of Soil BROWN CLAY

Test Performed By LANCE STACK Date of Test OCTOBER 7, 1994

Blows/Layer 25 No. of Layers 3 Wt. of Hammer 5.5 lb

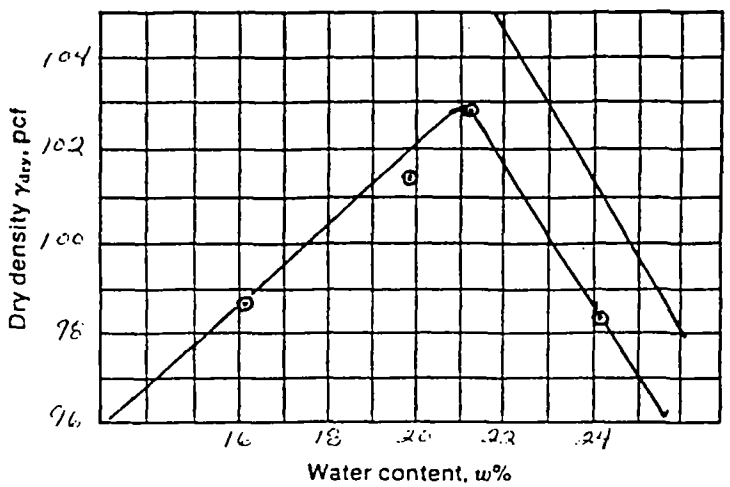
Mold dimensions: Diam. 0.33 ft Ht. 0.38 ft Vol. .0333 cu ft

Water Content Determination

Sample no.	1		2		3		4		5		6	
Moisture can no.	D4(ER)	12	A2	B2	T	#7	P	Z				
Wt. of can + wet soil	751.23	915.57	907.56	829.68	899.18	960.31	468.98	514.01				
Wt. of can + dry soil	664.23	800.06	770.65	709.77	762.10	810.56	413.18	449.55				
Wt. of water	93.0	115.51	136.91	121.91	137.08	149.75	55.80	64.46				
Wt. of can	91.03	87.26	89.23	92.32	191.55	192.43	149.46	149.93				
Wt. of dry soil	573.20	712.78	681.42	615.45	570.55	618.13	263.72	299.62				
Water content, w%	16.2	16.2	20.1	19.8	24.0	24.2	21.2	21.5				

Density Determination

Assumed water content	16.5	19	23	21.5		
Water content, w%	16.2	19.9	24.1	21.4		
Wt. of soil + mold	3796.0	3902.0	3910.0	3950.0		
Wt. of mold	2066.0	2066.0	2066.0	2066.0		
Wt. of soil in mold	1730.0	1836.0	1844.0	1884.0		
Wet density, pcf	114.55	121.57	122.10	124.75		
Dry density γ, pcf	98.58	101.39	98.39	102.76		



Optimum moisture = 21.2 % Maximum dry density = 102.8 pcf

MOISTURE CONTENTS

PROJECT NAME OBG TECHNICAL SERVICES DATE OF TEST OCT. 7, 1994

PROJECT NO. 4425.030 TESTED BY LANCE STACK

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	HP/ TS
	8		GRAB	DARK RED CLAY	389.34	357.48	8	123.08	13.6	

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project: SULLIVAN LANDFILL Boring No. _____ Sample No. 8

Description of Soil DARK RED CLAY Depth of Sample _____

Tested By LARRY HARMON Date of Testing OCTOBER 14, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

"WET SIEVE"

Wt. of dry sample + container	2311.06
Wt. of container	198.58
Wt. of dry sample, Ws	2112.48

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	18.35	18.35	0.87	99.13
3/4	8.32	26.67	1.26	98.74
3/8	49.26	75.93	3.59	96.41
4	158.05	233.98	11.08	88.92
10	181.99	415.97	19.69	80.31
20	73.67	489.64	23.18	76.82
40	85.81	575.45	27.24	72.76
60	292.64	868.09	41.09	58.91
140	211.78	1079.87	51.12	48.88
200	.24	1080.11	51.13	48.87
PAN	1032.32	2112.43	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

COMPACTION TEST

Project OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project SULLIVAN LANDFILL Boring No. ____ Sample No. 8

Description of Soil DARK RED CLAY

Test Performed By JOHN MARSHALL Date of Test OCTOBER 17, 1994

Blows/Layer 25 No. of Layers 3 Wt. of Hammer 5.5 lb

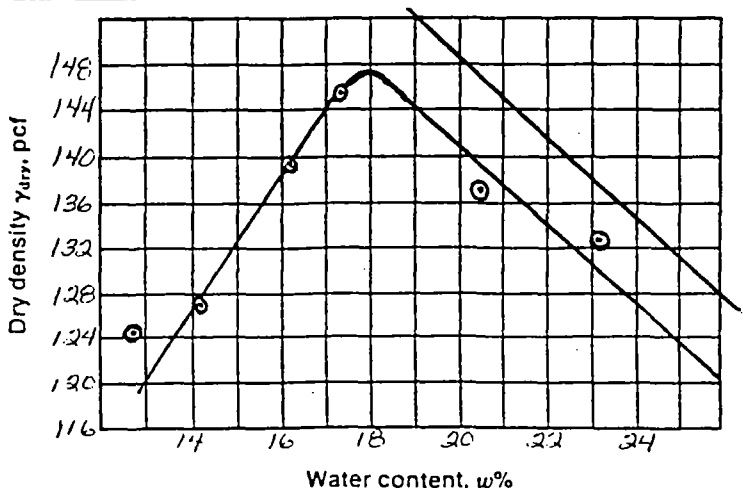
Mold dimensions: Diam. 0.5 ft Ht. 0.382 ft Vol. 1/13.333 cu ft

Water Content Determination

Sample no.	1		2		3		4		5		6	
Moisture can no.	B2	F	B2	FR	#12	A2	F	T	FR	12	T	A2
Wt. of can + wet soil	457.36	449.90	383.53	370.15	319.95	368.83	517.08	610.63	441.06	418.98	715.63	537.94
Wt. of can + dry soil	405.48	457.26	340.35	362.52	292.72	338.54	476.27	559.39	382.00	362.80	617.36	457.11
Wt. of water	51.88	42.64	43.18	8.21	27.23	30.24	40.76	51.24	59.06	56.18	96.27	80.83
Wt. of can	92.30	92.25	92.29	91.05	87.51	89.24	182.30	171.58	91.12	87.67	171.69	89.48
Wt. of dry soil	313.18	365.01	248.06	291.47	205.21	249.35	293.97	387.81	290.88	275.13	445.67	367.63
Water content, w%	16.6	16.1	17.4	2.8	13.3	12.1	14.4	13.9	20.3	20.4	22.5	23.7

Density Determination

Assumed water content	16	17	12	14	20.5	23.5
Water content, w%	16.3	17.4	12.7	14.2	20.4	23.1
Wt. of soil + mold	9277	9594	8541	8668	9398.7	9333.7
Wt. of mold	3770	3770	3770	3770	3770	3770
Wt. of soil in mold	5507	5824	4771	4898	5628.70	5563.70
Wet density, pcf	161.90	171.22	140.27	144.00	165.48	163.57
Dry density γ, pcf	139.16	145.84	124.46	126.09	137.44	132.88



Optimum moisture = 18.0 % Maximum dry density = 147.0 pcf

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

ATTERBERG LIMITS DETERMINATION

Project OBG TECHNICAL SERVICES Job No. 4425.030

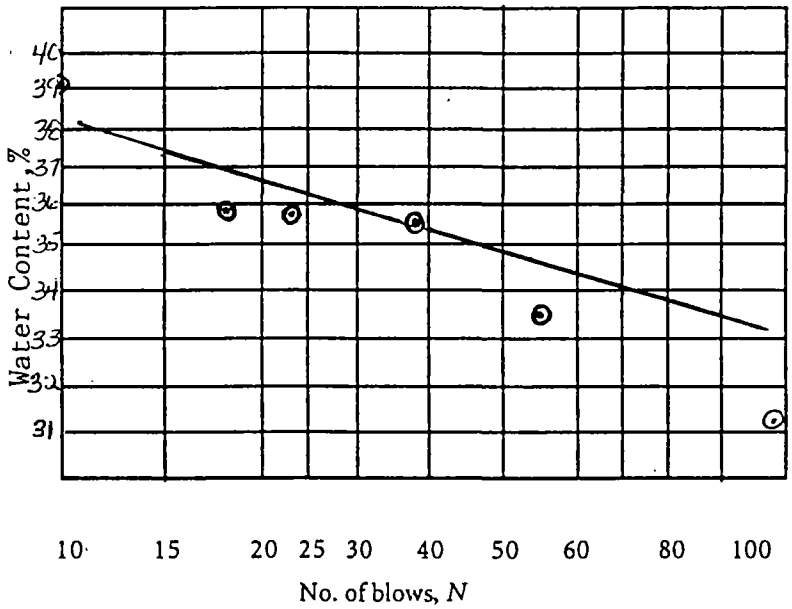
Location of Project SULLIVAN LANDFILL Boring No. _____ Sample No. 8

Description of Soil DARK RED CLAY

Depth of Sample _____ Tested By JOHN MARSHALL Date OCTOBER 17, 1994

Liquid Limit Determination

Can no.	A4	.3	2 10	6	A-1	B-1
Wt. of wet soil + can	47.02	47.49	48.81	45.06	51.57	48.28
Wt. of dry soil + can	42.91	43.55	44.64	41.99	46.45	43.59
Wt. of can	31.42	32.44	32.20	32.12	32.18	31.64
Wt. of dry soil	11.49	11.11	12.44	9.87	14.27	11.95
Wt. of moisture	4.11	3.94	4.17	3.07	5.12	4.69
Water content, *w*%	35.8	35.5	33.5	31.1	35.9	39.2
No. of blows, *N*	23	39	55	98	18	9



Flow index *Fi* = _____

Liquid Limit = 36

Plastic limit = 15

Plasticity index I_p = 21

Plastic Limit Determination				
Can no.	C	G		
Wt. of wet soil + can	26.78	23.94		
Wt. of dry soil + can	25.38	22.84		
Wt. of can	15.66	15.46		
Wt. of dry soil	9.72	7.38		
Wt. of moisture	1.4	1.1		
Water content, $w\% = w_p$	14.4	14.9		

MIDWEST TESTING & ENVIRONMENTAL SERVICES

A STACK & ASSOCIATES COMPANY

Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

SULLIVAN LANDFILL CLOSURE
HYDRAULIC BARRIER PERMEABILITY RESULTS

Clay Sample	Moisture Content (%)	Permeability "K" (cm/sec)
7	19.9	4.75×10^{-8}
8	13.6	2.2×10^{-7}

111 East Hardy Street, P.O. Box 297 St. James, Missouri 65559 314-265-5695

IN-PLACE DENSITY DATA

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2603	567
STANDARDIZATION **LIMITS**	6.4	11.8

DATE OF TEST August 3, 19 94

WEATHER 90 ° Sunny

TESTED BY: Jeff Medows

CHECKED BY: Terris Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	Test Pad	Test Pad								
OFFSET										
ELEVATION	1' 10"	1' 18"								
MODE & DEPTH	4"	4"								
DENS. CNT.	3038	3067								
WET DENS.	124.5	124.1								
MSTRE. CNT.	217	201								
MOISTURE	21.5	19.7								
DRY DENS.	103.0	104.4								
% MOISTURE	20.9	18.9								
STD. DENS.	101.8	101.8								
OPT. MSTR.	19.9	19.9								
% COMP.	101.2	102.6								
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

REMARKS In Place Hydraulic Barrier

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown clay	19.9	101.8
2			
3			
4			
5			
6			
7			
8			
9			

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2590	567
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST August 4, 19 94
WEATHER 80 ° Cloudy
TESTED BY: Jeff Medows
CHECKED BY: Terris Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION										
OFFSET										
ELEVATION	10"	10"	18"	18"						
MODE & DEPTH	6"	6"	4"	4"						
DENS. CNT.	3651	2853	3630	3726						
WET DENS.	115.5	116.4	115.7	114.4						
MSTRE. CNT.	172	197	185	201						
MOISTURE	16.9	19.7	18.3	20.1						
DRY DENS.	98.6	96.7	97.4	94.3						
% MOISTURE	17.1	20.3	18.8	21.3						
STD. DENS.	95.7	95.7	95.7	95.7						
OPT. MSTR.	21.7	21.7	21.7	21.7						
% COMP.	103.0	101.0	101.1	98.5						
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

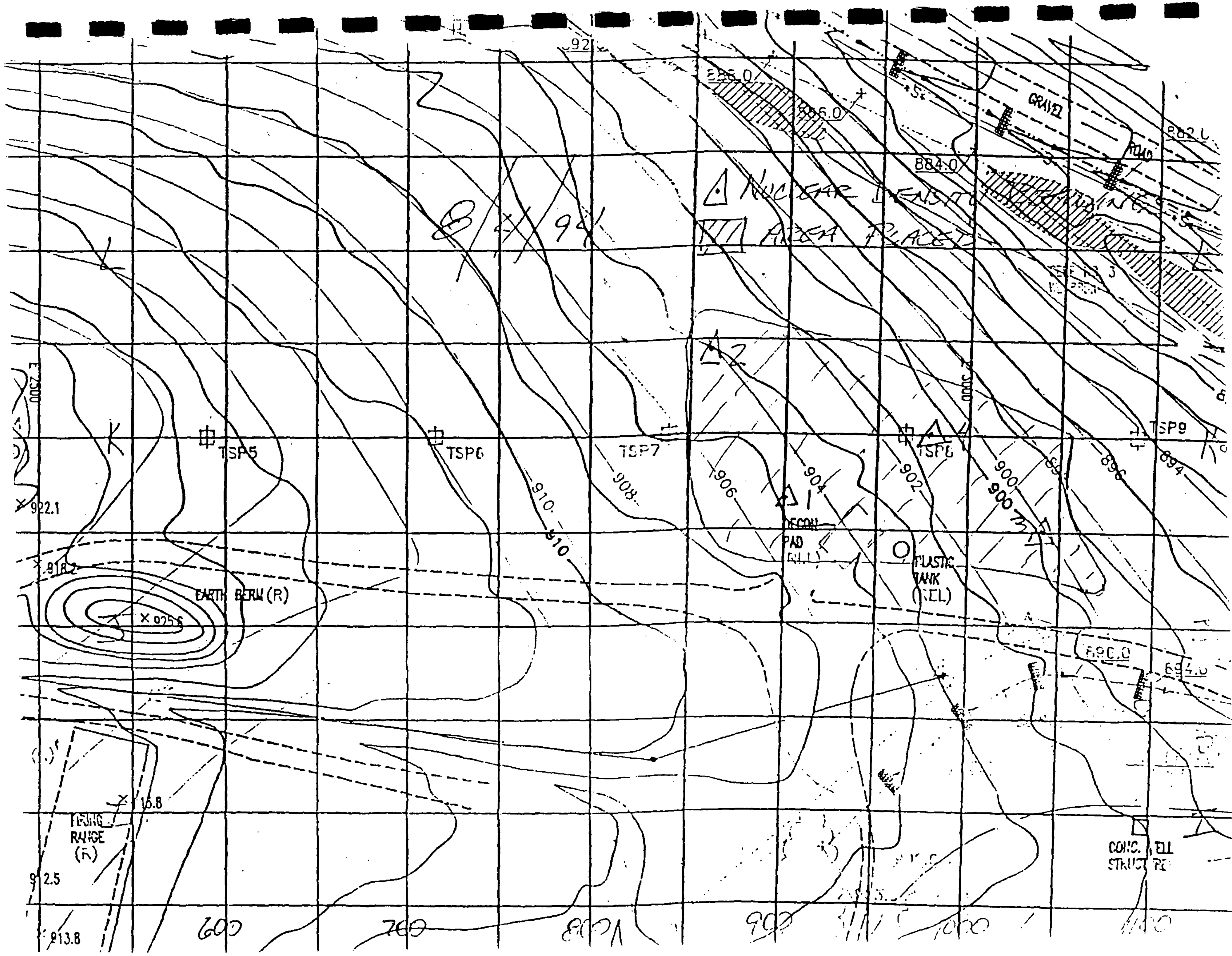
REMARKS Hydraulic Barrier

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	"Brucker" Borrow Study	21.7	95.7
2			
3			
4			
5			
6			
7			
8			
9			



886.0
886.0
GRAVEL
ROAD
882.0
884.0
8/4/94
Nuclear Density
Area Placed
Δ 2
TSP5
TSP6
TSP7
TSP8
TSP9
910
908
906
904
902
900
896
894
Δ 1
DECON PAD
PLASTIC TANK
922.1
918.2
EARTH BERM (R)
925.6
890.0
894.0
FIRING RANGE (R)
912.5
913.8
CONC. WELL STRUCTURE
600
700
800
900
1000

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2589	562
STANDARDIZATION **LIMITS**	6.4	11.8

DATE OF TEST August 5, 19 94

WEATHER 80 ° Sunny

TESTED BY: Jeff Medows

CHECKED BY: Terris Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	K,825	L,810	K+10,760	J+50,840	J+75,800	K+90,750	L,775			
OFFSET										
ELEVATION	6"	6"	6"	18"	18"	6"	18"			
MODE & DEPTH	4"	4"	4"	6"	6"	4"	6"			
DENS. CNT.	3227	3336	3243	2436	2701	3109	2588			
WET DENS.	121.1	119.5	120.9	122.8	118.5	122.9	120.3			
MSTRE. CNT.	247	236	242	230	217	242	221			
MOISTURE	25.1	23.9	24.6	23.2	21.8	24.6	22.2			
DRY DENS.	96.0	95.8	96.3	99.6	96.7	98.4	98.0			
% MOISTURE	26.2	25.0	25.5	23.3	22.5	25.0	22.7			
STD. DENS.	101.8	101.8	101.8	101.8	101.8	101.8	101.8			
OPT. MSTR.	19.9	19.9	19.9	19.9	19.9	19.9	19.9			
% COMP.	94.3	94.1	94.6	97.8	95.0	96.7	96.3			
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED	95	95	95	95	95	95	95			

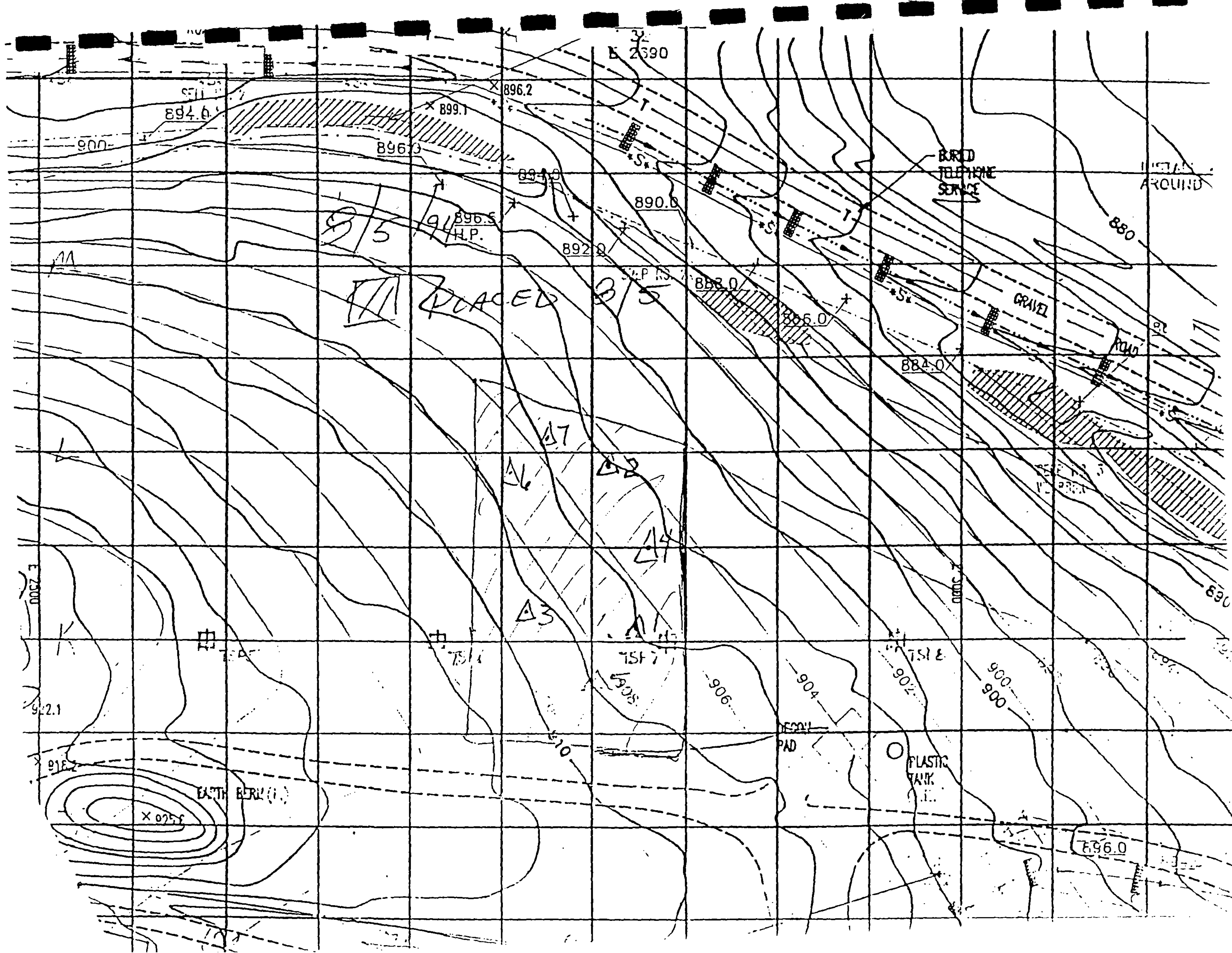
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2			
3			
4			
5			
6			
7			
8			
9			



E 2690
896.2
899.1
894.6
900
896.0
894.0
BURIED TELEPHONE SERVICE
AROUND
890.0
880
896.5 H.P.
892.0
888.0
886.0
GRAVEL
ROAD
884.0
PLACED
E 2600
E 2600
906
904
902
900
900
910
922.1
918.2
PLASTIC TANK
PAD
896.0

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2597	556
STANDARDIZATION **LIMITS**	6.4	11.9

DATE OF TEST August 15, 19 94

WEATHER 80 ° Sunny

TESTED BY: Jeff Medows

CHECKED BY: Terris Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	H75, 625	H50, 550	H50, 500	I, 600	H75, 525	G75, 575	I, 500	H, 480	H, 610	
OFFSET										
ELEVATION	9"	9"	9"	18"	18"	9	9"	18"	18"	
MODE & DEPTH	4"	4"	4"	6"	6"	4"	4"	6"	6"	
DENS. CNT.	3387	3283	3413	2512	2442	3124	3054	2554	2676	
WET DENS.	119.0	120.5	118.6	121.6	122.9	122.9	123.4	120.9	119.8	
MSTRE. CNT.	222	220	218	230	224	234	227	237	221	
MOISTURE	22.5	22.3	22.0	23.4	22.7	23.8	23.0	24.1	22.4	
DRY DENS.	96.5	98.3	96.6	98.2	100.2	99.1	100.4	96.7	97.4	
% MOISTURE	23.3	22.6	22.8	23.8	22.7	24.0	23.0	25.0	23.0	
STD. DENS.	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	
OPT. MSTR.	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	
% COMP.	95.0	96.7	95.1	96.7	98.6	97.5	98.8	95.2	95.9	
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

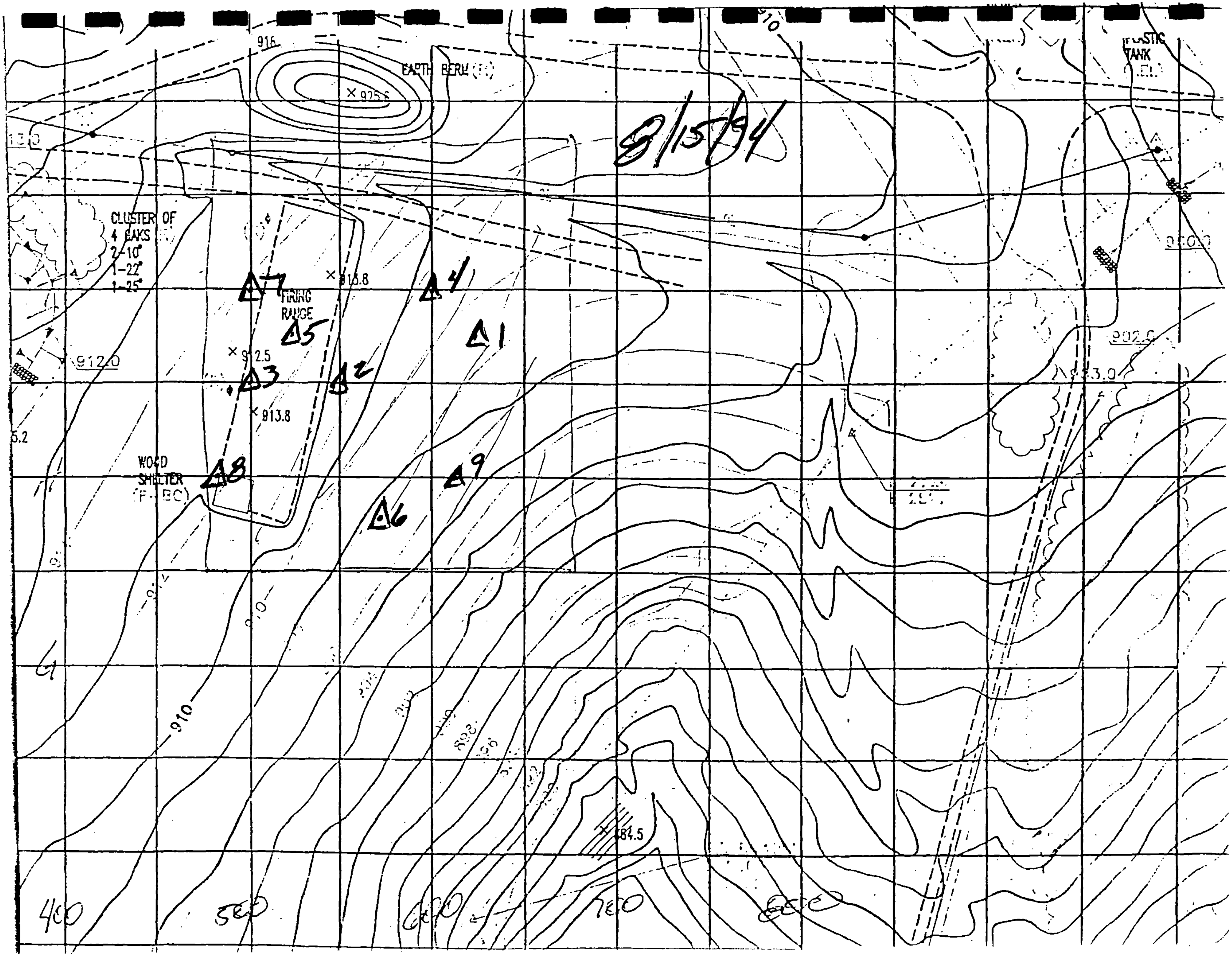
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	22.7	101.6
2			
3			
4			
5			
6			
7			
8			
9			



916
EARTH BERM
× 925.6
8/15/94
PLASTIC TANK
CLUSTER OF
4 OAKS
2-10"
1-22"
1-25"
× 913.8
FIRING RANGE
× 912.5
912.0
× 913.8
WOOD SHELTER
902.0
913.0
910
× 884.5
400
500
600
700
800

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2593	566
STANDARDIZATION LIMITS	6.4	11.9

DATE OF TEST August 9, 19 94
WEATHER 95 ° Sunny
TESTED BY: Jeff Medows
CHECKED BY: Terris Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	K25, 575	L10, 555	K25, 590	K75, 550	L50, 575	K50, 500	L, 500	K75, 490	J95, 505	
OFFSET										
ELEVATION	8"	8"	18"	18"	18"	8"	8"	18"	18"	
MODE & DEPTH	4"	4"	6"	6"	6"	4"	4"	6"	6"	
DENS. CNT.	3088	3016	2480	2397	2538	3175	3781	2560	2570	
WET DENS.	123.4	124.6	122.1	123.6	121.3	122.0	121.4	122.5	121.8	
MSTRE. CNT.	244	232	226	227	210	237	229	244	228	
MOISTURE	24.4	23.1	22.5	22.6	20.7	23.7	22.8	24.6	22.9	
DRY DENS.	98.9	101.5	99.6	101.0	100.5	98.3	98.5	98.2	97.7	
% MOISTURE	24.7	22.8	77.6	22.4	20.6	74.1	73.1	24.0	23.5	
STD. DENS.	101.8	101.8	101.8	101.8	101.8	101.8	101.8	101.8	101.8	
OPT. MSTR.	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	
% COMP.	97.2	99.7	97.9	99.2	98.7	96.6	96.8	96.5	96.0	
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

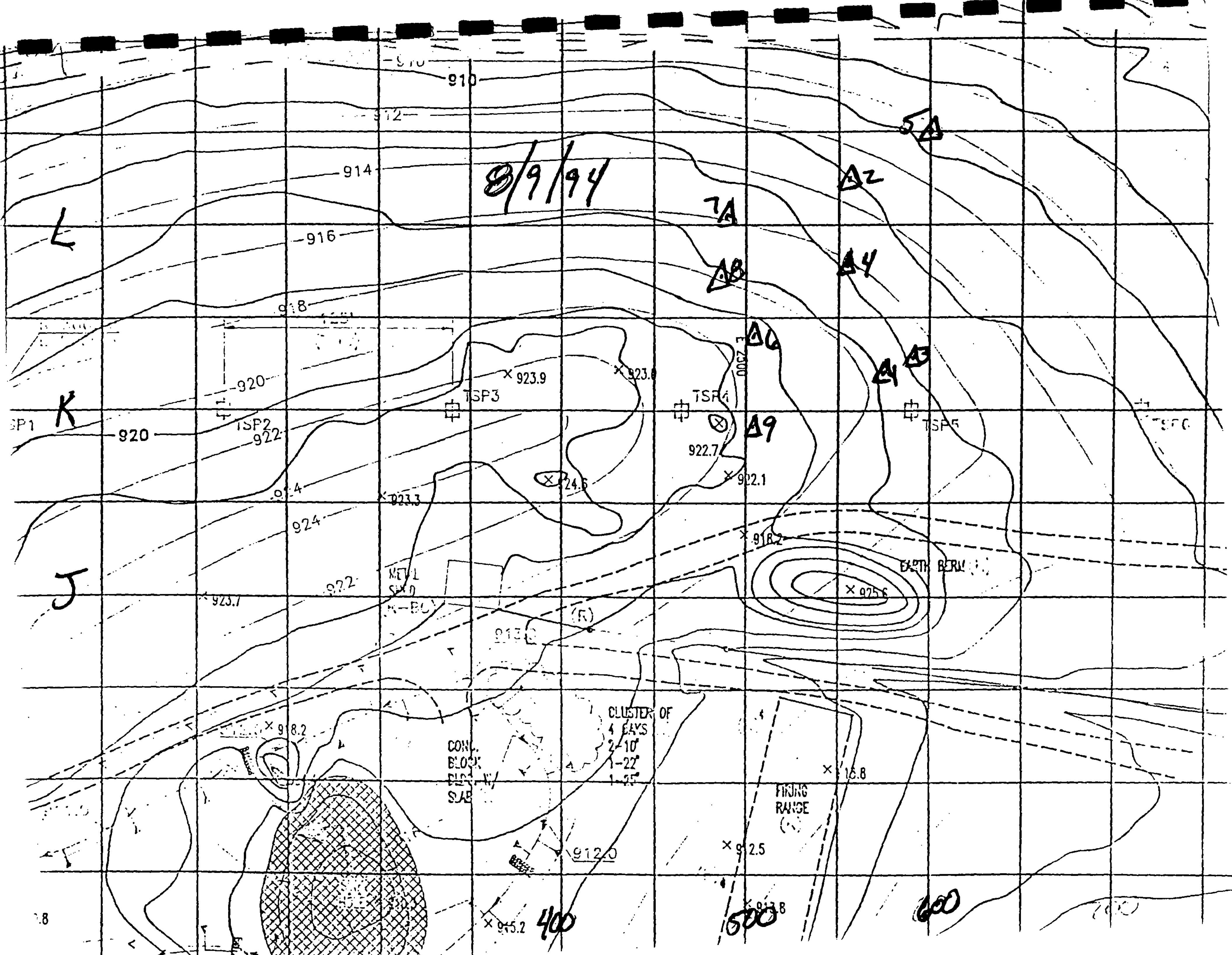
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2			
3			
4			
5			
6			
7			
8			
9			



8/9/94
910
912
914
916
918
920
922
924
L
K
J
TSP2
TSP3
TSP4
TSP5
923.9
923.8
922.7
922.1
923.3
923.7
918.2
EARTH BERM
925.6
CLUSTER OF
4 OAKS
2-10"
1-22"
1-25"
FIRING
RANGE
912.5
912.0
915.2
400
500
600
5
2
7
4
8
6
3
1
9

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2608	564
STANDARDIZATION LIMITS	6.4	11.9

DATE OF TEST August 11, 19 94
WEATHER 90 ° Partly Sunny
TESTED BY: Jeff Medows
CHECKED BY: Terris Cates

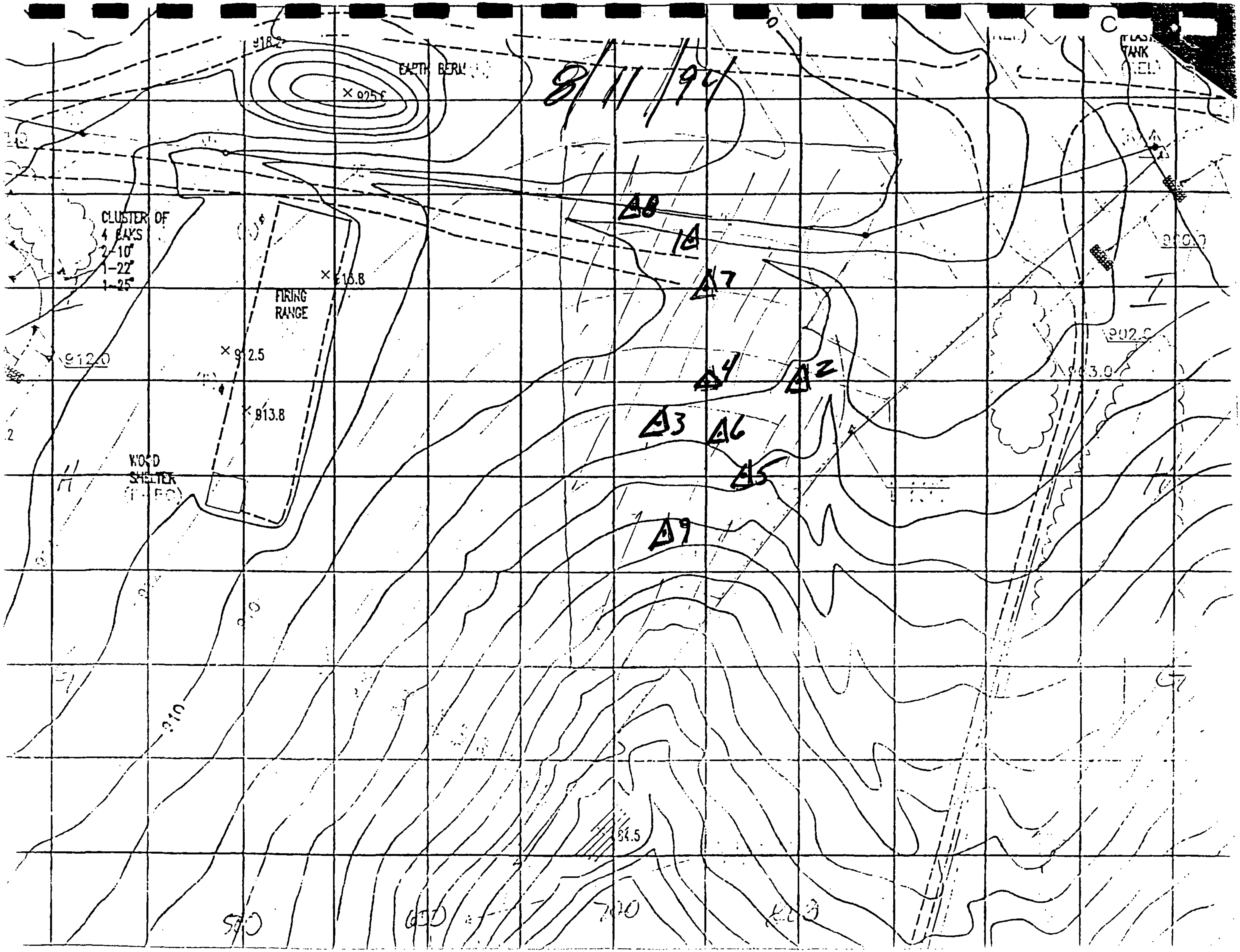
TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	I25, 750	H50, 800	H24, 725	H50, 750	H, 775	H25, 755	I, 700	I50, 710	G25, 725	
OFFSET										
ELEVATION	9"	9"	9"	9"	9"	18"	18"	18"	18"	
MODE & DEPTH	4"	4"	4"	4"	4"	6"	6"	6"	4"	
DENS. CNT.	3265	3196	3219	3102	3192	2551	2451	2569	3328	
WET DENS.	120.8	121.9	121.5	123.3	121.9	121.0	122.7	120.8	119.9	
MSTRE. CNT.	233	233	239	245	239	233	242	229	229	
MOISTURE	23.5	23.5	24.1	24.8	24.1	23.5	24.5	23.0	23.0	
DRY DENS.	97.3	98.4	97.3	98.5	97.7	97.5	98.2	97.7	96.9	
% MOISTURE	24.1	23.9	24.8	25.2	24.7	24.1	24.9	23.6	23.8	
STD. DENS.	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	
OPT. MSTR.	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	
% COMP.	95.8	96.9	95.8	96.9	96.2	96.0	96.7	96.2	95.4	
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE
SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	22.7	101.6
3			
4			
5			
6			
7			
8			
9			


8/11/94
EARTH BERM
× 925.6
918.2
CLUSTER OF
4 OAKS
2-10"
1-22"
1-25"
FIRING
RANGE
× 913.8
× 912.5
912.0
WOOD
SHELTER
910
TANK
902.0
500
600
700
800
C
1
2
3
4
5
6
7
8
9

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: **OBG Technical Services**

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2605	564
STANDARDIZATION LIMITS	6.4	11.9

DATE OF TEST August 12, 19 94

WEATHER 90 ° Mostly Sunny

TESTED BY: Jeff Medows

CHECKED BY: Terris Cates

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	K75, 460	J75, 425	J75, 375	K75, 375	K75, 425	L75, 375	J75, 325	K75, 375	L25, 325	L, 350
OFFSET										
ELEVATION	9"	9"	9"	9"	18"	18"	9"	9"	9"	18"
MODE & DEPTH	4"	4"	4"	4"	6"	6"	4"	4"	4"	6"
DENS. CNT.	3257	3157	3273	3504	2694	2545	3314	3353	3153	2568
WET DENS.	121.0	132.6	120.8	117.6	118.9	121.3	120.2	119.7	122.6	120.9
MSTRE. CNT.	243	325	232	218	219	218	231	217	234	231
MOISTURE	24.4	22.4	23.2	22.2	22.3	22.2	23.6	22.1	24.6	23.6
DRY DENS.	96.6	101.3	97.6	96.8	96.6	99.1	96.6	97.6	98.7	97.2
% MOISTURE	25.2	22.4	23.7	23.2	23.1	22.4	24.5	22.6	24.3	24.3
STD. DENS.	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6
OPT. MSTR.	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7
% COMP.	95.1	98.6	96.1	95.3	95.1	97.6	95.1	96.1	97.1	95.7
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED										

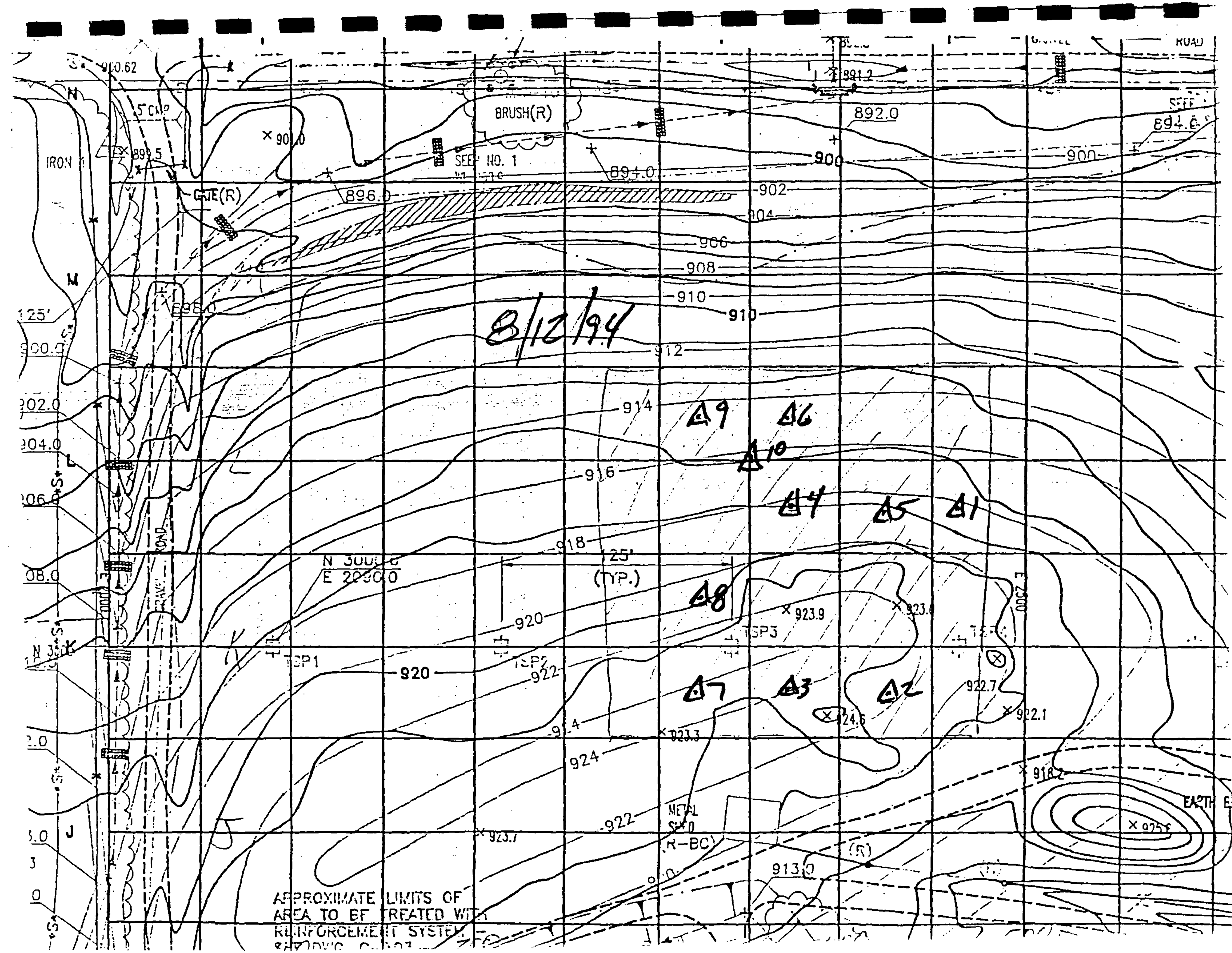
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1			
2			
3			
4			
5			
6			
7			
8			
9			


BRUSH(R)
SEEP NO. 1
892.0
894.0
896.0
900
902
904
906
908
910
912
914
916
918
920
922
924
8/12/94
Δ9
Δ6
Δ10
Δ4
Δ5
Δ1
Δ8
Δ7
Δ3
Δ2
125'
(TYP.)
N 3000.0
E 2030.0
TSP1
TSP2
TSP3
923.9
923.3
924.6
922.7
922.1
918.2
923.7
913.0
METAL SHED
(R-BC)
EARTH
IRON
GATE(R)
899.5
891.2
SEEP
900.0
902.0
904.0
906.0
908.0
ROAD
APPROXIMATE LIMITS OF
AREA TO BE TREATED WITH
REINFORCEMENT SYSTEM

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2603	554
STANDARDIZATION LIMITS	6.9	11.9

DATE OF TEST August 16 19 94
WEATHER 78° Sunny
TESTED BY: Greg Vaughn
CHECKED BY: TLC

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION										
OFFSET										
ELEVATION	Topliet	Topliet	Bottom 9"	Bottom 9"	Bottom 9"					
MODE & DEPTH	4"	4"	6"	6"	6"					
DENS. CNT.	3227	3300	2640	2649	2533					
WET DENS.	121.5	120.4	119.6	119.5	121.3					
MSTRE. CNT.	236	228	234	220	237					
MOISTURE	23.0	23.2	24.1	22.6	24.5					
DRY DENS.	98.4	97.1	95.4	96.9	96.6					
% MOISTURE	23.4	23.9	25.3	23.3	25.3					
STD. DENS.	101.6	101.6	101.6	101.6	101.6					
OPT. MSTR.	22.7	22.7	22.7	22.7	22.7					
% COMP.	96.9	95.6	94.0	95.4	95.3					
MSTRE. CORR.										
PROCTOR NO.										
% REQUIRED	95	95	95	95	95					

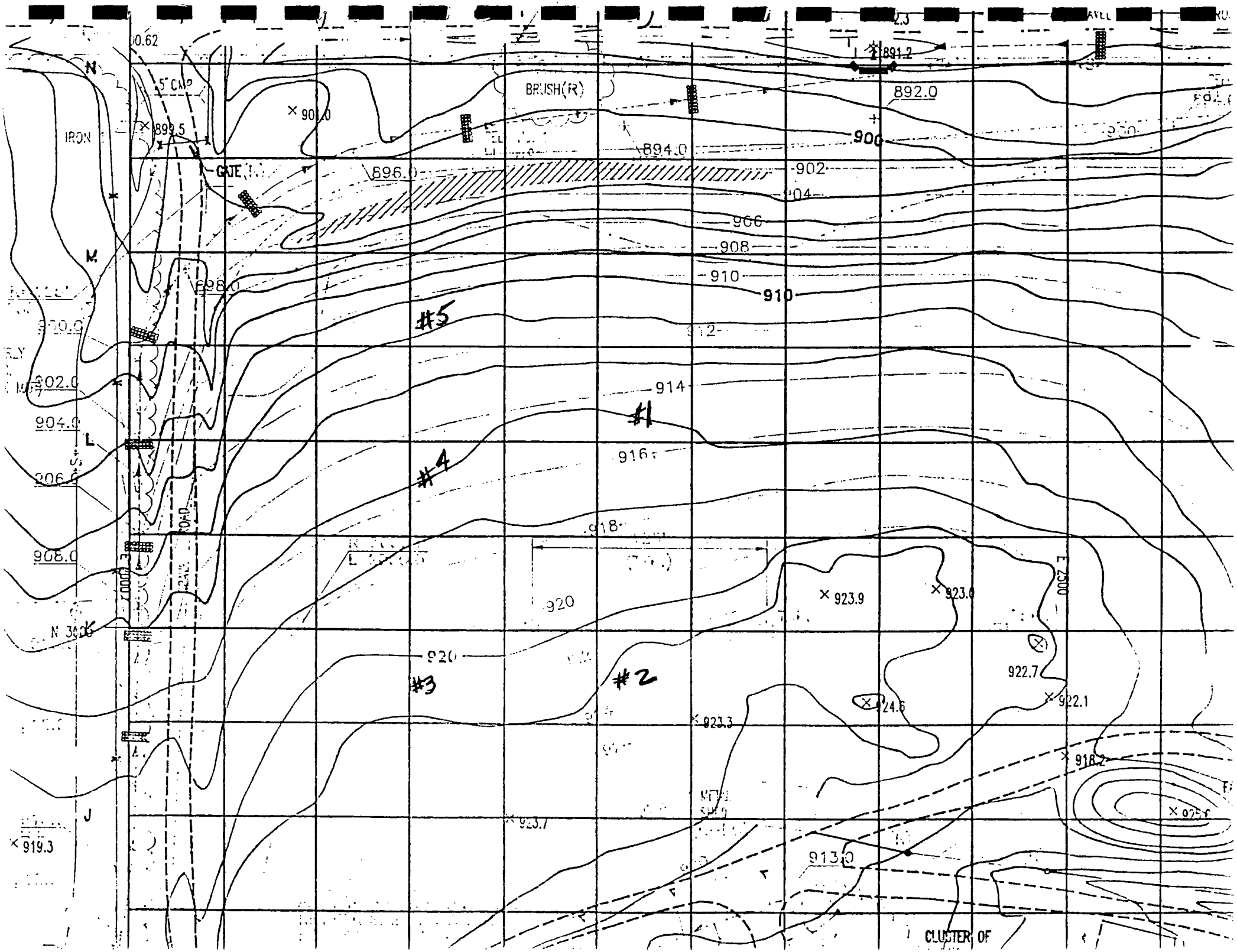
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay	20.0	102.3


BRUSH(R)
IRON
GATE
892.0
894.0
896.0
898.0
900
902
904
906
908
910
912
914
916
918
920
922
#1
#2
#3
#4
#5
891.2
899.5
923.9
923.0
922.7
922.1
924.6
923.3
923.7
918.2
913.0
919.3
CLUSTER OF

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2594	556
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 8/17 19 94
WEATHER 85° Sunny
TESTED BY: Jeff Meadows
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	350,100	L,100	K50,200	K,100	I75,475	I25,375	H75,425	I60,425	I25,475	H75,375
OFFSET										
ELEVATION	9"	9"	18"	18"	9"	9"	9"	18"	18"	18"
MODE & DEPTH	4"	4"	6"	6"	4"	4"	4"	6"	6"	6"
DENS. CNT.	3378	3270	2537	2533	3251	3374	3357	2698	2622	2468
WET DENS.	119.2	120.7	121.2	121.4	121.0	119.2	119.5	118.7	119.9	122.4
MSTRE. CNT.	230	239	239	224	237	230	233	226	236	243
MOISTURE	22.7	23.7	23.7	22.1	23.5	22.1	23.1	22.3	23.4	24.2
DRY DENS.	96.6	97.0	97.5	99.3	97.5	96.5	96.5	96.6	96.5	98.2
% MOISTURE	23.6	24.5	24.3	22.3	24.1	23.6	23.9	23.1	24.2	24.6
STD. DENS.	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6
OPT. MSTR.	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7
% COMP.	95.1	95.5	96.0	97.7	96.0	95.0	95.0	95.1	95.0	96.7
MSTRE. CORR.										
PROCTOR NO.	5	5	5	5	5	5	5	5	5	5
% REQUIRED	95	95	95	95	95	95	95	95	95	95

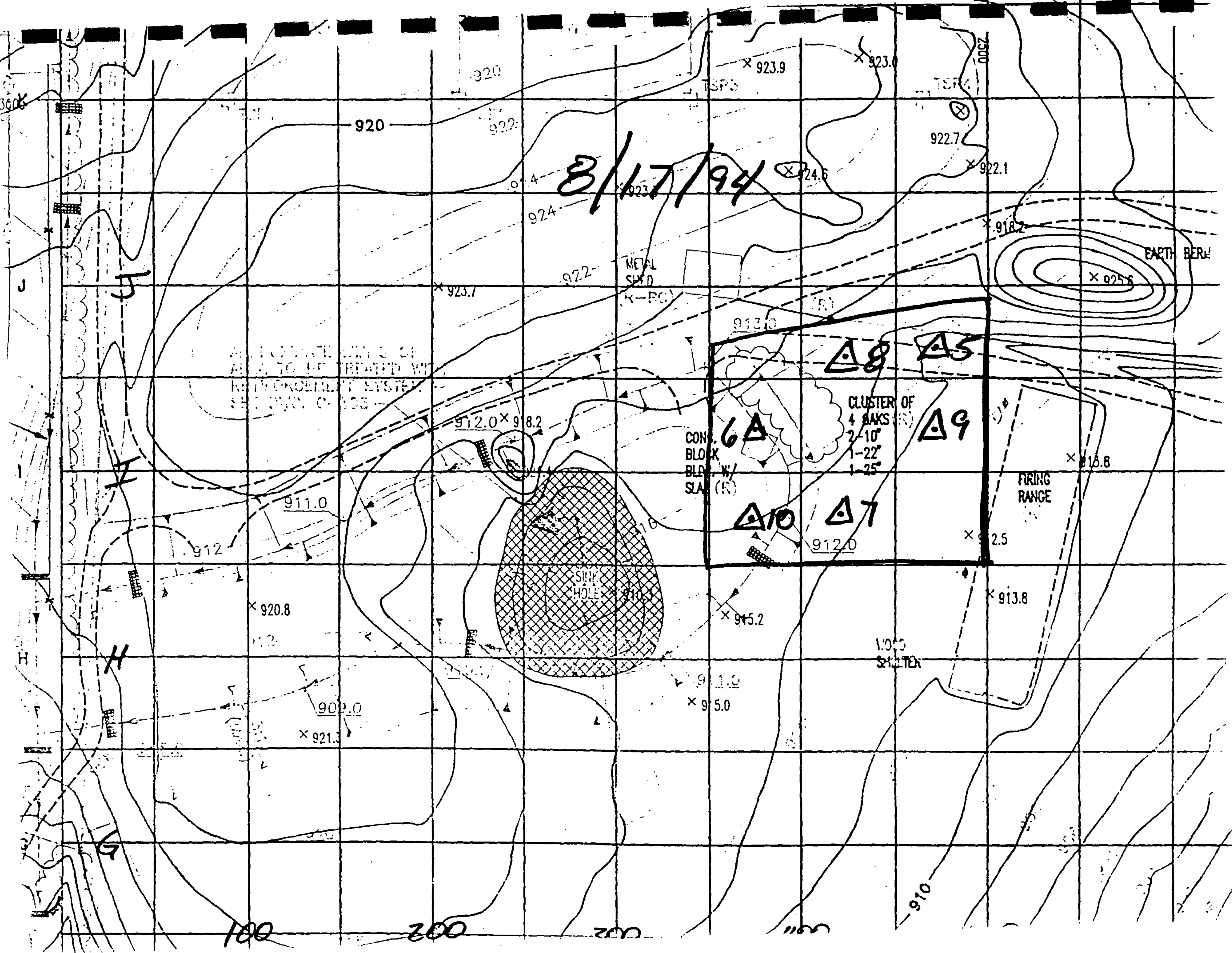
REMARKS _____

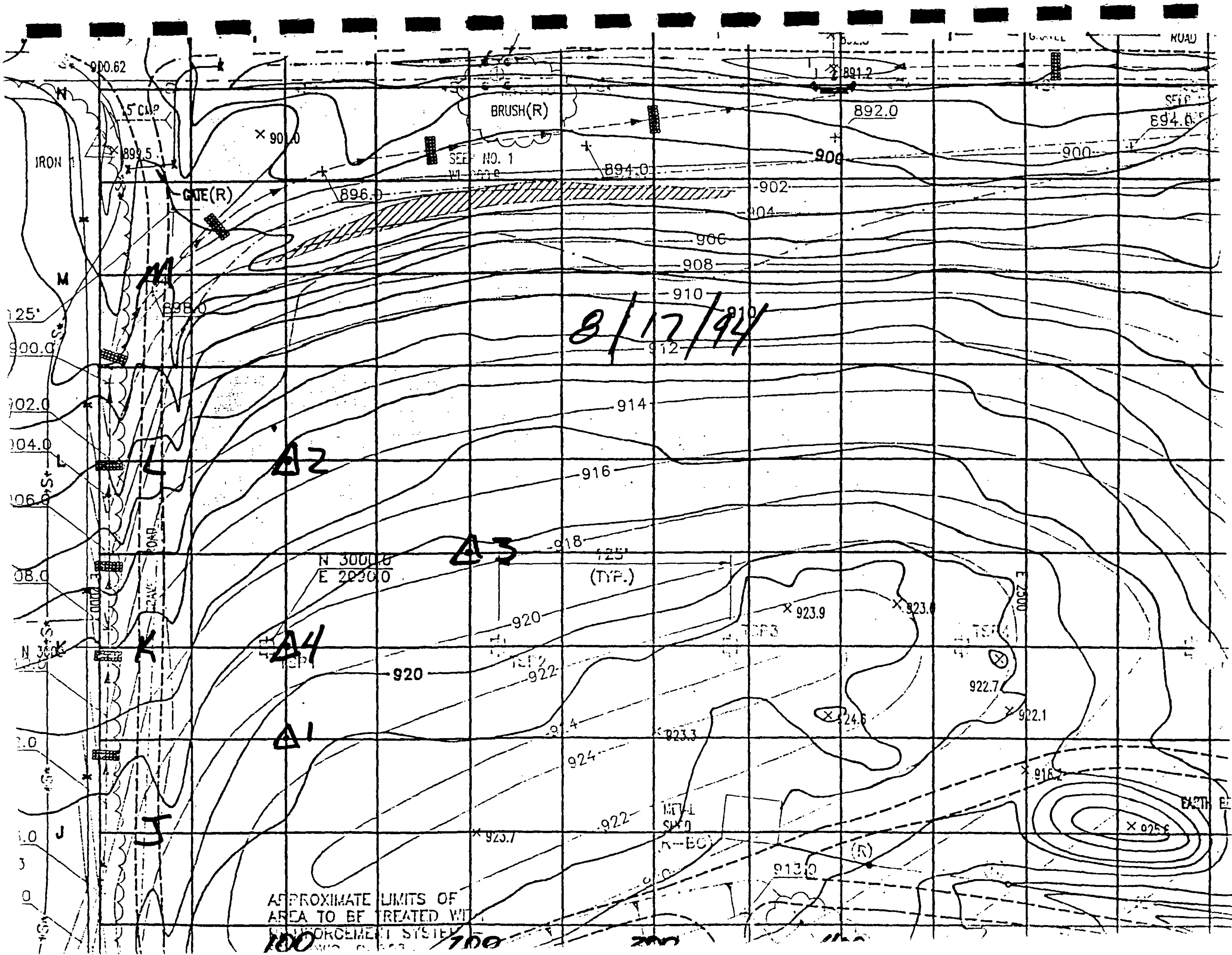
DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay	20.0	102.3


8/17/94
920
924
922
923.9
923.0
922.7
922.1
924.6
918.2
EARTH BERM
925.6
923.7
METAL SHED
913.0
CLUSTER OF 4 OAKS
2-10"
1-22"
1-25"
CONC. BLOCK BLDG. W/ SLAB
FIRING RANGE
912.0
918.2
911.0
912
920.8
SINK HOLE
915.2
913.8
912.5
915.0
909.0
921.3
910
J
I
H
G
6
7
8
5
9
10
100
200



900.62
IRON
899.5
GATE(R)
BRUSH(R)
SEEP NO. 1
901.0
896.0
894.0
891.2
892.0
900
902
904
906
908
910
912
914
916
918
920
922
924
8/17/94
M
L
K
J
2
3
4
1
125'
(TYP.)
923.9
922.7
924.6
922.1
923.3
916.2
925.7
913.0
(R)
ROAD
APPROXIMATE LIMITS OF
AREA TO BE TREATED WI
100

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2612	544
STANDARDIZATION LIMITS	6.4	11.7

DATE OF TEST 8/18 19 94
WEATHER 95° Sunny
TESTED BY: Jeff Meadows
CHECKED BY: TLC

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	4+00	4+25, 4+75	5+50, 5+00	5+25, 4+75	5+50, 4+50	6+75, 3+75	6+75, 4+25			
OFFSET										
ELEVATION	9"	9"	9"	9"	18"	18"	18"			
MODE & DEPTH	4"	4"	4"	4"	6"	6"	6"			
DENS. CNT.	3277	3236	3300	3379	2731	2459	2630			
WET DENS.	120.9	121.6	120.6	119.5	118.5	122.9	120.1			
MSTRE. CNT.	226	214	228	219	205	214	236			
MOISTURE	23.9	22.5	24.1	23.1	21.4	22.5	23.4			
DRY DENS.	97.1	99.1	96.5	96.6	97.1	100.4	96.5			
% MOISTURE	24.6	22.7	25.0	23.9	22.1	22.4	24.2			
STD. DENS.	101.6	101.6	101.6	101.6	101.6	101.6	101.6			
OPT. MSTR.	22.7	22.7	22.7	22.7	22.7	22.7	22.7			
% COMP.	95.6	97.6	95.0	95.1	95.6	98.9	95.0			
MSTRE. CORR.										
PROCTOR NO.	5	5	5	5	5	5	5			
% REQUIRED	95	95	95	95	95	95	95			

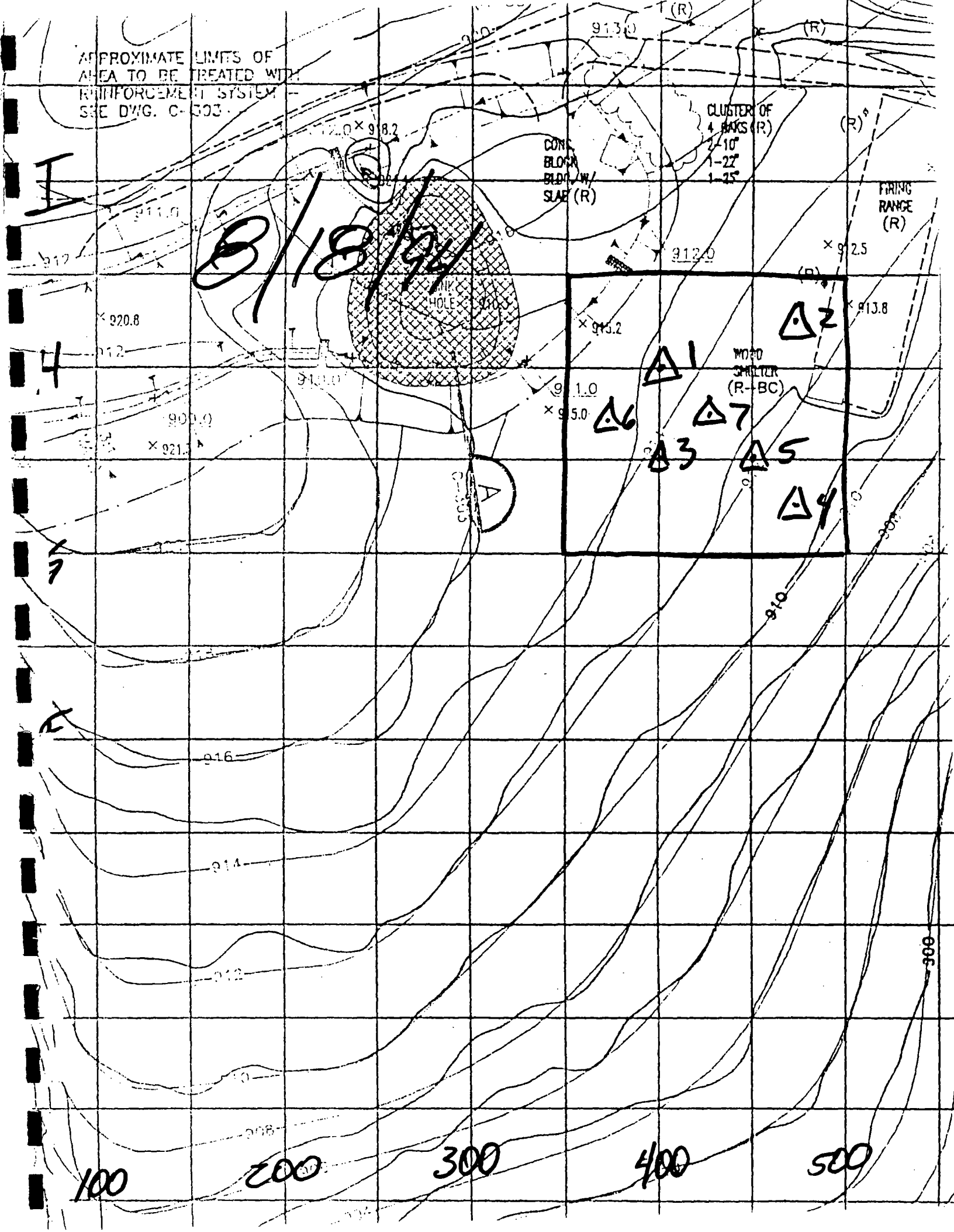
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay	20.0	102.3


APPROXIMATE LIMITS OF AREA TO BE TREATED WITH REINFORCEMENT SYSTEM - SEE DWG. C-503
CONC. BLOCK BLDG. W/ SLAB (R)
CLUSTER OF 4 BAKS (R) 2-10' 1-22' 1-35'
FIRING RANGE (R)
WOOD SHELTER (R-BC)
SINK HOLE
Δ1
Δ2
Δ3
Δ4
Δ5
Δ6
Δ7
8/18/94
100
200
300
400
500

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	6.4	556
STANDARDIZATION LIMITS	2606	11.7

DATE OF TEST 8/19 19 94
WEATHER 85° Cloudy
TESTED BY: Jeff Meadows
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	F75.550	F25.550	F50.600	F75.650	F50.550	F25.600	F25.650	E75.400	E75.450	
OFFSET										
ELEVATION	9"	9"	9"	9"	18"	18"	18"	9"	18"	
MODE & DEPTH	4"	4"	4"	4"	6"	6"	6"	4"	6"	
DENS. CNT.	3333	3217	3403	3464	2429	2699	2424	3380	2649	
WET DENS.	120.0	121.6	119.0	118.1	123.1	118.7	123.1	119.2	119.5	
MSTRE. CNT.	215	235	218	213	229	217	246	213	221	
MOISTURE	21.7	23.9	22.0	21.5	23.6	22.2	25.5	21.8	22.7	
DRY DENS.	98.3	97.7	96.9	96.6	99.5	96.5	97.6	97.4	96.8	
% MOISTURE	22.1	24.5	22.7	22.2	23.7	23.0	26.1	22.4	23.4	
STD. DENS.	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	101.6	
OPT. MSTR.	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	
% COMP.	96.8	96.2	95.4	95.1	98.0	95.0	96.1	95.9	95.3	
MSTRE. CORR.										
PROCTOR NO.	5	5	5	5	5	5	5	5	5	
% REQUIRED	95	95	95	95	95	95	95	95	95	

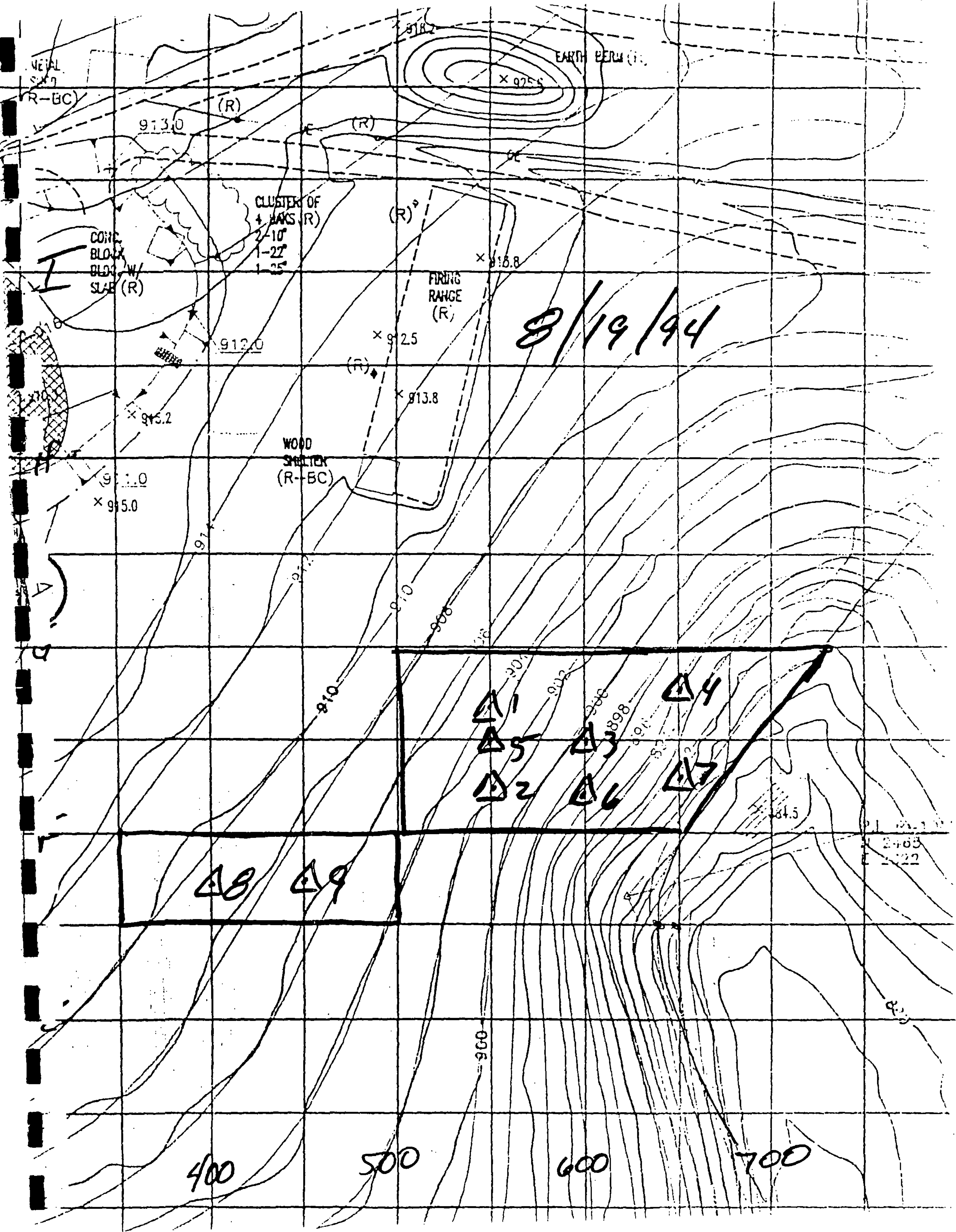
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay		



EARTH BERM (R)
× 925.5
(R)
913.0
CLUSTER OF 4 OAKS (R) 2-10" 1-22" 1-25"
CONC. BLOCK BLDG. W/ SLAB (R)
(R)
× 915.8
FIRING RANGE (R)
× 912.5
8/19/94
(R)
× 913.8
× 915.2
WOOD SHELTER (R-BC)
× 915.0
910
908
904
902
900
898
1
2
3
4
5
6
7
8
9
400
500
600
700

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	6.4	~~550~~ 11.7
STANDARDIZATION LIMITS	2607	550

DATE OF TEST 8/22 19 94
WEATHER 85° SUNNY
TESTED BY: JEFF MOORE
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	~~E50,400~~	~~E50,475~~	E,425	~~E50,450~~	E,400	E,450	E,550	~~E50,575~~		
OFFSET										
ELEVATION	9"	9"	9"	18"	18"	18"	9"	9"		
MODE & DEPTH	4"	4"	4"	6"	6"	6"	4"	4"		
DENS. CNT.	3200	3226	3201	2578	2539	2603	3482	3176		
WET DENS.	122.0	121.5	122.0	120.4	121.3	120.3	117.9	122.3		
MSTRE. CNT.	214	227	211	225	229	231	204	226		
MOISTURE	21.4	23.3	21.5	23.1	23.5	23.8	20.7	23.2		
DRY DENS.	100.1	98.2	100.5	97.3	97.8	97.6	97.2	99.1		
% MOISTURE	21.8	23.7	21.4	23.7	24.1	24.6	21.3	23.4		
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3		
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0		
% COMP.	98.6	96.7	98.2	95.1	95.6	95.4	95.0	96.9		
MSTRE. CORR.										
PROCTOR NO.	8	8	8	8	8	8	8	8		
% REQUIRED	95	95	95	95	95	95	95	95		

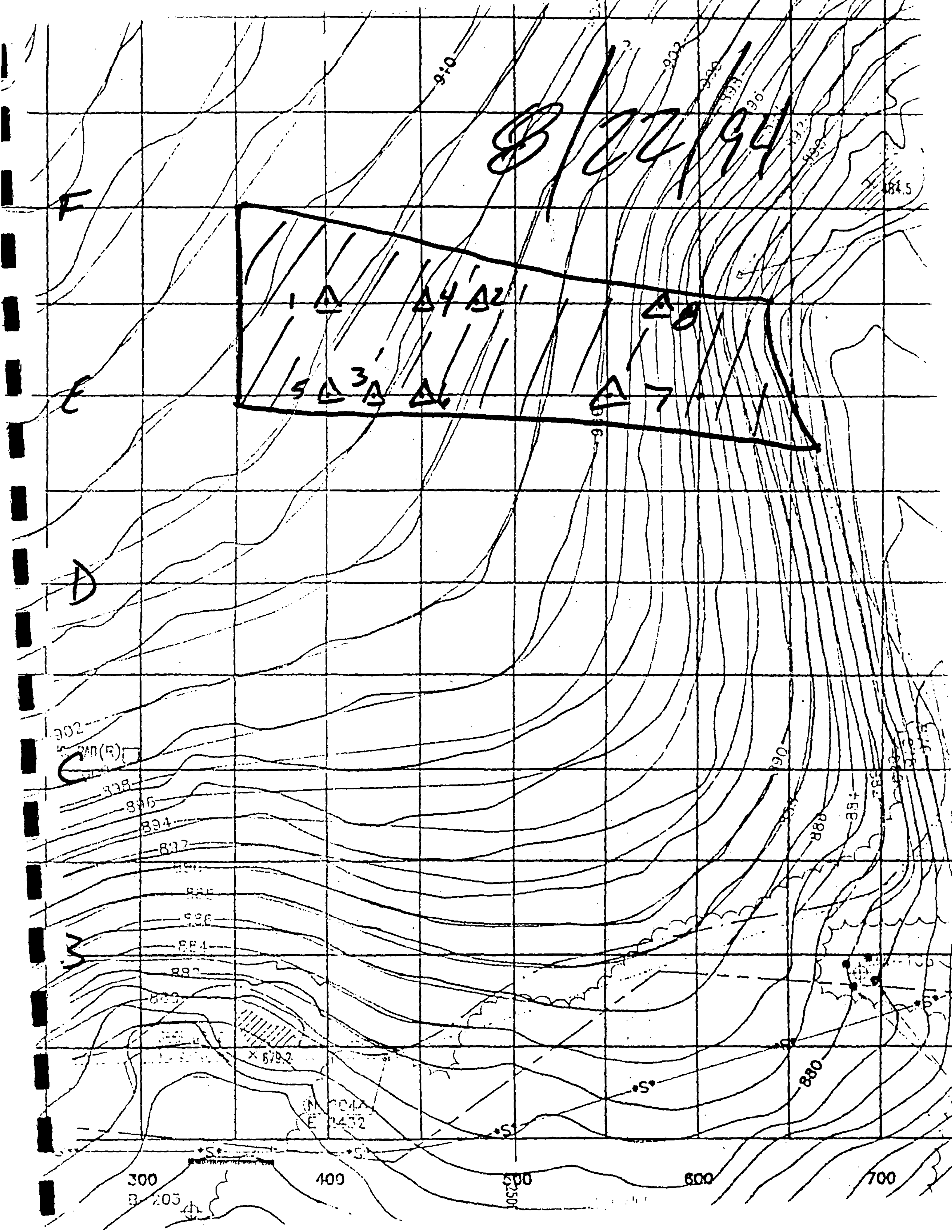
REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay	20.0	102.3



8/22/94
F
E
D
C
1
2
3
4
5
6
7
8
910
902
898
896
894
890
888
880
884.5
679.2
300
400
500
600
700

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-8695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DATE OF TEST 8/24 19 94
WEATHER 90° P. Sunny
TESTED BY: Jeff Meadows
CHECKED BY:

DAILY STANDARD COUNTS	DENSITY (DS)	MOISTURE (MS)
COUNTS	2611	532
STANDARDIZATION LIMITS	6.4	11.7

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	E.550	E.600	DS.400	CS0,425	DS0.450	D.375	CS0,400			
OFFSET										
ELEVATION	18"	18	9	9	18	18	9			
MODE & DEPTH	6"	6	4	4	6	6	4			
DENS. CNT.	2557	2473	3306	3263	2511	2509	3265			
WET DENS.	121.1	122.5	120.5	121.7	121.9	121.9	121.1			
MSTRE. CNT.	219	220	210	200	220	216	214			
MOISTURE	23.2	23.4	22.2	21.0	23.4	22.9	22.7			
DRY DENS.	97.8	99.1	98.2	100.1	98.5	99.0	98.4			
% MOISTURE	23.8	23.6	22.6	21.0	23.7	23.1	23.0			
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3	102.3			
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0	20.0			
% COMP.	95.7	96.9	96.1	97.9	96.3	96.8				
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	3	3			
% REQUIRED										

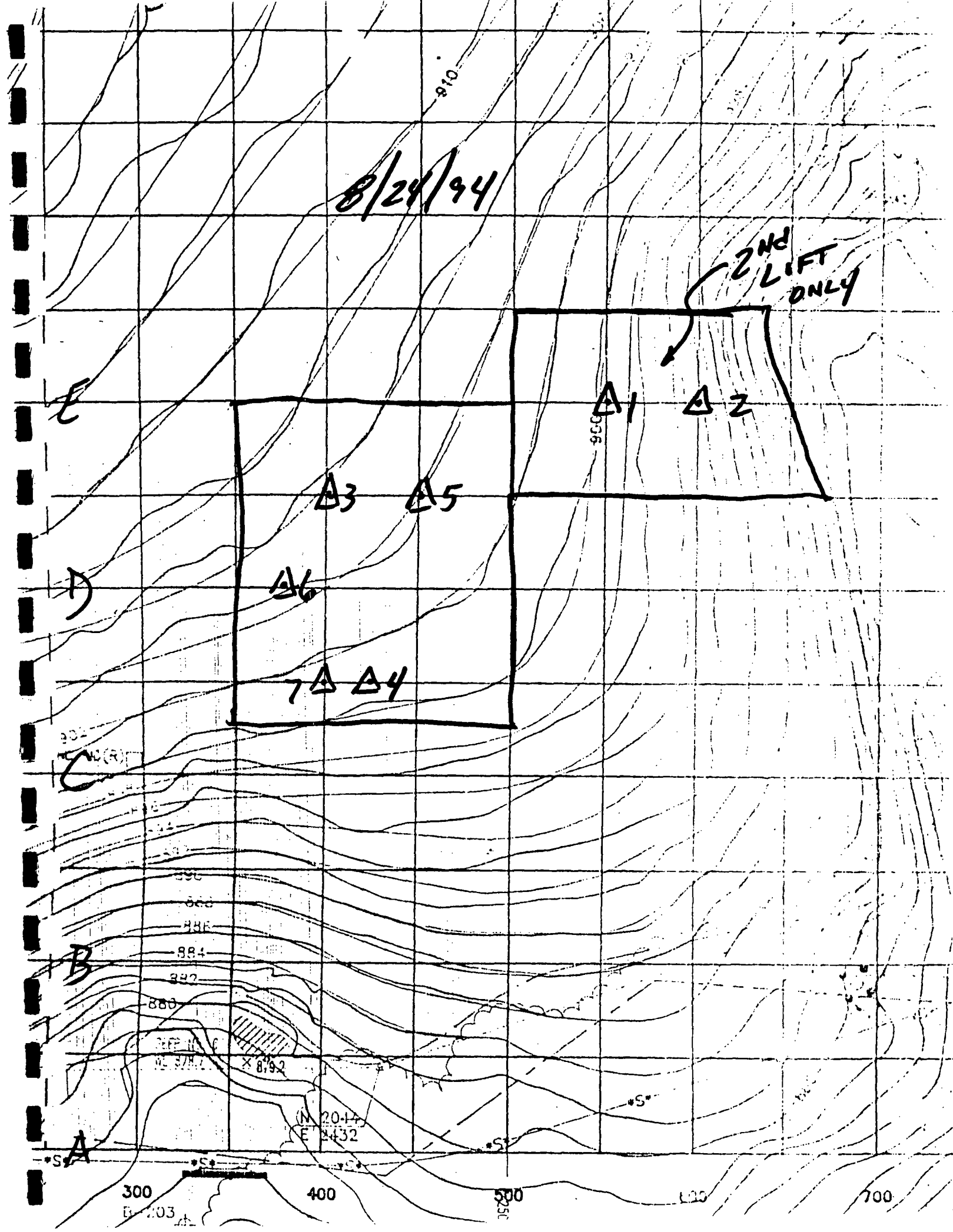
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay	20.0	102.3


8/24/94
2ND LIFT ONLY
Δ1
Δ2
Δ3
Δ5
Δ6
Δ4
E
D
C
B
A
910
890
888
886
884
882
880
300
400
500
700

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-8696

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2602	560
STANDARDIZATION LIMITS	6.4	11.7

DATE OF TEST 8/26 19 94
WEATHER 90° Cloudy
TESTED BY: Jeff Meadows
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	B50.375	B50.450	C.600	B50.650	B50.400	B75.475	B25.525	B25.380	B25.450	
OFFSET										
ELEVATION	9	9	9	9	18	18	18	9	18	
MODE & DEPTH	4	4	4	4	6	6	6	4	6	
DENS. CNT.	3148	3390	3316	3112	2567	2706	2577	3412	2536	
WET DENS.	122.5	118.9	118.9	123.1	120.7	118.5	120.5	118.6	121.3	
MSTRE. CNT.	230	216	233	226	222	208	229	207	205	
MOISTURE	23.5	21.8	23.7	22.9	22.5	20.9	23.3	20.8	20.6	
DRY DENS.	99.1	97.2	97.3	100.1	98.2	97.6	97.2	97.8	100.7	
% MOISTURE	23.6	22.5	24.6	22.9	22.9	21.4	23.9	21.3	20.5	
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
% COMP.	96.9	95.1	95.1	97.9	96.0	95.4	95.1	95.7	98.5	
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	3	3	3	3	
% REQUIRED										

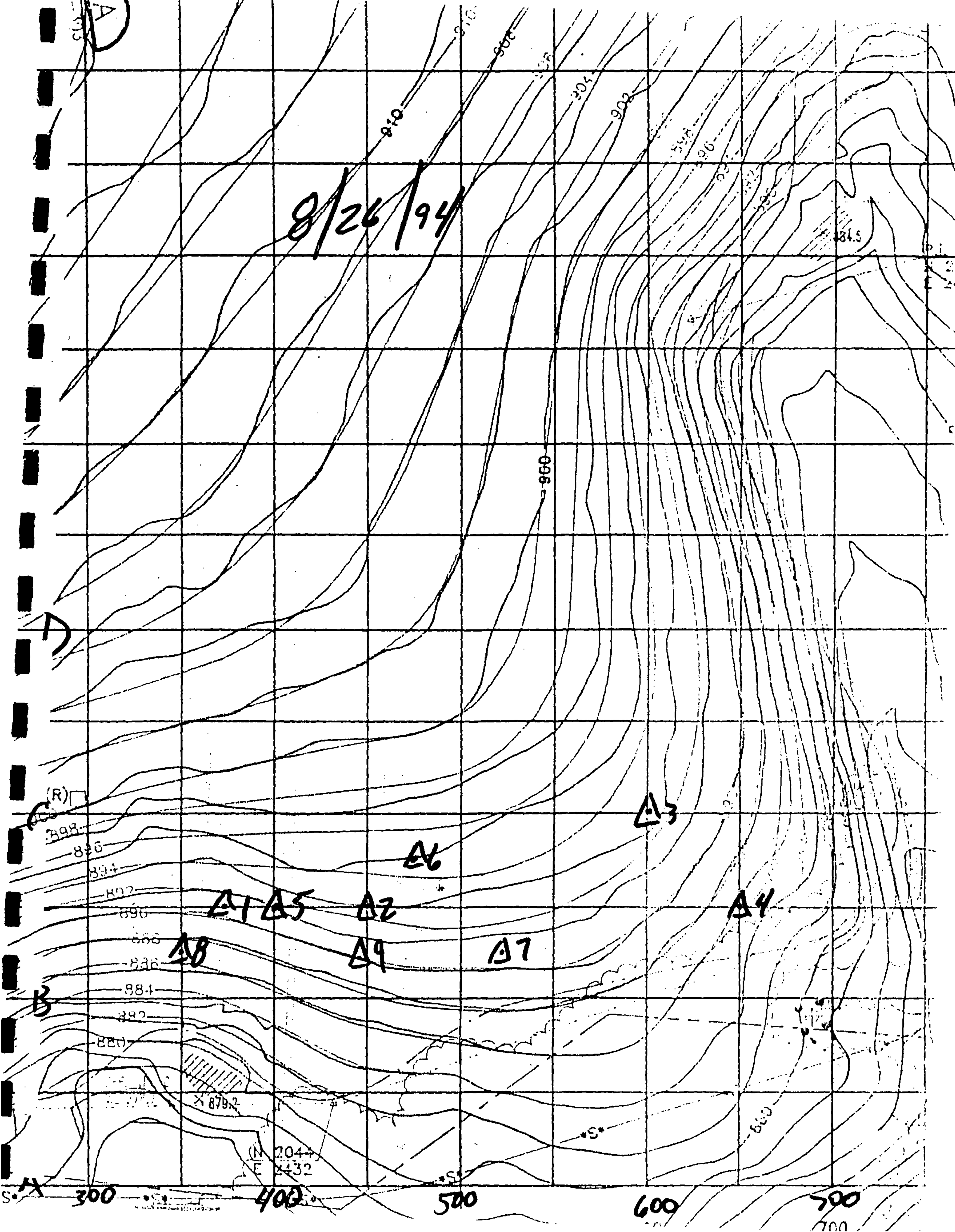
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay	20.0	102.3



8/26/94
910
908
906
904
902
900
898
896
894
892
890
888
886
884
882
880
(R)
X 879.2
(N 2044
E 2432
884.5
D
C
B
A
Δ1
Δ2
Δ3
Δ4
Δ5
Δ6
Δ7
Δ8
Δ9
300
400
500
600
700

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2606	556
STANDARDIZATION LIMITS	6.4	11.7

DATE OF TEST 9/1 19 94
WEATHER 68° Cloudy
TESTED BY: Jeff Meddows
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	B&D.300									
OFFSET										
ELEVATION	9	9	9	9	9	18	18	18	18	
MODE & DEPTH	4	4	4	4	4	6	6	6	6	
DENS. CNT.	3179	3222	3231	3432	3200	2731	2524	2799	2551	
WET DENS.	122.1	121.7	121.5	118.6	122.0	118.4	121.7	112.4	121.2	
MSTRE. CNT.	213	208	210	205	213	206	210	199	224	
MOISTURE	21.2	20.9	21.2	20.6	21.5	20.7	21.2	19.9	22.7	
DRY DENS.	100.9	100.8	100.4	98.0	100.5	97.7	100.5	93.4	98.4	
% MOISTURE	21.0	20.8	21.1	21.0	21.4	21.2	21.0	20.4	23.1	
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
% COMP.	98.6	98.5	98.2	95.8	98.3	95.5	98.3	95.3	96.3	
MSTRE. CORR.										
PROCTOR NO.	8	8	8	8	8	8	8	8	8	
% REQUIRED										

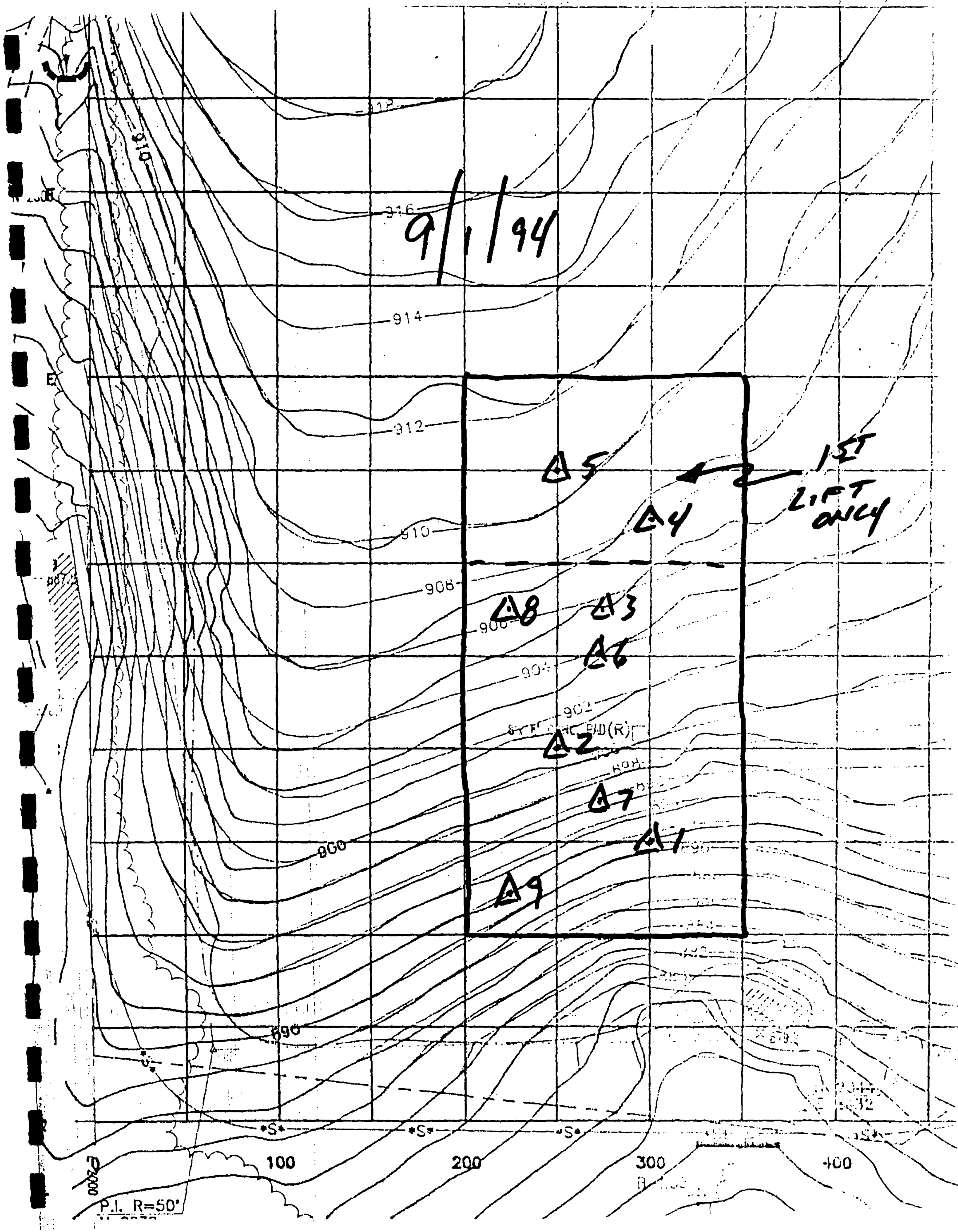
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay	20.0	102.3


9/1/94
1ST LIFT ONLY
Δ5
Δ4
Δ8
Δ3
Δ6
Δ2
Δ7
Δ1
Δ9
916
914
912
910
908
906
904
902
900
890
0
100
200
300
400
P.I. R=50'

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-8695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DATE OF TEST 9/2 19 94
WEATHER 70° SUNNY
TESTED BY: JEFF MEADOWS
CHECKED BY:

DAILY STANDARD COUNTS	DENSITY (DS)	MOISTURE (MS)
COUNTS	2610	547
STANDARDIZATION LIMITS	6.4	11.7

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	E05,225	F,300	F50.250	D00.250	E,300	E50.275				
OFFSET										
ELEVATION	9	9	9	18	18	18				
MODE & DEPTH	4	4	4	6	6	6				
DENS. CNT.	3185	3229	3444	2561	2719	2761				
WET DENS.	122.2	121.6	119.5	121.0	118.6	118.0				
MSTRE. CNT.	220	221	206	231	201	201				
MOISTURE	22.7	22.8	21.1	23.9	20.5	20.5				
DRY DENS.	99.6	98.9	97.4	97.2	98.1	97.5				
% MOISTURE	22.8	23.1	21.6	24.6	20.9	21.1				
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3				
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0				
% COMP.	97.4	96.6	95.3	95.0	95.9	95.3				
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	3				
% REQUIRED										

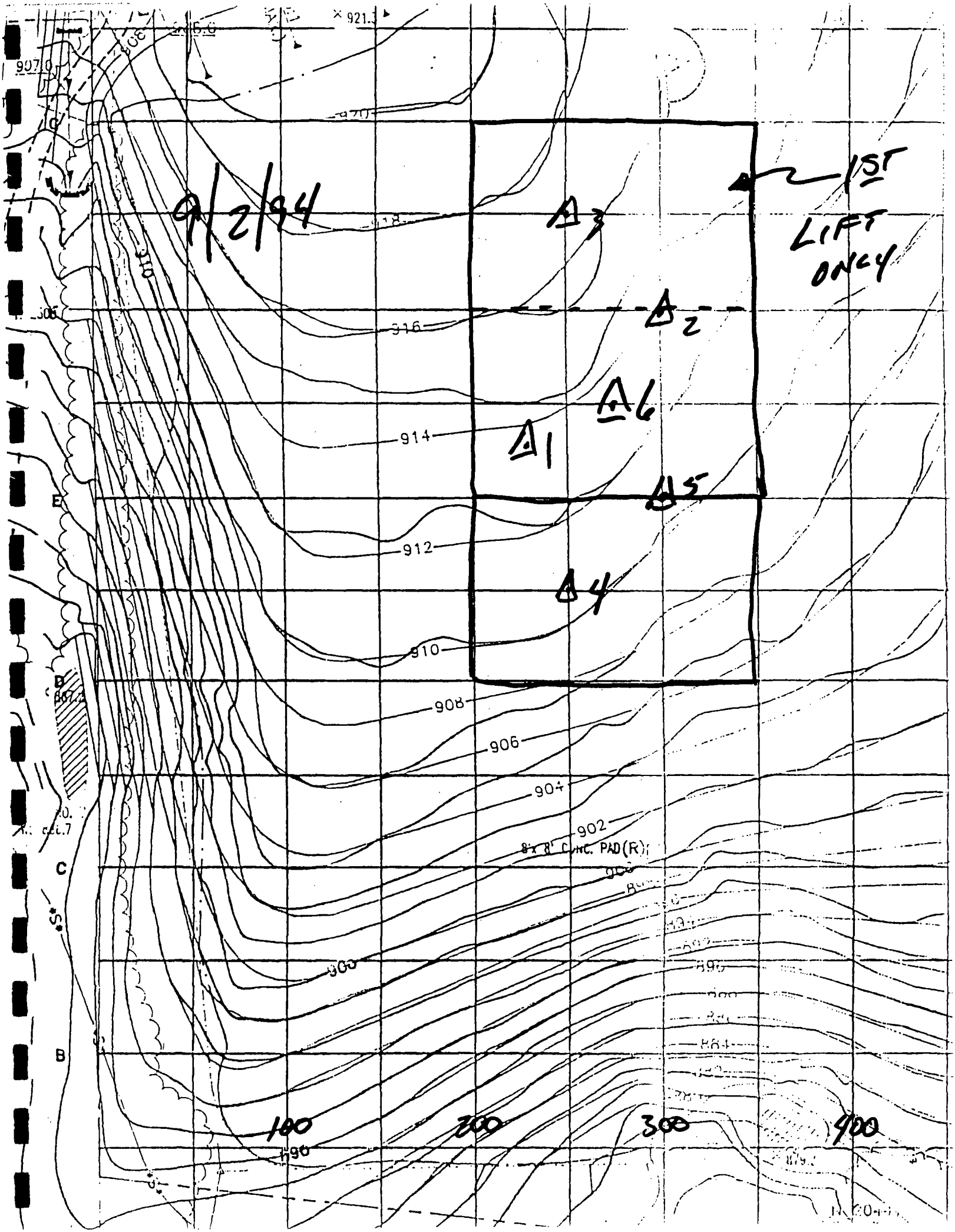
DENSITY	MOISTURE

REMARKS

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Light Brown Clay	20.0	102.3


9/2/94
A3
A2
A6
A1
A5
A4
1ST
LIFT
ONLY
914
912
910
908
906
904
902
8' x 8' CONC. PAD (R)
100
200
300
400

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2600	560
STANDARDIZATION LIMITS	6.4	11.7

DATE OF TEST 9/7 19 94
WEATHER 80° SUNNY
TESTED BY: JEFF MEDDERS
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	G,300	F75,275	F50,250	G75,300	H,275	H40,225	I35,455	J,540		
OFFSET										
ELEVATION	18	18	18	9	9	9	9	9		
MODE & DEPTH	6	6	6	4	4	4	4	4		
DENS. CNT.	2505	2533	2523	3282	3149	3224	3673	3994		
WET DENS.	121.8	121.4	121.5	120.6	122.5	114.3	115.1	111.3		
MSTRE. CNT.	239	226	237	226	239	258	271	227		
MOISTURE	24.2	22.7	24.0	22.7	24.2	26.3	27.4	22.6		
DRY DENS.	97.6	98.6	97.5	97.8	98.3	88.0	87.7	88.7		
% MOISTURE	24.8	23.1	24.6	23.3	24.6	29.8	31.2	25.5		
STD. DENS.	102.3	102.3	102.3	102.3	102.3	91.8	91.8	91.8		
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	26.3	26.3	26.3		
% COMP.	95.4	96.4	95.3	95.7	96.2	95.9	95.6	96.7		
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	4	4	4		
% REQUIRED										

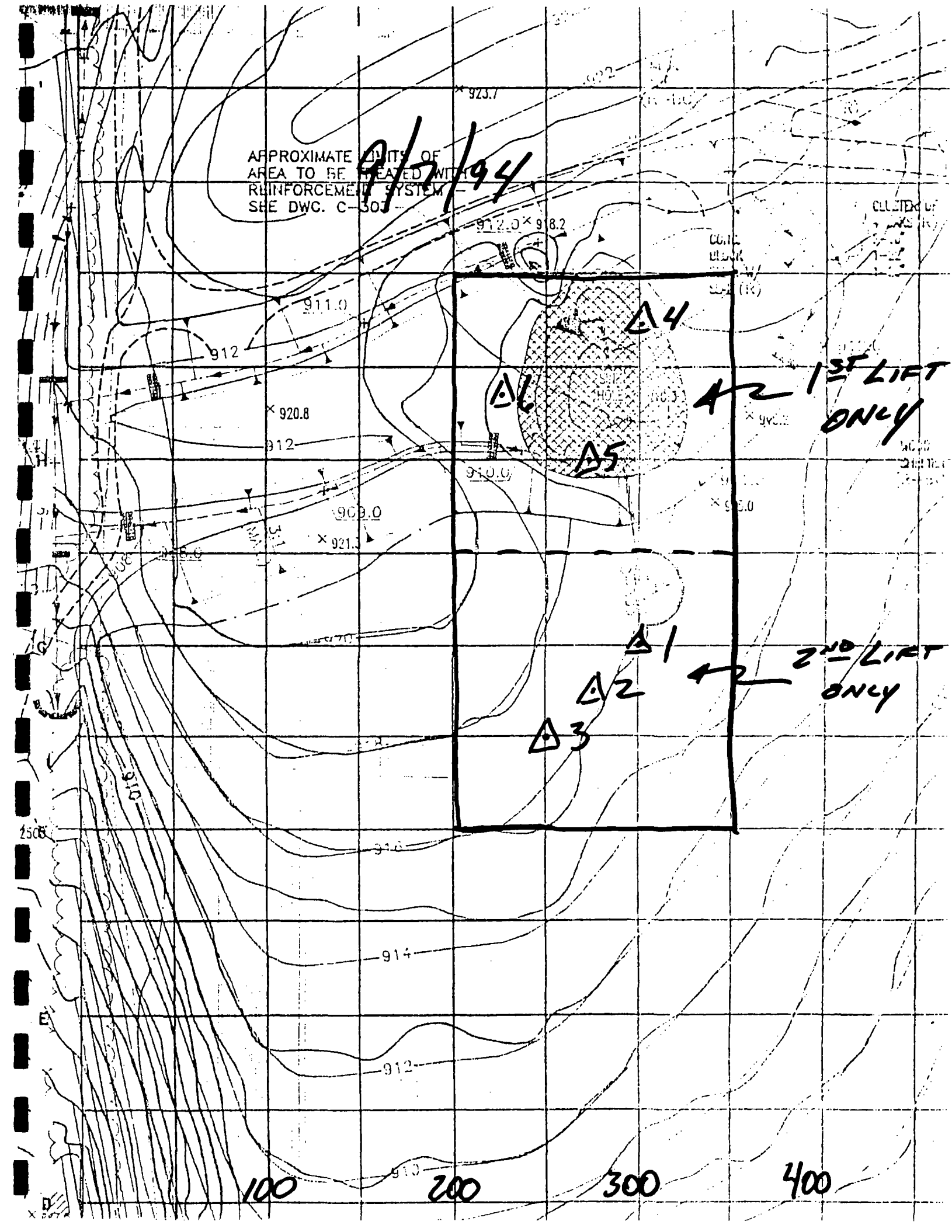
REMARKS

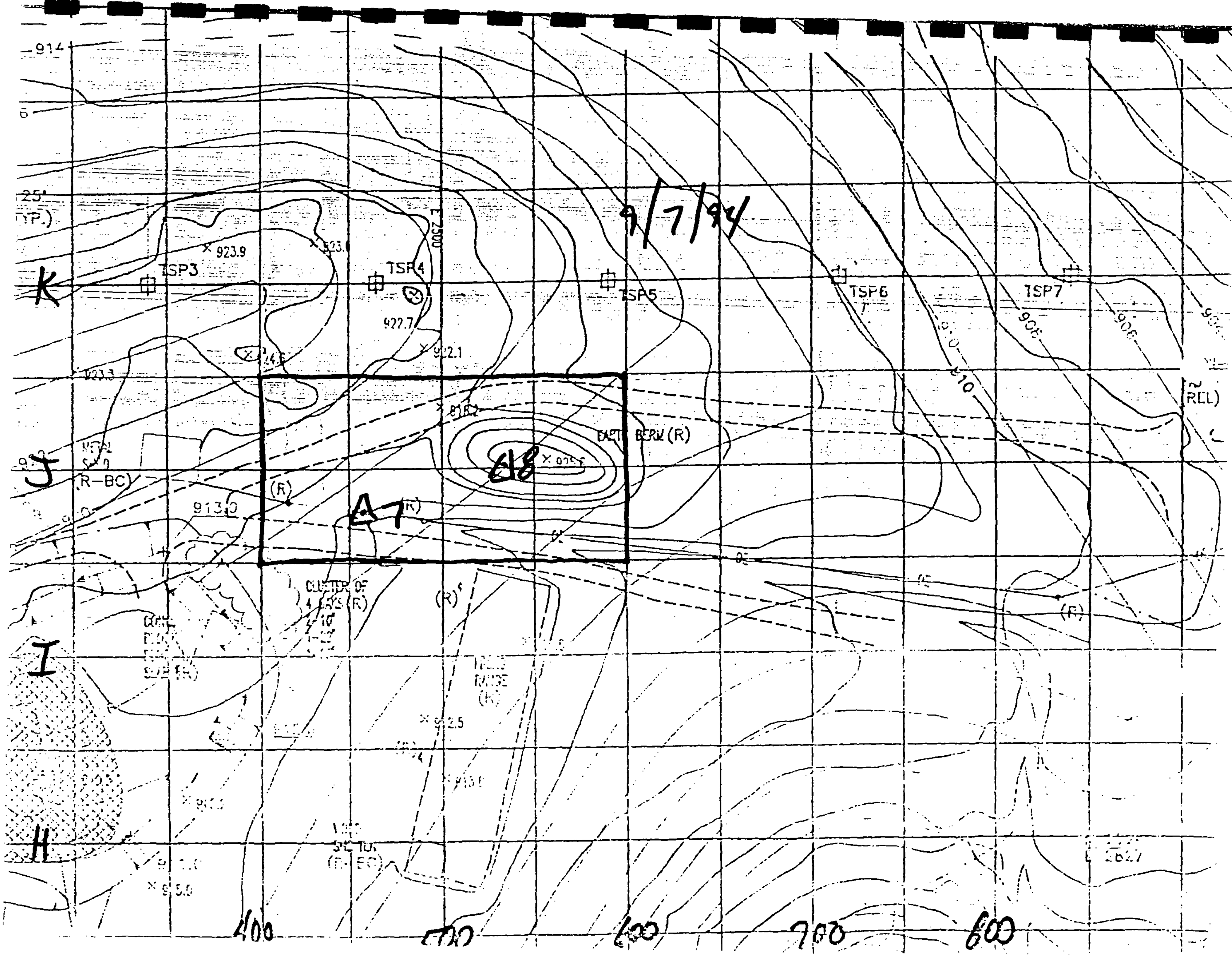
DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1


APPROXIMATE LIMITS OF
AREA TO BE TREATED WITH
REINFORCEMENT SYSTEM -
SEE DWG. C-307
9/7/94
912.0
918.2
911.0
912
920.8
912
910.0
909.0
921.3
Δ4
Δ1
Δ5
1ST LIFT
ONLY
Δ1
Δ2
Δ3
2ND LIFT
ONLY
914
912
910
100
200
300
400



914
25'
923.9
TSP3
TSP4
TSP5
TSP6
TSP7
922.7
922.1
K
J
I
H
9/7/94
EARTH BERM (R)
(R-BC)
(R)
913.0
A7
A8
(R)
906
910
REL)
400
600
700
800

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2598	560
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/8 19 94
WEATHER 85° SUNNY
TESTED BY: JEFF MEDDERS
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION										
OFFSET										
ELEVATION	9	9	18	18	18					
MODE & DEPTH	4	4	6	6	6					
DENS. CNT.	3481	3282	2893	2744	2783					
WET DENS.	117.6	121.3	115.8	117.9	117.3					
MSTRE. CNT.	232	234	223	231	232					
MOISTURE	23.4	23.6	22.4	23.3	23.4					
DRY DENS.	94.2	97.6	93.3	94.6	93.9					
% MOISTURE	24.8	24.2	24.0	24.6	24.9					
STD. DENS.	97.1	102.3	97.1	97.1	97.1					
OPT. MSTR.	23.2	20.0	23.2	23.2	23.2					
% COMP.	97.0	95.4	96.1	97.4	96.7					
MSTRE. CORR.										
PROCTOR NO.	Avg 3&4	3	Avg 3&4	Avg 3/4	Avg 3/4					
% REQUIRED										

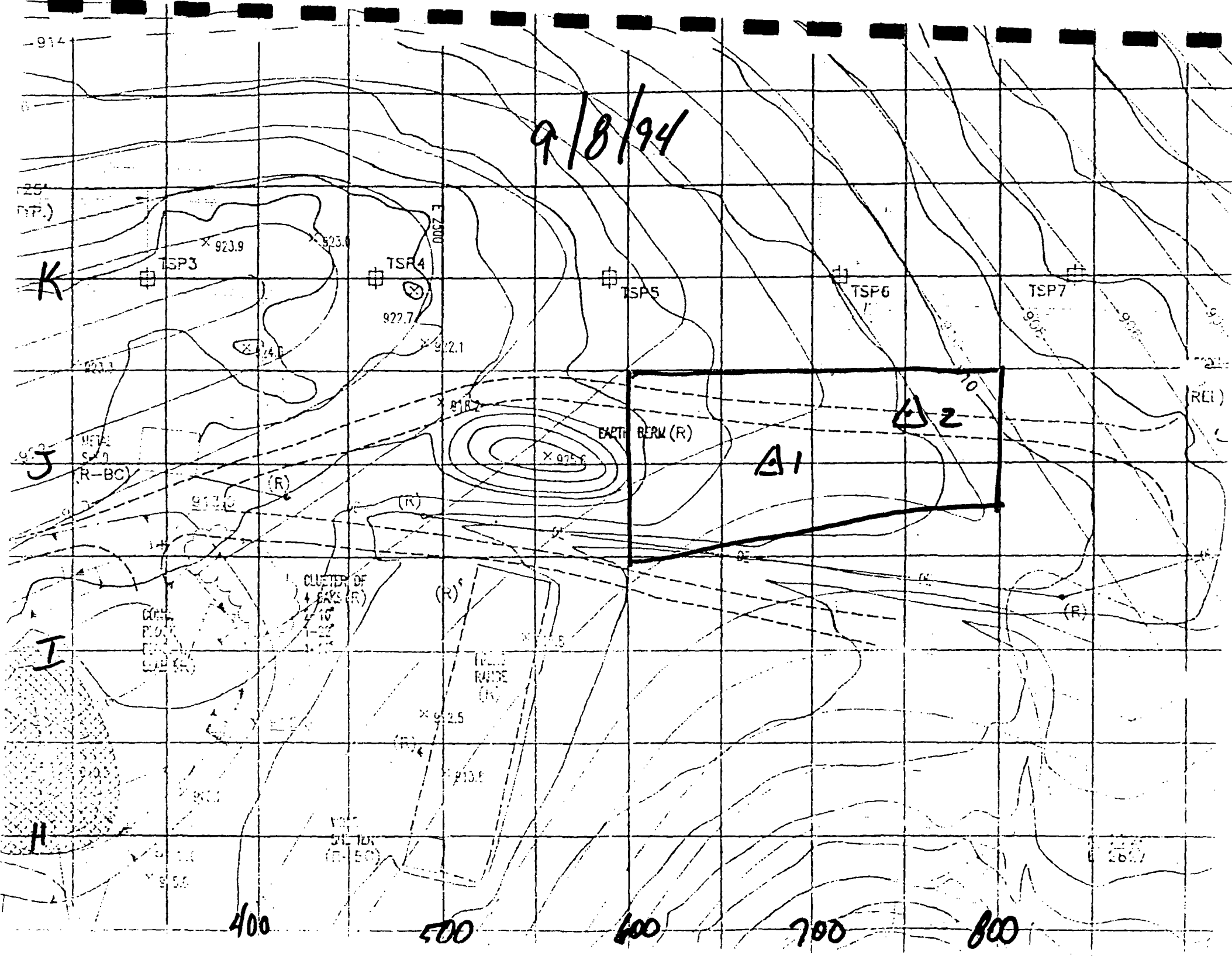
REMARKS

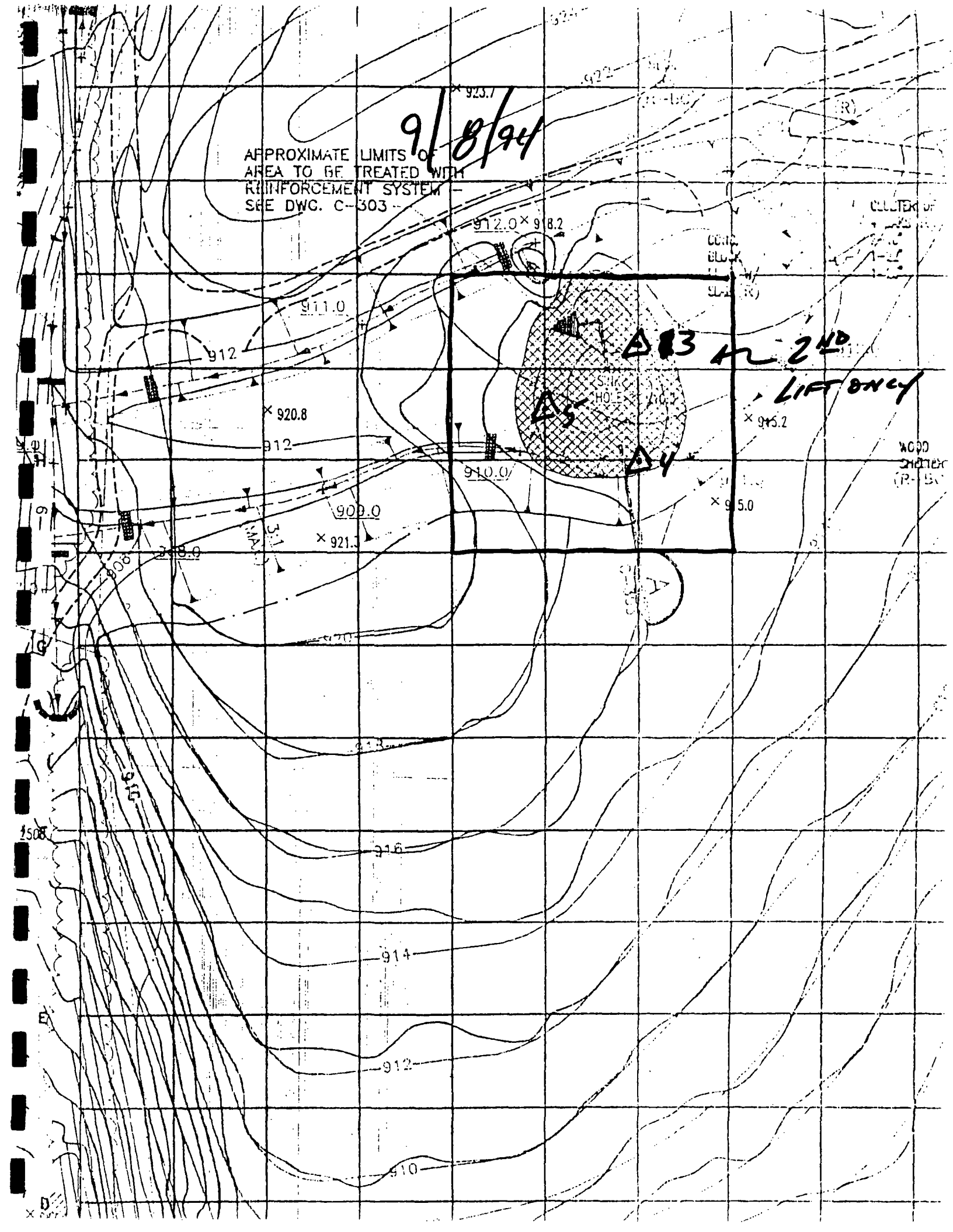
DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1


9/8/94
TSP3
TSP4
TSP5
TSP6
TSP7
923.9
922.7
922.1
EARTH BERM (R)
Δ1
Δ2
K
J
I
H
400
500
600
700
800


9/8/94
APPROXIMATE LIMITS OF
AREA TO BE TREATED WITH
REINFORCEMENT SYSTEM -
SEE DWG. C-303
912.0
918.2
911.0
912
920.8
912
910.0
909.0
921.3
915.2
915.0
Δ3 & 2ND LIFT ONLY
Δ5
Δ4
916
914
912
910

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2602	563
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/9 19 94
WEATHER 85° SUNNY
TESTED BY: JEFF MEDOWS
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	J25,980	J,850	I75,925	J20,500	J,600	I75,450	I75,680	J25,745	I60 925	J,900
OFFSET										
ELEVATION	9	9	9	18	18	18	18	18	18	18
MODE & DEPTH	4	4	4	6	6	6	6	6	6	6
DENS. CNT.	3390	3856	3655	2650	2627	2521	2989	2712	2666	2757
WET DENS.	119.1	112.8	115.4	119.3	119.6	121.5	114.3	118.1	119.1	117.7
MSTRE. CNT.	220	237	225	237	269	240	254	238	251	244
MOISTURE	22.0	23.8	22.5	23.8	27.3	24.2	25.7	23.9	25.1	24.6
DRY DENS.	97.2	89.0	92.9	95.5	92.3	97.4	88.6	94.5	93.7	93.1
% MOISTURE	22.6	26.8	24.2	24.9	29.6	24.8	29.0	25.3	27.0	26.4
STD. DENS.	97.1	91.8	97.1	97.1	97.1	102.3	91.8	97.1	97.1	97.1
OPT. MSTR.	23.2	26.3	23.2	23.2	23.2	20.0	26.3	23.2	23.2	23.2
% COMP.	95.0	96.9	95.7	98.4	95.1	95.2	96.5	97.3	96.5	95.9
MSTRE. CORR.										
PROCTOR NO.	3	4	AVG 3/4	AVG 3/4	AVG 3/4	3	4	AVG 3/4	AVG 3/4	AVG 3/4
% REQUIRED										

REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2602	563
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/9 19 94
WEATHER 85° Sunny
TESTED BY: Jeff Meadows
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	525,950									
OFFSET										
ELEVATION	18									
MODE & DEPTH	6									
DENS. CNT.	2598									
WET DENS.	120.2									
MSTRE. CNT.	255									
MOISTURE	25.8									
DRY DENS.	94.4									
% MOISTURE	27.3									
STD. DENS.	97.1									
OPT. MSTR.	23.2									
% COMP.	97.2									
MSTRE. CORR.										
PROCTOR NO.	Ave 3/4									
% REQUIRED										

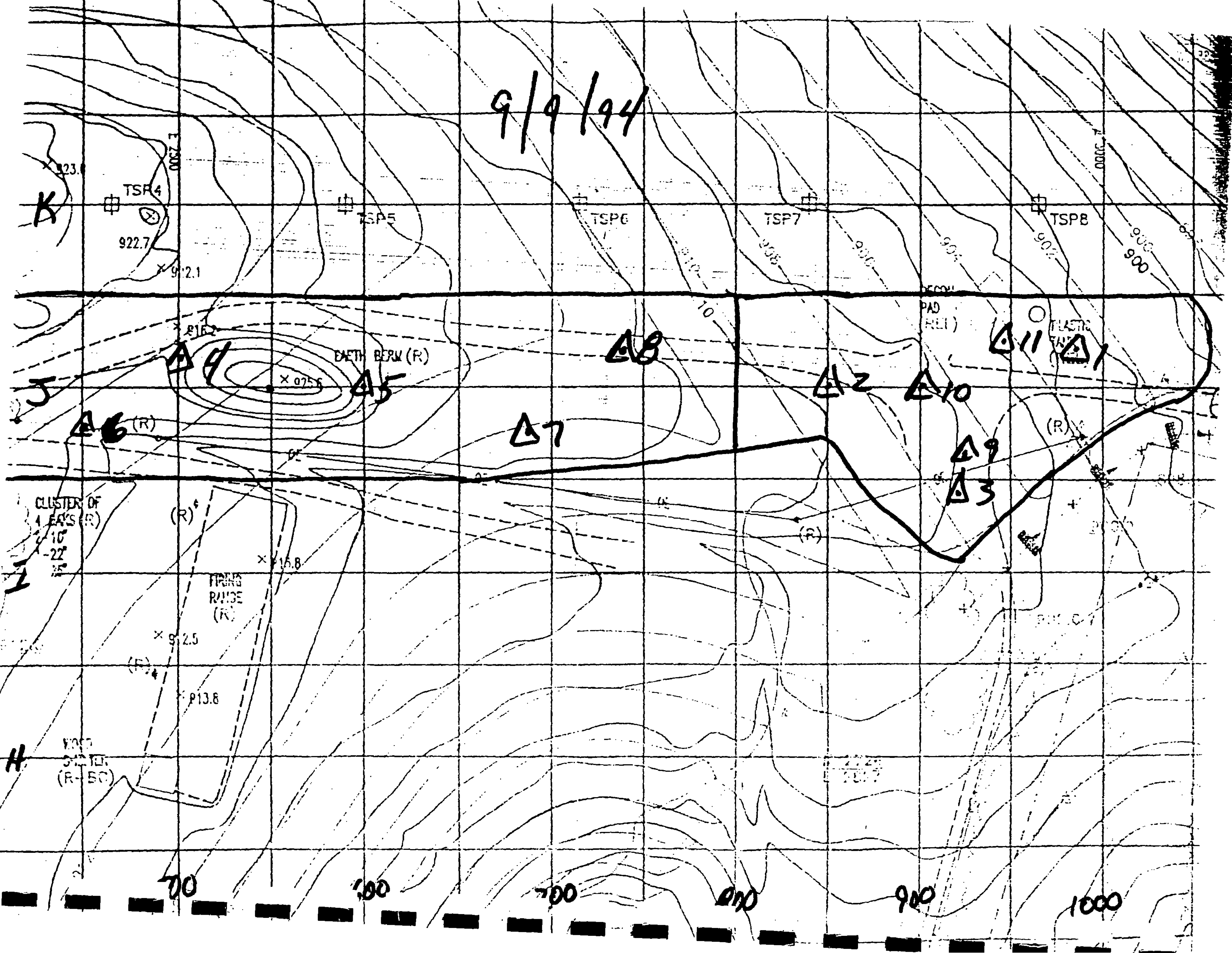
REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1


9/9/94
K
J
I
H
TSP4
TSP5
TSP6
TSP7
TSP8
923.6
922.7
912.1
EARTH BERM (R)
DECON
PAD
Δ1
Δ2
Δ3
Δ4
Δ5
Δ6
Δ7
Δ8
Δ9
Δ10
Δ11
CLUSTER OF
FIRING
RANGE
(R)
915.8
912.5
913.8
500
600
700
800
900
1000

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2610	563
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/12 19 94
WEATHER 88° Sunny
TESTED BY: Jeff Meeks
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	H50,175	H25,140								
OFFSET										
ELEVATION	9	9								
MODE & DEPTH	4	4								
DENS. CNT.	3289	3238								
WET DENS.	120.7	121.4								
MSTRE. CNT.	218	232								
MOISTURE	21.8	23.4								
DRY DENS.	98.9	98.0								
% MOISTURE	22.1	23.8								
STD. DENS.	102.3	102.3								
OPT. MSTR.	20.0	20.0								
% COMP.	96.7	95.8								
MSTRE. CORR.										
PROCTOR NO.	3	3								
% REQUIRED										

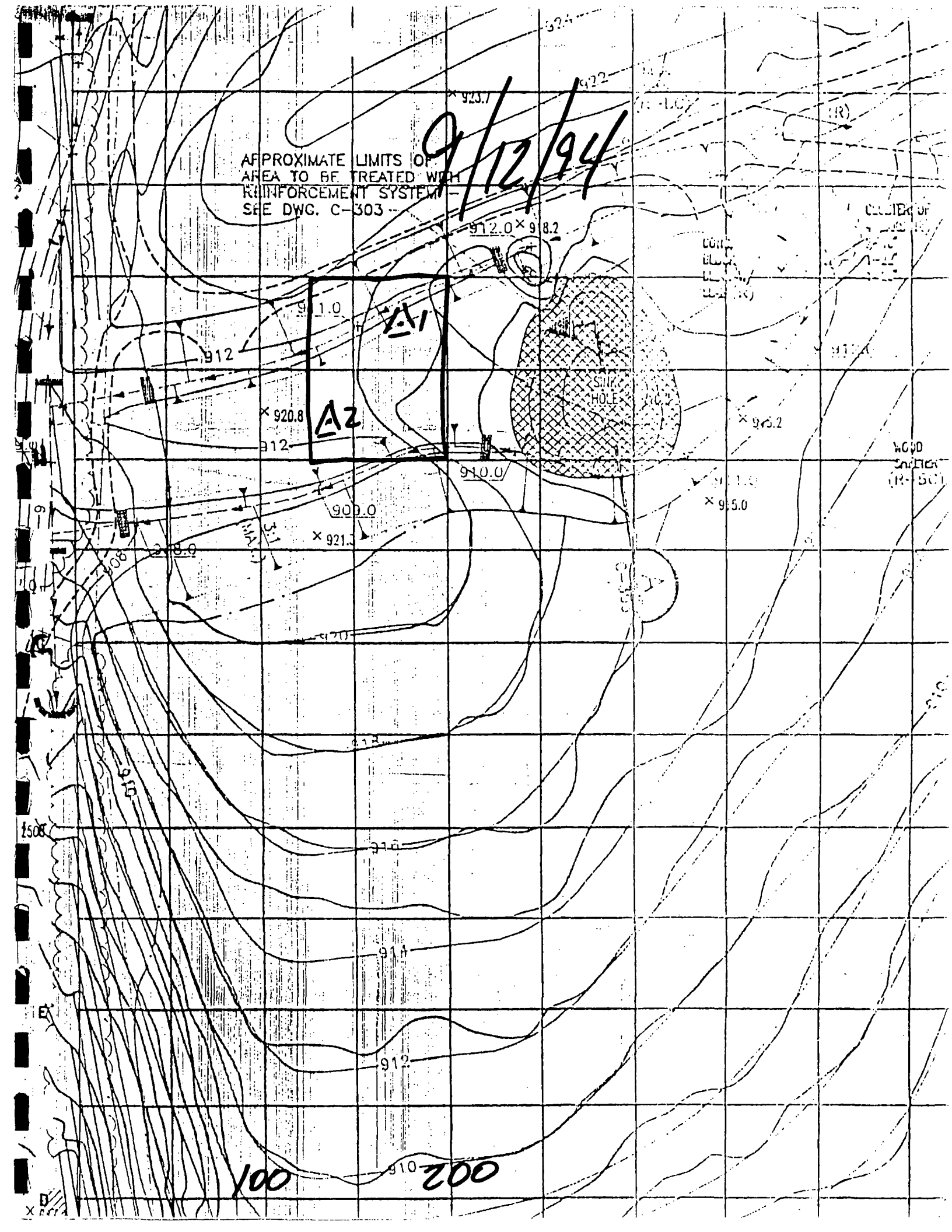
REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1


APPROXIMATE LIMITS OF AREA TO BE TREATED WITH REINFORCEMENT SYSTEM — SEE DWG. C-303
9/12/94
A1
A2
912.0
918.2
911.0
912
920.8
910.0
900.0
921.3
918.0
915.0
SINK HOLE
100
200

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2615	560
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/13 19 94
WEATHER 88° Sunny
TESTED BY: JEFF MEDOWS
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	1125,90	1155,55	660,140	650,75						
OFFSET										
ELEVATION	9	9	9	9						
MODE & DEPTH	4	4	4	4						
DENS. CNT.	3292	3161	3190	3437						
WET DENS.	120.8	122.6	122.2	118.5						
MSTRE. CNT.	220	242	231	252						
MOISTURE	22.1	24.5	23.3	25.6						
DRY DENS.	98.6	98.1	98.9	92.8						
% MOISTURE	22.4	25.0	23.5	27.6						
STD. DENS.	102.3	102.3	102.3	97.1						
OPT. MSTR.	20.0	20.0	20.0	23.2						
% COMP.	96.5	95.9	96.7	95.6						
MSTRE. CORR.										
PROCTOR NO.	3	3	3	Avg. 3/4						
% REQUIRED										

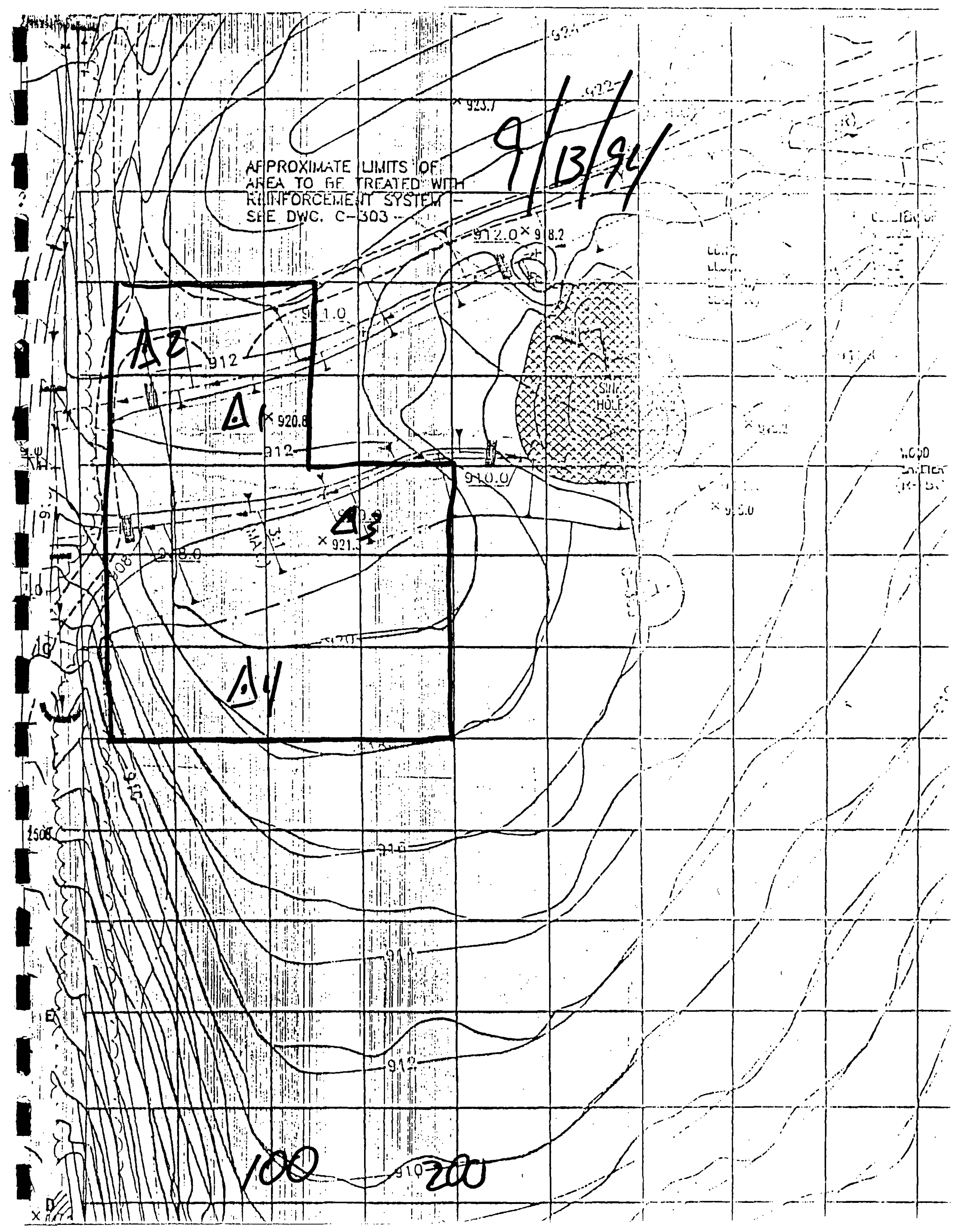
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1



APPROXIMATE LIMITS OF
AREA TO BE TREATED WITH
REINFORCEMENT SYSTEM –
SEE DWG. C-303
9/13/94
923.7
922
912.0
918.2
911.0
912
920.8
910.0
921.3
908.0
SINK HOLE
910
912
100
200
2500

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2600	562
STANDARDIZATION LIMITS	6-4	11.8

DATE OF TEST 9/14 19 94
WEATHER 90° Sunny
TESTED BY: Jeff Meadows
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	F30, 150	E, 150	G60, 140	H25, 150	H, 50	H75, 75				
OFFSET										
ELEVATION	9	9	18	18	18	18				
MODE & DEPTH	4	4	6	6	6	6				
DENS. CNT.	3415	3382	2638	2607	2590	2711				
WET DENS.	118.6	119.0	119.7	120.2	120.2	118.9				
MSTRE. CNT.	234	248	218	223	262	243				
MOISTURE	23.5	25.1	21.8	22.3	26.6	24.5				
DRY DENS.	95.1	93.9	97.9	97.8	93.6	93.9				
% MOISTURE	24.8	26.7	22.2	22.8	28.4	26.1				
STD. DENS.	97.1	97.1	102.3	102.3	97.1	97.1				
OPT. MSTR.	23.2	23.2	20.0	20.0	23.2	23.2				
% COMP.	97.9	96.7	95.7	95.6	96.4	96.6				
MSTRE. CORR.										
PROCTOR NO.	Avg 3/4	Avg 3/4	3	3	Avg 3/4	Avg 3/4				
% REQUIRED										

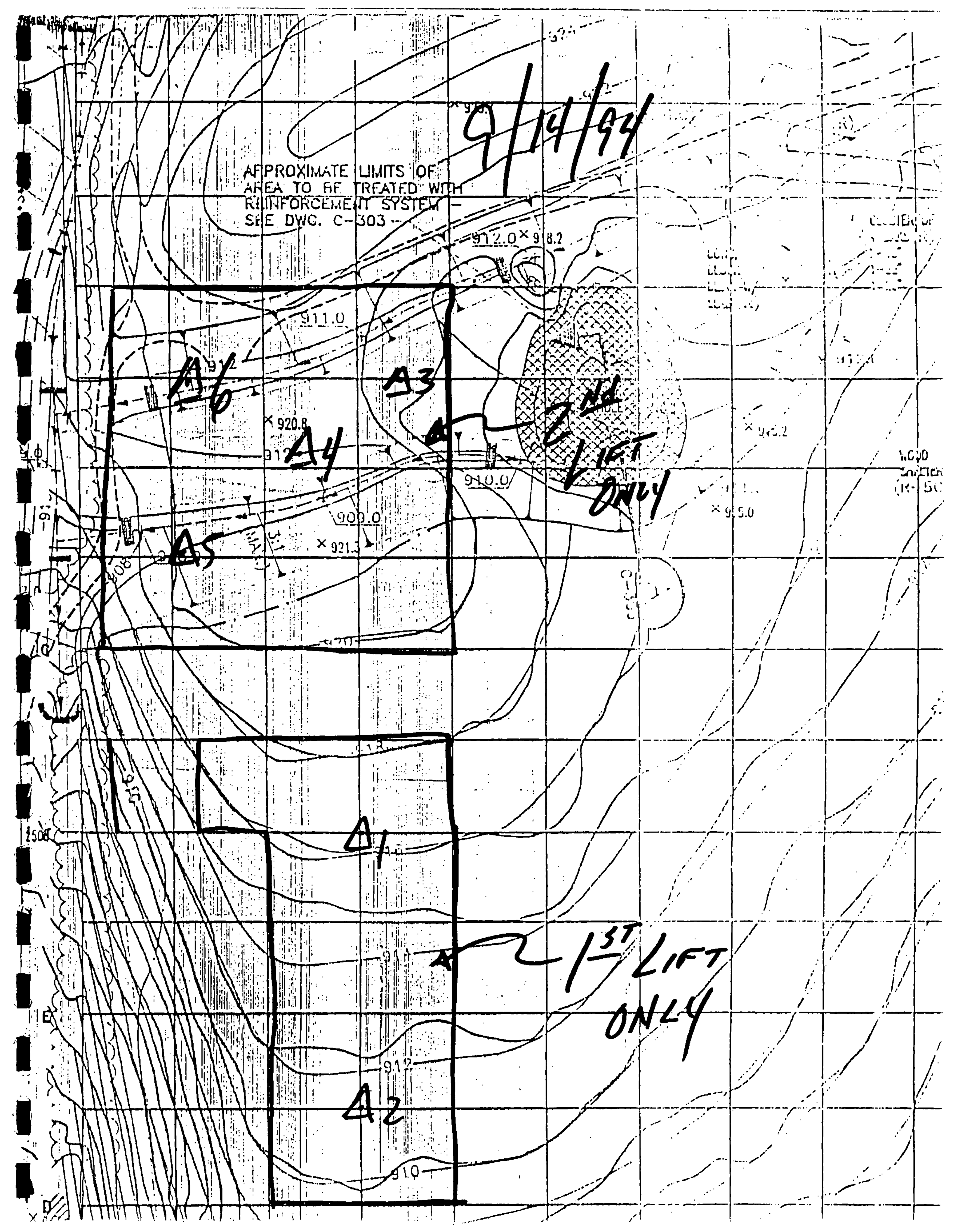
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1


9/14/94
APPROXIMATE LIMITS OF
AREA TO BE TREATED WITH
REINFORCEMENT SYSTEM -
SEE DWG. C-303
912.0
911.0
910.0
909.0
×920.8
×921.3
Δ6
Δ3
Δ4
Δ5
Δ1
Δ2
2ND LIFT ONLY
1ST LIFT ONLY
912
910
WOOD

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2610	550
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/16 19 94
WEATHER 80° M Cloudy
TESTED BY: Jeff Meddas
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	J75, 1250	J85, 1210	J40, 1140	J5, 1160	J30, 1210	K5, 1250	J75, 1180	J25, 1115		
OFFSET										
ELEVATION	9"	9	9	9	18	18	18	18		
MODE & DEPTH	4	4	4	4	6	6	6	6		
DENS. CNT.	3161	3513	3418	3361	2802	2793	2890	2620		
WET DENS.	122.5	117.4	118.7	119.5	117.3	117.3	115.8	120.0		
MSTRE. CNT.	243	238	231	243	224	233	251	246		
MOISTURE	25.1	24.5	23.8	25.1	23.0	24.0	26.0	25.4		
DRY DENS.	97.4	92.8	95.0	94.4	94.3	93.3	89.8	94.5		
% MOISTURE	25.8	26.4	25.0	26.6	24.4	25.7	29.0	26.9		
STD. DENS.	102.3	97.1	97.1	97.1	97.1	97.1	91.8	97.1		
OPT. MSTR.	20.0	23.2	23.2	23.2	23.2	23.2	26.3	23.2		
% COMP.	95.2	95.6	97.8	97.2	97.1	96.1	97.9	97.3		
MSTRE. CORR.										
PROCTOR NO.	3	Avg 3/4	Avg. 3/4	Avg. 3/4	Avg 3/4	Avg 3/4	4	Avg 3/4		
% REQUIRED	95	95	95	95	95	95	95	95		

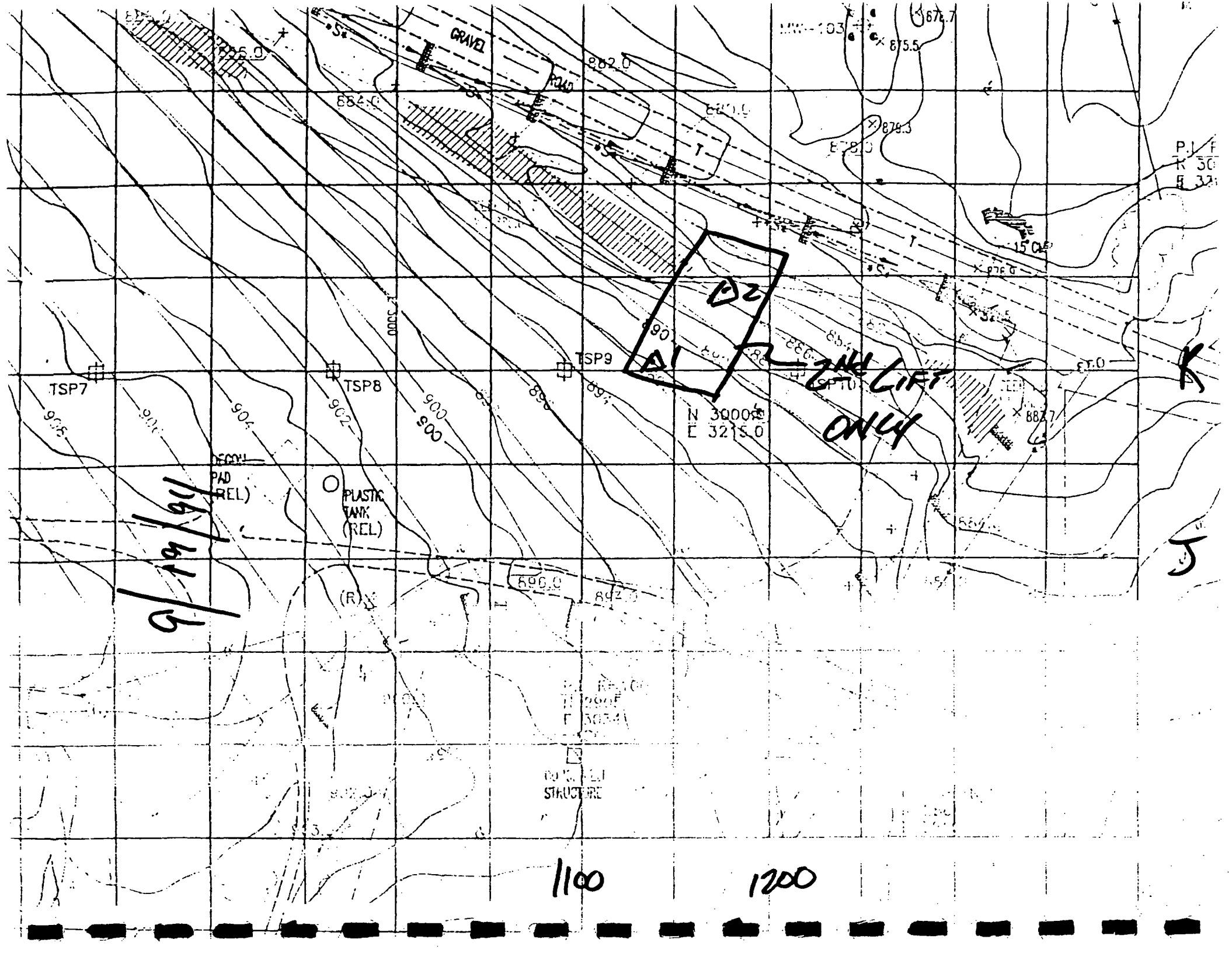
REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0


GRAVEL
ROAD
TSP7
TSP8
TSP9
N 3000
E 3215.0
2ND LIFT
ONLY
PLASTIC
TANK
(REL)
STRUCTURE
1100
1200

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2609	566
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/20 19 94
WEATHER 85° SUNNY
TESTED BY: JEFF MEDDERS
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	K50, 1025	K50, 1075	K60, 1120	K, 1075	K25, 1060	K25, 1110	K60, 1080			
OFFSET										
ELEVATION	9	9	9	9	18	18	18			
MODE & DEPTH	4	4	4	4	6	6	6			
DENS. CNT.	3133	3222	3134	3135	2518	2475	2684			
WET DENS.	123.0	121.6	123.0	122.9	121.6	122.4	119.4			
MSTRE. CNT.	232	242	224	252	236	232	214			
MOISTURE	23.1	24.2	22.3	25.3	24.2	23.7	21.7			
DRY DENS.	99.9	97.3	100.8	97.5	97.5	98.6	97.3			
% MOISTURE	23.2	24.9	22.1	26.0	24.8	24.1	22.3			
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3	102.3			
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0	20.0			
% COMP.	97.6	95.2	98.5	95.4	95.3	96.5	95.2			
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	3	3			
% REQUIRED	95	95	95	95	95	95	95			

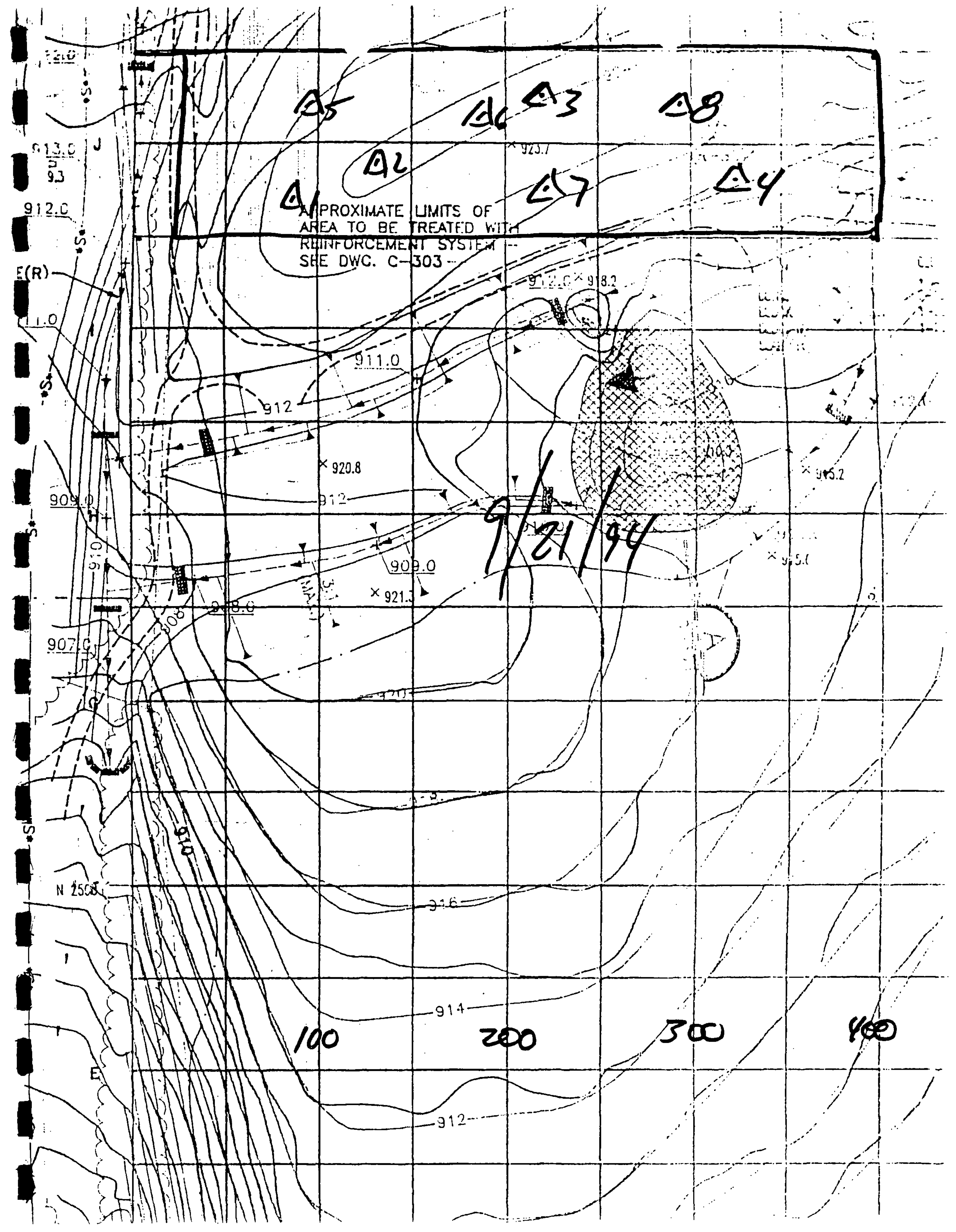
REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0


APPROXIMATE LIMITS OF
AREA TO BE TREATED WITH
REINFORCEMENT SYSTEM
SEE DWG. C-303
△1
△2
△3
△4
△5
△6
△7
△8
9/21/94
912.0
911.0
909.0
907.0
912
916
914
910
909.0
× 920.8
× 921.3
100
200
300
400
N 2500

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2619	556
STANDARDIZATION LIMITS		

DATE OF TEST 9/23 19 94
WEATHER 44° P.C.
TESTED BY: GAK
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION										
OFFSET										
ELEVATION	9	9	9	9	9	18				
MODE & DEPTH	6	6	6	6	6	6				
DENS. CNT.	2573	2365	2008	2672	2298	2339				
WET DENS.	121.1	124.5	122.2	119.4	125.8	125.1				
MSTRE. CNT.	212	244	218	213	223	219				
MOISTURE	21.4	24.9	22.1	21.6	22.7	22.2				
DRY DENS.	99.7	99.5	105.0	97.9	103.1	102.8				
% MOISTURE	21.4	25.0	21.1	22.0	22.0	21.6				
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3				
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0				
% COMP.	97.5	97.3	102.7	95.7	100.8	100.5				
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3					
% REQUIRED	95	95	95	95	95					

REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS		
STANDARDIZATION LIMITS		

DATE OF TEST 9/28 19 94
WEATHER 65° SUNNY
TESTED BY: GAV
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION										
OFFSET										
ELEVATION	9	9	18	9	9	9				
MODE & DEPTH	6	6	4	6	6	6				
DENS. CNT.	2685	2371	3271	2778	2487	2676				
WET DENS.	120.2	124.5	121.1	117.8	122.6	119.5				
MSTRE. CNT.	215	209	218	207	214	218				
MOISTURE	21.5	20.9	21.9		21.2	21.7				
DRY DENS.	98.6	103.7	99.2	96.8	101.4	97.6				
% MOISTURE	21.8	20.1	22.1	21.7	20.7	22.1				
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3				
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0				
% COMP.	96.4	101.4	97.0	94.6	99.1	95.7				
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	3				
% REQUIRED	95	95	95	95	95	95				

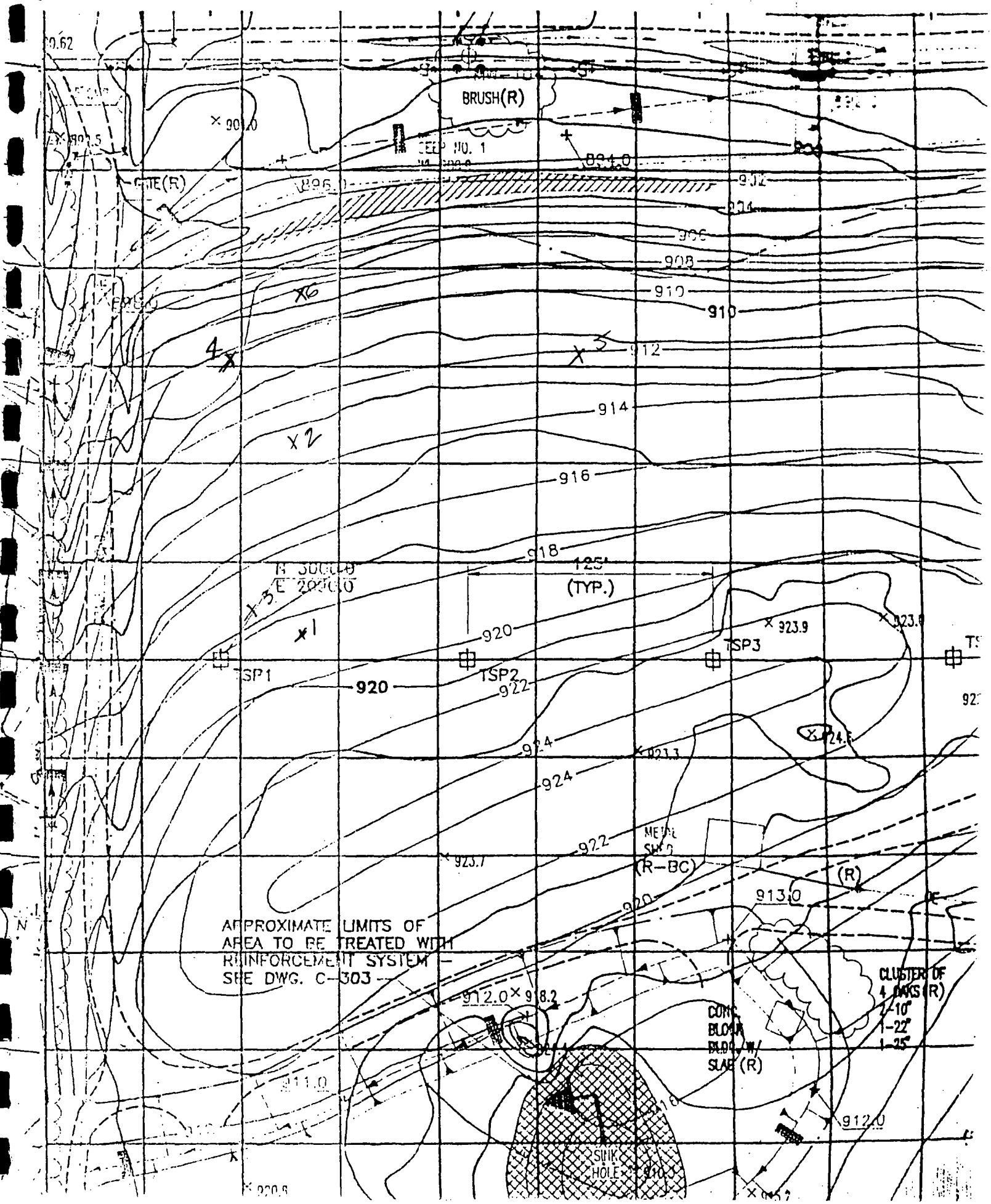
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0


BRUSH(R)
SEEP NO. 1
GATE(R)
TSP1
TSP2
TSP3
125'
(TYP.)
APPROXIMATE LIMITS OF
AREA TO BE TREATED WITH
REINFORCEMENT SYSTEM -
SEE DWG. C-303
SINK
HOLE
CLUSTER OF
4 OAKS (R)
910
912
914
916
918
920
922
924

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2605	563
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/29 19 94
WEATHER 88° Sunny
TESTED BY: Jeff Meadows
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	M,350	M25,400								
OFFSET										
ELEVATION	9	9								
MODE & DEPTH	4	4								
DENS. CNT.	2757	2900								
WET DENS.	129.7	126.9								
MSTRE. CNT.	187	222								
MOISTURE	18.3	22.2								
DRY DENS.	111.4	104.7								
% MOISTURE	16.5	21.2								
STD. DENS.	102.3	102.3								
OPT. MSTR.	20.0	20.0								
% COMP.	108.9	102.4								
MSTRE. CORR.										
PROCTOR NO.	3	3								
% REQUIRED	95	95								

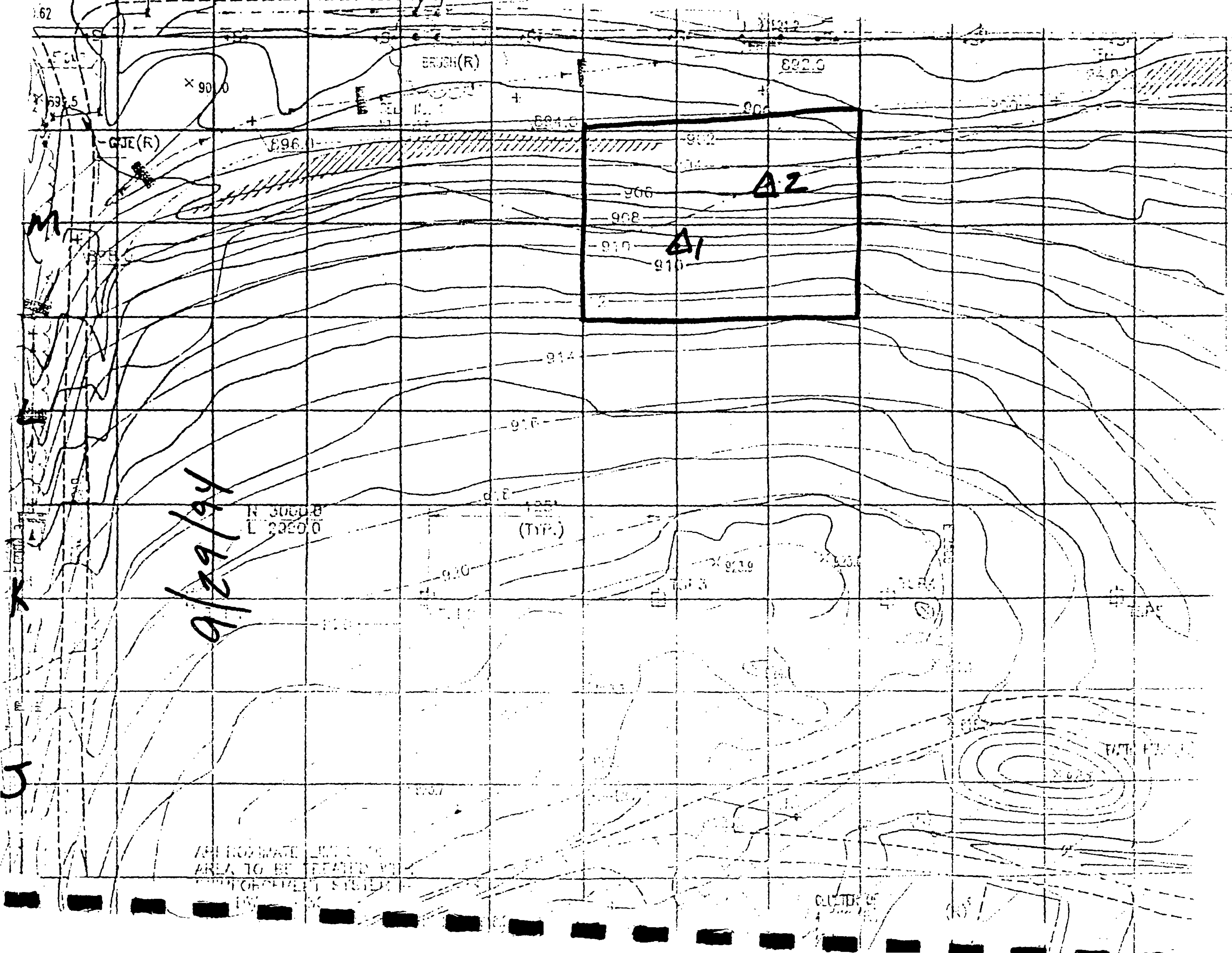
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01 AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0


BRUSH(R)
892.0
× 900.0
896.0
906
908
910
914
916
△2
△1
9/29/94
(TYP.)
M
L
K
J

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2613	560
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 9/30 19 94
WEATHER 88° SUNNY
TESTED BY: JEFF MEDOWS
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	M, 500	L 25, 575	M40, 600	M10, 675	L90, 350	M25, 410	M20, 550	L90, 625	M45, 660	L75, 700
OFFSET										
ELEVATION	9	9	9	9	18	18	18	18	18	18
MODE & DEPTH	4	4	4	4	6	6	6	6	6	6
DENS. CNT.	3080	3044	2933	3332	2311	2222	2312	2546	2204	2413
WET DENS.	101.4	124.5	126.3	120.3	125.5	127.1	125.4	121.4	127.6	123.8
MSTRE. CNT.	224	235	236	194	227	241	234	210	206	200
MOISTURE	22.5	23.7	23.8	19.2	22.9	24.4	23.6	21.0	20.5	19.9
DRY DENS.	101.4	100.7	102.5	101.0	102.6	102.7	101.8	100.5	107.1	103.9
% MOISTURE	22.2	23.6	23.3	19.0	22.3	23.8	23.2	20.9	19.2	19.1
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
% COMP.	99.2	98.5	100.2	98.8	100.3	100.4	99.5	98.2	104.7	101.6
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	3	3	3	3	3
% REQUIRED	95	95	95	95	95	95	95	95	95	95

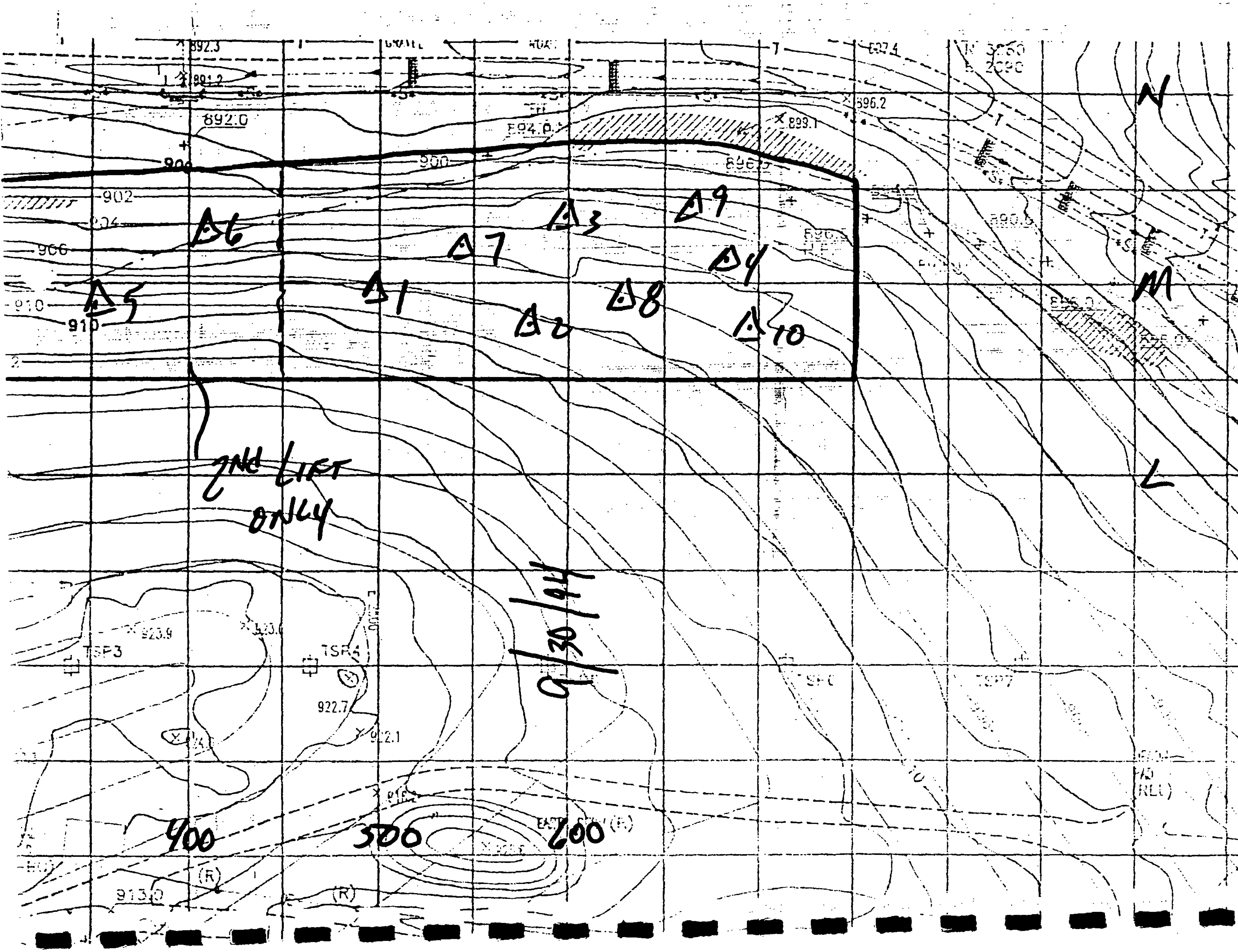
REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0


892.3
892.0
900
902
904
906
910
910
896.2
899.1
N
M
L
6
7
3
9
4
1
8
2
10
5
2ND LIFT ONLY
9/30/94
TSP3
TSP4
923.9
922.7
922.1
913.0
(R)
(R)
400
500
600

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2593	559
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 10/4 19 94
WEATHER 70° CLOUDY
TESTED BY: JEFF MEDOWS
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	F50,50	E50,50	E,75	D50,50						
OFFSET										
ELEVATION	9	9	9	9						
MODE & DEPTH	4	4	4	4						
DENS. CNT.	3288	3331	3216	3236						
WET DENS.	120.4	119.7	121.5	121.2						
MSTRE. CNT.	222.0	225	219	225						
MOISTURE	22.4	22.7	22.0	22.7						
DRY DENS.	98.0	97.0	99.4	98.5						
% MOISTURE	22.8	23.4	22.1	23.0						
STD. DENS.	102.0	102.0	102.0	102.0						
OPT. MSTR.	21.5	21.5	21.5	21.5						
% COMP.	96.1	95.2	97.5	96.5						
MSTRE. CORR.										
PROCTOR NO.	5	5	5	5						
% REQUIRED	95	95	95	95						

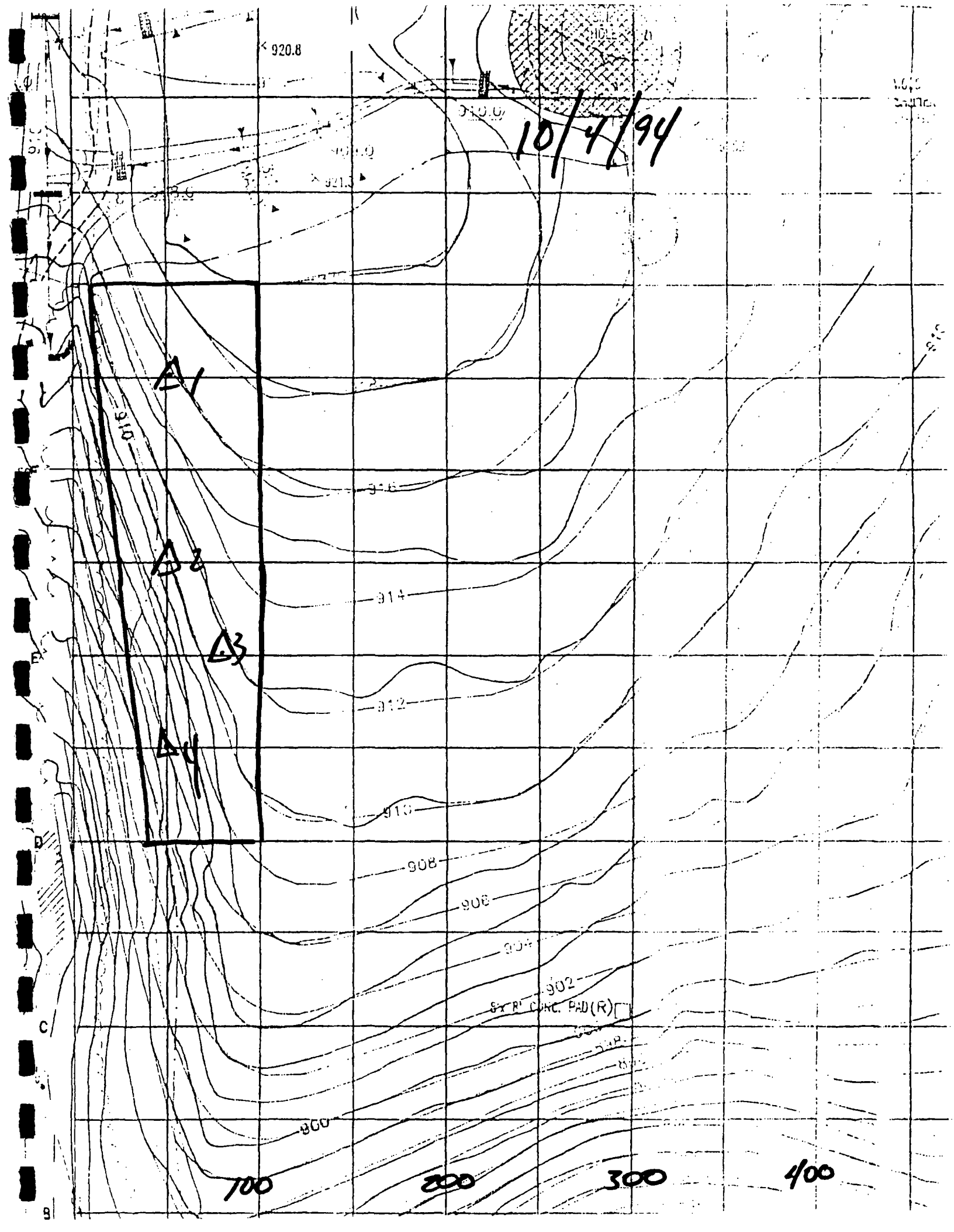
REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0


920.8
10/4/94
Δ1
Δ2
Δ3
Δ4
916
914
912
910
908
906
904
902
900
8" R CONC. PAD (R)
100
200
300
400
D
C
B

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2615	561
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 10/5 19 94
WEATHER 75° Sunny
TESTED BY: Jeff Meadows
CHECKED BY:

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	E, 50	F, 50	F50, 100	F, 150	E. 150	D50, 125	C50, 100	C, 150	B50, 100	B, 150
OFFSET										
ELEVATION	18	18	18	18	18	18	9	9	9	9
MODE & DEPTH	6	6	6	6	6	6	4	4	4	4
DENS. CNT.	2557	2496	2697	2585	2538	2365	3261	2908	3121	2850
WET DENS.	121.4	122.3	119.0	120.8	121.5	124.6	121.3	127.0	123.5	128.0
MSTRE. CNT.	190	209	218	213	222	216	207	205	196	[illegible]209
MOISTURE	18.7	20.8	21.8	21.3	22.3	21.6	20.6	20.4	19.4	20.8
DRY DENS.	102.6	101.5	97.2	99.5	99.3	103.0	100.7	106.6	104.1	107.1
% MOISTURE	18.3	20.5	22.5	21.4	22.4	21.0	20.5	19.1	18.6	19.4
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
% COMP.	100.4	99.2	95.0	97.3	97.1	100.7	98.4	104.2	101.8	104.7
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	3	3	3	3	3
% REQUIRED	95	95	95	95	95	95	95	95	95	95

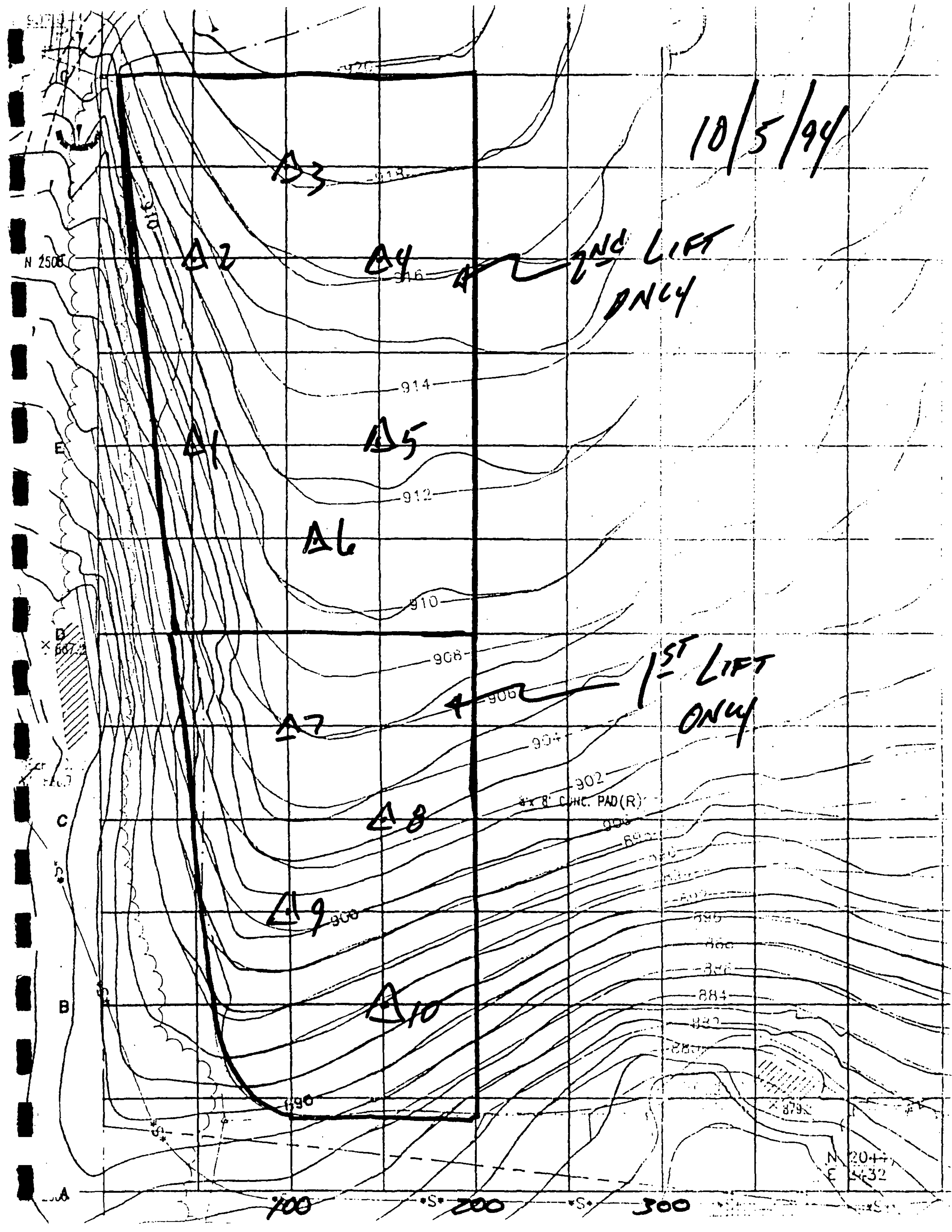
REMARKS

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0



10/5/94
2nd LIFT ONLY
1st LIFT ONLY
Δ1
Δ2
Δ3
Δ4
Δ5
Δ6
Δ7
Δ8
Δ9
Δ10
920
918
916
914
912
910
908
906
904
902
900
884
890
8' x 8' CONC. PAD(R)
N 2500
E
D
C
B
A
100
200
300

MIDWEST TESTING & ENVIRONMENTAL SERVICES

111 East Hardy; P.O. Box 297; St. James, MO 65559
(314) 265-5695

DENSITY OF SOIL AND SOIL - AGGREGATE IN PLACE BY NUCLEAR METHODS ASTM D - 2922

PROJECT: Sullivan Landfill Closure
Sullivan, MO

PROJECT NO.: 4425.030

TESTS PROVIDED FOR: OBG Technical Services
295 Emma Lane
Sullivan, MO 63080
314 860-2432

DAILY STANDARD COUNTS		
	DENSITY (DS)	MOISTURE (MS)
COUNTS	2612	557
STANDARDIZATION LIMITS	6.4	11.8

DATE OF TEST 10/6 19 94
WEATHER 75° SUNNY/BREEZY
TESTED BY: JEFF MEDDERS
CHECKED BY: _____

TEST NUMBER	1	2	3	4	5	6	7	8	9	10
STATION	B50, 250	B50, 300	B, 250	B, 300	C50, 100	C, 150	B, 150	B25, 225	B25, 300	
OFFSET										
ELEVATION	9	9	9	9	18	18	18	18	18	
MODE & DEPTH	4	4	4	4	6	6	6	6	6	
DENS. CNT.	3446	3442	3414	3004	2625	2678	2194	2344	2309	
WET DENS.	118.6	118.6	119.0	125.2	120.2	119.3	122.7	124.9	125.4	
MSTRE. CNT.	191	210	203	216	200	205	221	210	233	
MOISTURE	19.1	21.2	20.5	21.9	20.1	20.7	22.5	21.2	23.8	
DRY DENS.	99.5	97.3	98.5	103.3	100.1	98.6	105.2	103.7	101.6	
% MOISTURE	19.2	21.8	20.8	21.2	20.1	21.0	21.3	20.5	23.4	
STD. DENS.	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	102.3	
OPT. MSTR.	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
% COMP.	97.3	95.2	96.3	101.0	97.8	96.4	102.9	101.4	99.4	
MSTRE. CORR.										
PROCTOR NO.	3	3	3	3	3	3	3	3	3	
% REQUIRED	95	95	95	95	95	95	95	95	95	

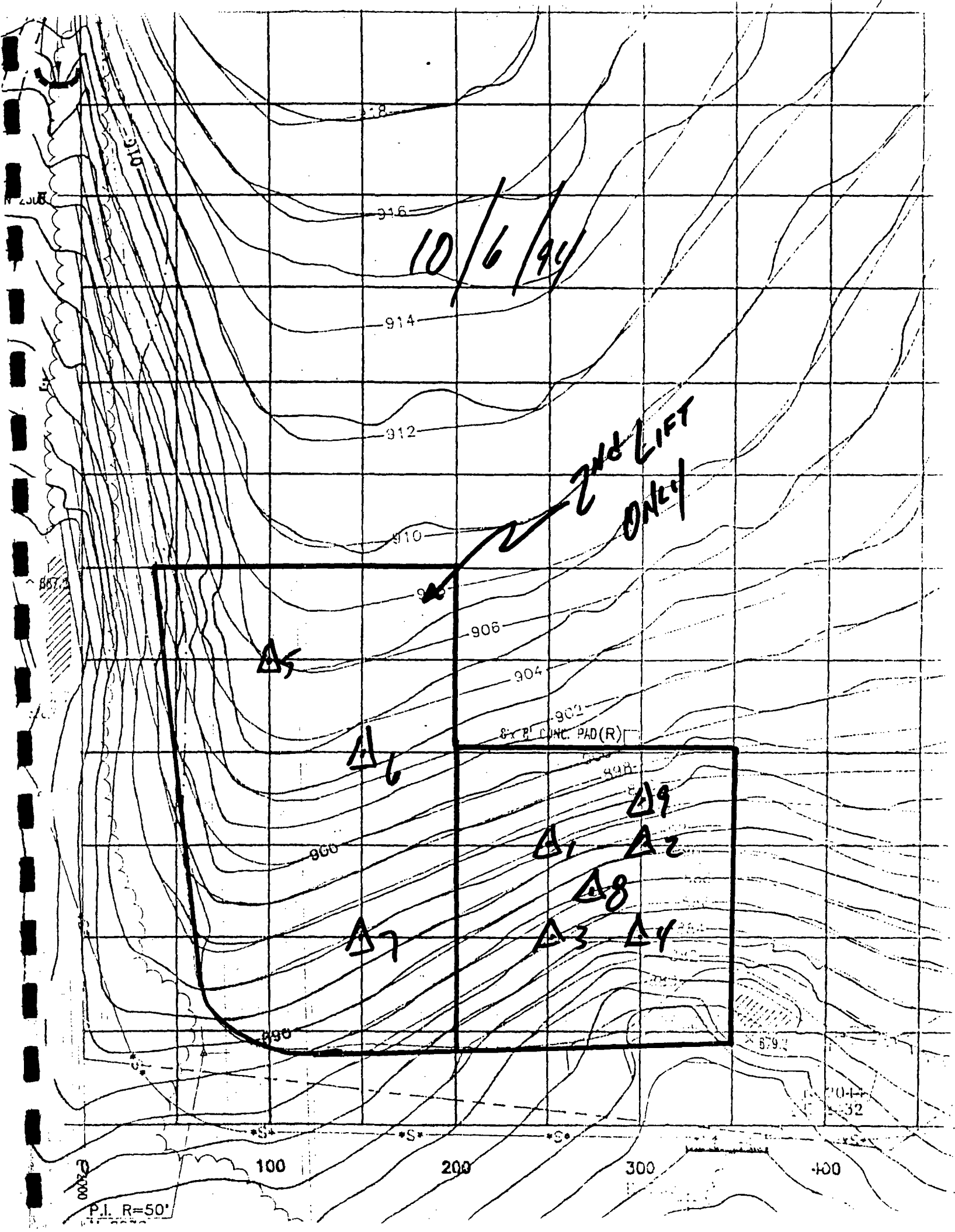
REMARKS _____

DENSITY	MOISTURE

TROXLER 3411B
SURFACE MOISTURE - DENSITY
GAUGE

SERIAL NUMBER 13769
CALIBRATION DATE 14 DEC 93
NRC LICENSE 24-24708-01
AMEND 04

No.	Soil Description	Optimum Water Content %	Maximum Dry Density lb/ft3
1	Brown Clay	19.9	101.8
2	Brown Silt Clay	22.7	101.6
3	Red Clay	20.0	102.3
4	Yellow Gray Clay	26.3	91.8
	Ave. # 3 and # 4 Clays	23.2	97.1
5	Reddish Brown Clay	21.5	102.0


10/6/94
2ND LIFT ONLY
Δ5
Δ6
Δ9
Δ1
Δ2
Δ8
Δ7
Δ3
Δ4
914
912
910
906
904
902
900
8'x8' CONC. PAD(R)
100
200
300
400
P.I. R=50'

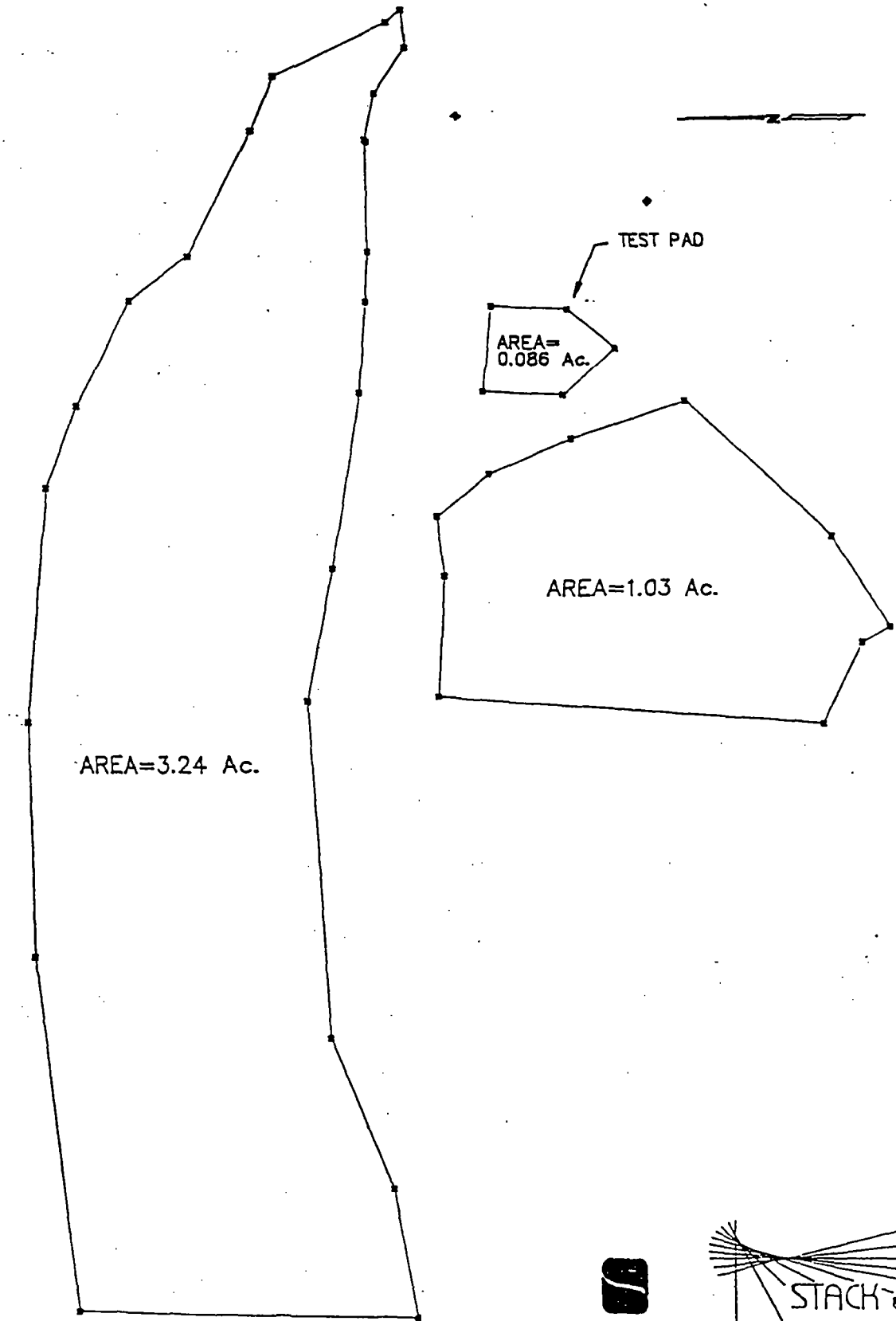
TOPOGRAPHIC SURVEY DATA

HYDRAULIC BARRIER ELEVATIONS
CLAY.TXT

00304,2999.99600,2600.07,918.92,7 LATHE
00248,3100.14643,2500.17785,922.36611,7 LATHE
00250,2999.95803,2499.86882,922.25334,7 LATHE
00284,2650.08395,2550.20854,910.29838,7 LATHE
00286,2749.82729,2550.15438,912.85086,7 LATHE
00288,2849.96503,2550.14694,915.22015,7 LATHE
00234,2850.09660,2450.17661,918.44786,7 LATHE
00232,2750.15472,2449.95399,915.67258,7 LATHE
00230,2649.83155,2449.93880,914.31441,7 LATHE
00174,2549.86164,2349.79934,915.45674,7 LATHE
00011,2549.67330,2049.80833,917.29275,7 LATHE
00066,2549.84514,2150.34748,920.21316,7 LATHE
00120,2549.84336,2249.91110,918.82286,7 LATHE
00176,2650.11543,2349.92016,917.20963,7 LATHE
00178,2749.85231,2350.23120,918.06884,7 LATHE
00194,3100.14384,2400.15961,920.46442,7 LATHE
00196,3000.16222,2400.21966,924.62819,7 LATHE
00140,3100.03345,2299.74758,920.07487,7 LATHE
00142,2999.84696,2299.77897,925.27222,7 LATHE
00086,3100.17240,2200.06441,919.36223,7 LATHE
00088,3000.18911,2200.11336,924.41280,7 LATHE
00033,2999.93427,2099.94828,920.83751,7 LATHE
00311,2649.87453,2599.94028,907.54692,7 LATHE
00313,2549.97717,2599.91632,901.98427,7 LATHE
00259,2549.66091,2500.12726,909.21724,7 LATHE
00257,2650.11630,2500.46303,912.09349,7 LATHE
00261,2449.99582,2499.94711,905.98422,7 LATHE
00315,2450.01763,2600.18331,896.09599,7 LATHE
00263,2350.10563,2499.95916,904.41811,7 LATHE
00321,2150.10630,2599.91051,892.96715,7 LATHE
00319,2249.76033,2600.24898,897.63689,7 LATHE
00375,2150.02492,2700.06826,884.16249,7 LATHE
00373,2250.08387,2699.85532,881.12705,7 LATHE
00317,2349.97603,2599.77954,898.05302,7 LATHE
00265,2250.04399,2500.09541,901.48774,7 LATHE
00267,2150.01704,2500.14125,895.67049,7 LATHE
00207,2449.95617,2400.06918,910.67301,7 LATHE
00209,2350.06645,2400.04222,907.90300,7 LATHE
00211,2249.24508,2399.49592,903.68165,7 LATHE
00213,2149.89292,2400.06357,893.89487,7 LATHE
00153,2449.46310,2299.64940,914.41004,7 LATHE
00155,2349.97180,2300.20233,910.87807,7 LATHE
00157,2249.95021,2299.94930,905.19788,7 LATHE
00159,2149.89684,2300.01476,893.66820,7 LATHE
11,2549.97,2050,918.63,7 LATHE
66,2550.02,2149.99,921.57,7 LATHE
99,2450.04,2199.97,917.71,7 LATHE
101,2349.82,2200.09,914.15,7 LATHE
103,2249.98,2200.01,909.63,7 LATHE
52,2050.1,2100.01,897.34,7 LATHE
50,2149.85,2100.06,904.39,7 LATHE
48,2249.78,2100.04,910.56,7 LATHE
46,2349.86,2100.01,913.57,7 LATHE
44,2450.12,2099.97,916.9,7 LATHE

8-15-94

TOTAL AREA=4.36 Ac.
TOTAL CLAY VOLUME=10,550 cu. yds.



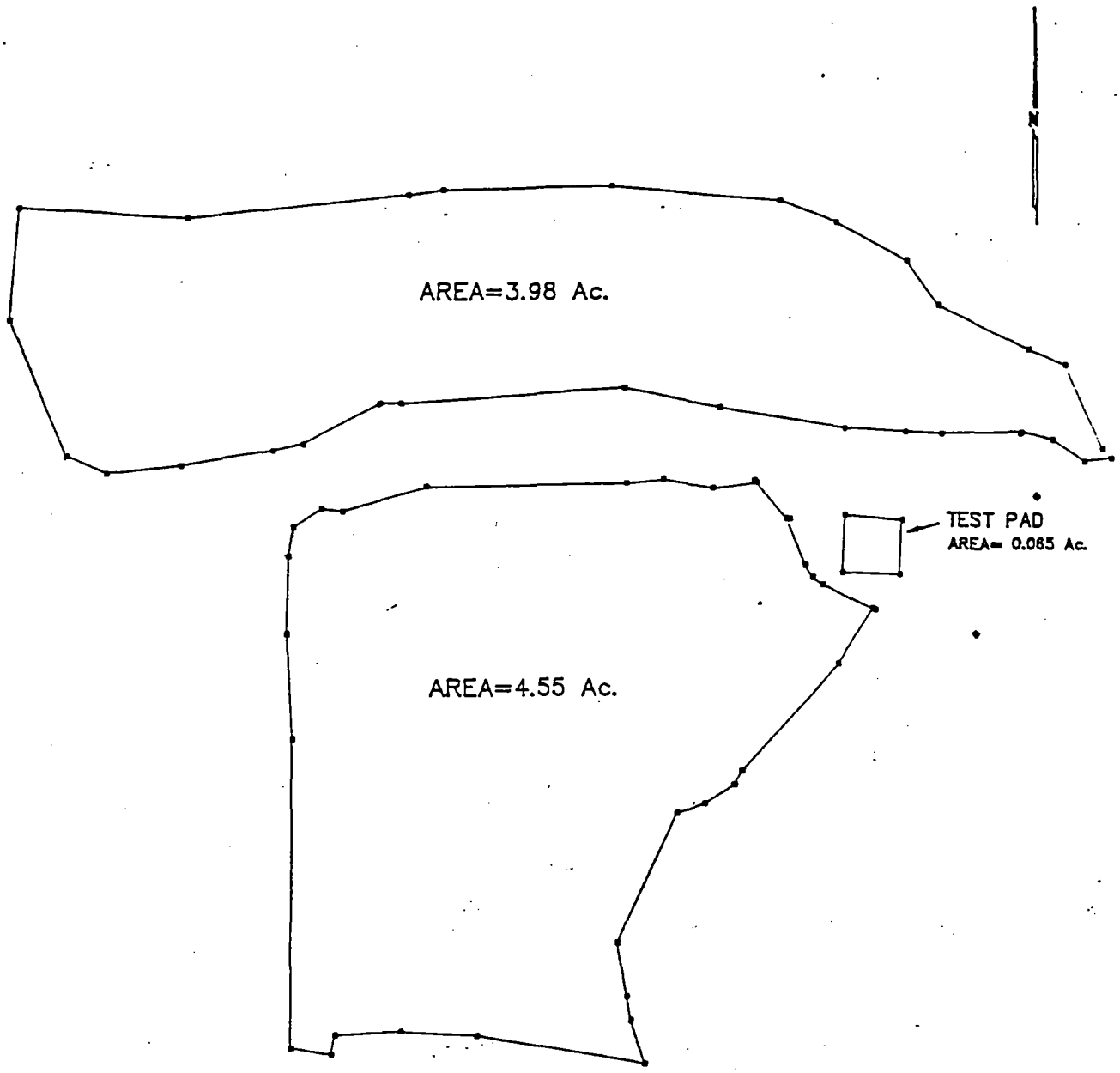
STACK & ASSOCIATES, INC.
Engineers • Architects • Surveyors

2,2914.919375,3089.601843,900.429977,161 GRND SHOT
3,2929.081393,3012.490969,903.766587,161 GRND SHOT
4,2928.775553,2907.282325,909.520162,161 GRND SHOT
5,2967.610019,2647.693383,917.124078,161 GRND SHOT
6,2953.429035,2430.110389,923.053852,161 GRND SHOT
7,2910.388437,2331.674574,927.377758,161 GRND SHOT
8,2895.725724,2247.557578,924.145456,161 GRND SHOT
9,3116.422425,2252.711703,925.900990,161 GRND SHOT
10,3144.806590,2484.123616,915.605185,161 GRND SHOT
11,3148.487916,2635.118008,912.787763,161 GRND SHOT
12,2767.356878,2876.913984,908.751515,161 GRND SHOT
13,2795.462589,2818.459894,911.498553,161 GRND SHOT
14,2848.836393,2795.763194,913.853382,161 GRND SHOT
15,2882.498925,2768.577359,913.673958,161 GRND SHOT
16,2877.287041,2729.806985,914.625869,161 GRND SHOT
17,2881.004628,2650.023806,916.572902,161 GRND SHOT
18,2626.943610,2632.535688,904.379189,161 GRND SHOT
19,2601.231815,2685.883730,897.325305,161 GRND SHOT
20,2583.093035,2696.592505,894.917370,161 GRND SHOT
21,2621.748975,2756.428056,896.221166,161 GRND SHOT
22,2718.306189,2843.145487,907.233975,161 GRND SHOT
1001,2870.000000,3027.500000,903.456000,17 REBAR
1016,2744.340000,2973.340000,905.120000,9 HUB\TACK

8-23-94

TOTAL AREA=8.6 Ac.

TOTAL CLAY VOLUME = 20,800 cu. yds.



STACK & ASSOCIATES, INC
Engineers • Architects • Surveyors

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3,2609.182101,2750.096954,893.788042,161  GRND SHOT
4,2591.922409,2723.476493,891.837780,161  GRND SHOT
5,2464.372606,2642.983323,887.401599,161  GRND SHOT
6,2416.701899,2651.545741,884.277502,161  GRND SHOT
7,2395.140646,2655.528041,883.859788,161  GRND SHOT
8,2357.136623,2668.823327,883.259637,161  GRND SHOT
9,2382.781683,2514.595683,904.379944,161  GRND SHOT
10,2386.626549,2448.514553,907.278799,161  GRND SHOT
11,2382.914869,2390.212648,909.372251,161  GRND SHOT
12,2365.484940,2386.397348,908.831113,161  GRND SHOT
13,2371.359589,2348.252251,910.104836,161  GRND SHOT
14,2650.141836,2349.890834,917.837196,161  GRND SHOT
15,2743.782653,2345.137447,917.945232,161  GRND SHOT
16,2814.085161,2347.080641,919.510606,161  GRND SHOT
17,2840.184171,2351.612794,920.375513,161  GRND SHOT
18,2857.445591,2378.162572,920.195892,161  GRND SHOT
19,2855.261496,2397.723603,919.235152,161  GRND SHOT
20,2878.219742,2471.368173,918.763823,161  GRND SHOT
21,2885.100357,2683.548457,915.687536,161  GRND SHOT
22,2884.512756,2766.623196,913.541467,161  GRND SHOT
23,2848.617471,2798.071131,912.703195,161  GRND SHOT
24,2806.640354,2811.800918,911.191375,161  GRND SHOT
25,2788.767561,2827.983669,910.279047,161  GRND SHOT
26,2870.053907,3027.536605,903.395859,17   REBAR
27,2953.654381,2448.611835,922.258136,161  GRND SHOT
28,2916.980209,2360.503686,923.586476,161  GRND SHOT
29,2887.811148,2179.849409,924.995603,161  GRND SHOT
30,2904.162218,2143.517304,924.759210,161  GRND SHOT
31,3025.713939,2091.953093,919.418220,161  GRND SHOT
32,3125.789724,2100.315339,913.760223,161  GRND SHOT
33,3139.880331,2454.142074,915.654146,161  GRND SHOT
1016,2744.340000,2973.340000,905.120000,9    HUB\TACK
1017,2828.085000,2067.910000,923.297000,9    HUB\TACK
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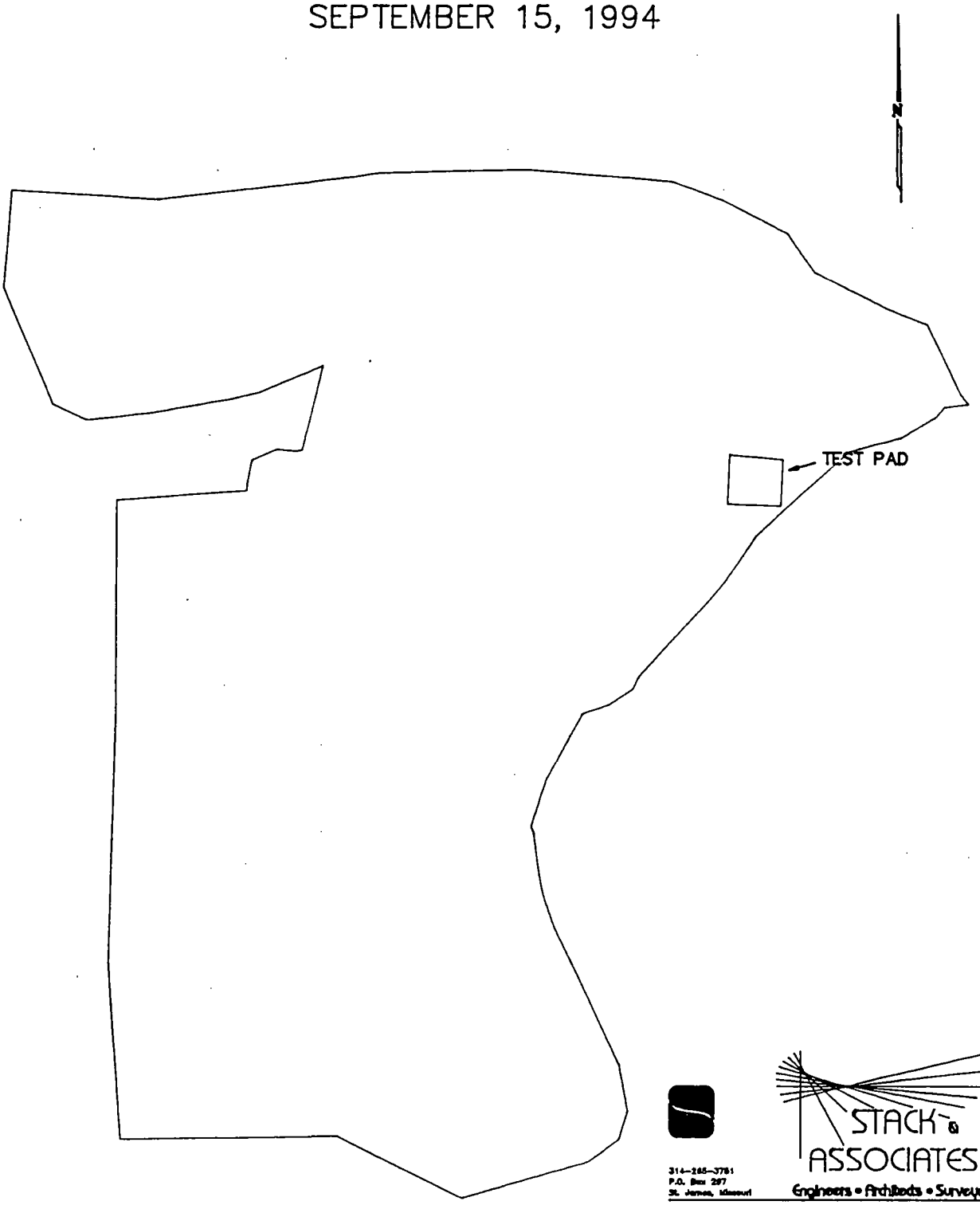
TOTAL AREA=14.24 Ac.

TOTAL CLAY VOLUME = 34,470 cu. yds.

SEPTEMBER 15, 1994



314-265-3781
P.O. Box 287
St. James, Missouri

STACK & ASSOCIATES, INC.
Engineers • Architects • Surveyors

AC912.TXT

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1,2257.150000,2587.080000,898.157000,9     HUB\TACK
2,2136.149981,2215.275265,896.484054,161   GRND SHOT
3,2319.003123,2202.470406,911.350304,161   GRND SHOT
4,2585.165036,2210.232900,921.861758,161   GRND SHOT
5,2803.460684,2210.486887,922.014375,161   GRND SHOT
6,2821.214345,2347.306713,920.058739,161   GRND SHOT
7,2846.269255,2352.336545,919.918273,161   GRND SHOT
8,2856.615157,2404.234046,920.290841,161   GRND SHOT
9,2943.726179,2425.908048,922.498372,161   GRND SHOT
10,2891.969811,3063.793204,901.875619,161   GRND SHOT
11,2855.793792,2973.833276,907.361146,161   GRND SHOT
12,2704.081706,2831.182504,906.260843,161   GRND SHOT
13,2514.106145,2659.012826,891.200096,161   GRND SHOT
14,2458.741947,2645.514359,886.843246,161   GRND SHOT
15,2215.414236,2735.678619,875.591481,161   GRND SHOT
16,2166.526227,2745.474688,874.380091,161   GRND SHOT
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18,2112.908502,2703.326268,880.129840,161   GRND SHOT
19,2074.210824,2571.159794,887.736984,161   GRND SHOT
20,2044.499869,2458.661994,887.167178,161   GRND SHOT
21,2139.596227,2442.594779,894.660629,161   GRND SHOT
```

DRAINAGE LAYER

A. LABORATORY SOIL TEST DATA

B. TOPOGRAPHIC SURVEY DATA

LABORATORY SOIL TEST DATA

MOISTURE CONTENTS

PROJECT NAME OBG TECHNICAL SERVICES DATE OF TEST Oct. 14, 1994

PROJECT NO. 4425.030 DRAINAGE LAYER TESTED BY JEFF MEDOW

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	HP/ TS
	1	GRAB		SANDY GRAVEL	624.65	594.15	T	191.60	7.6	
	2	GRAB		SANDY GRAVEL	619.59	582.98	AZ	89.33	7.4	
	1	GRAB		SANDY GRAVEL	2235.0	2016.3	DZ	207.60	8.5	
	2	GRAB		SANDY GRAVEL	2223.0	2089.3	D	221.27	7.2	

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project: SULLIVAN LANDFILL Boring No. _____ Sample No. 1

Description of Soil: SANDY GRAVEL Sample DRAINAGE LAYER

Tested By: JEFF MEDOWS Date of Testing OCTOBER 17, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2076.3
Wt. of container	207.60
Wt. of dry sample, W_s	1868.70

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	220.2	220.2	11.8	88.2
3/4	841.4	1061.6	56.8	43.2
3/8	330.9	1392.5	74.5	25.5
4	155.8	1548.4	82.9	17.1
8	74.5	1622.9	86.8	13.2
16	42.9	1665.8	89.1	10.9
30	56.8	1722.5	92.2	7.8
50	94.36	1816.9	97.2	2.8
100	47.3	1864.2	99.8	0.02
200	4.0	1868.2	100	0
PAN	3.0	1871.2	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project: SULLIVAN LANDFILL Boring No. _____ Sample No. 2

Description of Soil: SANDY GRAVEL Sample DRAINAGE LAYER

Tested By: JEFF MEDOWS Date of Testing OCTOBER 17, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2089.3
Wt. of container	221.27
Wt. of dry sample, W_s	1868.03

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	0	0	0	100
3/4	692.79	692.79	37.02	62.98
3/8	767.55	1460.34	78.04	21.96
4	215.96	1676.30	89.58	10.42
8	62.29	1738.59	92.90	7.1
16	31.97	1770.56	94.61	5.39
30	30.28	1800.84	96.23	3.77
50	44.01	1844.85	98.58	1.42
100	22.34	1867.19	99.78	0.22
200	1.40	1868.59	99.85	0.15
PAN	1.80	1871.39	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

A STACK & ASSOCIATES COMPANY

Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear
  - Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

SULLIVAN LANDFILL CLOSURE
DRAINAGE LAYER PERMEABILITY RESULTS

Gravel Sample	Moisture Content (%)	Permeability "K" (cm/sec)
2	7.4	212×10^{-4}

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MOISTURE CONTENTS

PROJECT NAME OBG Tech. Services, Sullivan Land Fill

PROJECT NO. 4425.030

DATE OF TEST 10-28-94
Sample Arrival 10-25-94
TESTED BY JRK

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare (g)	Dry Weight + Tare (g)	Tare No.	Tare Wt (g)	% Moist.	HP/ TS
	3	Surface	Grab	Sandy Gravel	2965.5	2923.3	10	344.94	1.63	

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG Tech Services

Job No. 4425.030

Location of Project: Sullivan Land Fill

Boring No. _____ Sample No. 3

Description of Soil: Sandy Gravel

Depth of Sample Surface

Tested By: JRK

Date of Testing 10-28-94

Sample Arrival Date 10-25-94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2923.3
Wt. of container	344.94
Wt. of dry sample, W_s	2578.36

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	212.56	212.56	8.24	91.76
3/4	823	1035.56	40.16	59.84
3/8	657.2	1692.76	65.65	34.35
4	391	2083.76	80.81	19.19
8	175	2258.76	87.60	12.4
16	92.3	2351.06	91.18	8.82
30	90.7	2441.76	94.70	5.3
50	115.3	2557.06	99.17	.83
100	19.5	2576.56	99.93	.07
200	1.2	2577.76	99.97	.03
PAN	.6	2578.36	100	0

% passing = 100 -- Σ % retained

MOISTURE CONTENTS

PROJECT NAME OBG Tech Services, Sullivan Landfill

DATE OF TEST 11/4/94
SAMPLE ARRIVAL 11/3/94
TESTED BY JRK

PROJECT NO. 4425.030

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	HP/ TS
	4	Surface	Grab	Sandy Gravel	2421	2383	10	344.81	1.86	

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG Tech Services
Job No. 4425.030
Location of Project: Sullivan Land Fill
Boring No. _____ Sample No. 4
Description of Soil: Sandy Gravel
Depth of Sample Surface
Tested By: JRK
Date of Testing 11/4/94
Sample Arrival Date 11/3/94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2383
Wt. of container	344.81
Wt. of dry sample, W_s	2038.19

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	125.69	125.69	6.17	93.8
3/4	631.5	757.19	37.2	62.8
3/8	636	1393.19	68.4	31.6
4	287	1680.19	82.4	17.6
8	142	1822.19	89.4	10.6
16	71	1893.19	92.9	7.1
30	58.3	1951.49	95.7	4.3
50	73.2	2024.69	99.3	.66
100	12	2036.69	99.9	.07
200	1	2037.69	99.9	.02
PAN	.5	2038.19	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

A STACK & ASSOCIATES COMPANY

Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear
  - Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

SULLIVAN LANDFILL CLOSURE
DRAINAGE LAYER PERMEABILITY RESULTS

Gravel Sample	Moisture Content (%)	Permeability "K" (cm/sec)
4	1.86	191×10^{-4}

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PROJECT NAME OBG TECHNICAL SERVICES

PROJECT NO. 4425.030

DATE OF TEST 12/9/94
SAMPLE ARRIVAL 12/6/94
TESTED BY J. MEEKS

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.	IP/ TS
	5		GRAB	DRAINAGE LAYER	952.21	892.59	Z	89.44	6.76	
	6A		GRAB	DRAINAGE LAYER	1191.60	1166.75	F	192.07	2.55	> 2.51
	6B		GRAB	DRAINAGE LAYER	999.36	980.07	T	196.78	2.46	

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG TECHNICAL SERVICES Job No. 4/25.030

Location of Project: SULLIVAN, MO Boring No. _____ Sample No. 6

Description of Soil: GRAVEL Depth of Sample GRAB

Tested By: J. MARSHAL Date of Testing 12/18/94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2251.3
Wt. of container	217.5
Wt. of dry sample, W_s	2033.8

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	346.6	346.6	17.0	83.0
3/4	387.2	733.8	36.1	63.9
3/8	591.8	1325.6	65.2	34.8
4	400.4	1726.0	84.9	15.1
8	162.0	1888.0	92.8	7.17
16	58.3	1946.3	95.7	4.30
30	30.7	1977.0	97.2	2.79
50	29.0	2006.0	98.6	1.37
100	13.6	2019.6	99.3	0.70
200	3.4	2023.0	99.5	0.50
PAN	3.3	2026.3	99.6	0

% passing = 100 − Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

A STACK & ASSOCIATES COMPANY

Environmental
Site Assessment
Laboratory Testing
- Wastewater
- Soil
- Pollutants

Materials Testing
Asphalt
Concrete
Soils
- Drive Cylinder
- Nuclear
  - Densometer
- Sand Cone

Site Sampling
Industrial
Leakage Testing
Percolation Tests
Permeability Tests
Soils
Water

SULLIVAN LANDFILL CLOSURE
DRAINAGE LAYER PERMEABILITY RESULTS

Gravel Sample	Permeability "K" (cm/sec)
6	194.5×10^{-4}

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TOPOGRAPHIC SURVEY DATA

DRAINAGE LAYER ELEVATIONS

00543,2950.03517,3200.01955,895.80708,7 LATHE
00542,3000.01383,3200.02896,893.01,7 LATHE
00551,3000.02242,3250.03148,889.60514,7 LATHE
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00526,3049.83966,3099.94096,895.77799,7 LATHE
00503,2949.92655,3000.02892,906.09526,7 LATHE
00501,3049.97904,2999.33481,902.14712,7 LATHE
00495,3150.19017,2999.99694,897.25617,7 LATHE
00467,2949.88915,2900.17869,911.63834,7 LATHE
00469,2850.12758,2899.85655,912.56411,7 LATHE
00415,2850.00651,2800.00230,915.08608,7 LATHE
00417,2749.96648,2799.95919,911.86451,7 LATHE
00361,2849.99428,2699.96632,916.51833,7 LATHE
00363,2749.90781,2699.75616,911.72355,7 LATHE
00307,2850.01376,2600.21503,918.03848,7 LATHE
00309,2750.04616,2600.07457,914.32964,7 LATHE
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414,2900.00,2800.31,915.26,7 LATHE
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00375,2150.02471,2700.03810,886.72525,7    LATHE
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107,2049.95,2200.52,888.89,7    LATHE
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VEGETATIVE LAYER

A. LABORATORY SOIL TEST DATA

B. TOPOGRAPHIC SURVEY DATA

LABORATORY SOIL TEST DATA

LANDING BORROW STUDY

ORGANIC MATTER

PROJECT NAME OBG TECHNICAL SERVICES DATE OF TEST 9/30/94

PROJECT NO. 4425.030 TESTED BY GREG VALICH

	Sample No.	Sample Depth (ft.)	Tare No.	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Organic	
	1	2	Z-10	TOPSOIL	58.8768	58.0878	17	24.1135	2.27	
	2	2.5	6	CLAYEY TOPSOIL	65.2655	64.5124	16	24.4163	1.84	
	3	1	A-4	SILTY TOPSOIL	65.4520	64.6850	20	23.4725	1.83	
	4	1	1	SANDY TOPSOIL	65.5063	64.2738	19	24.0352	2.97	
	5	2	A-3	CLAYEY SILTY TOPSOIL	63.3927	62.3857	15	23.4269	2.52	
	6	2.5	B-1	BROWN SANDY CLAYEY TOPSOIL	70.9110	69.7269	18	24.1379	2.53	

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Technical Services Job No. 4425.030

Location of Project: Sullivan Landfill Boring No. _____ Sample No. 1

Description of Soil Topsoil Depth of Sample _____

Tested By Lance Stack Date of Testing September 30, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2,589.44
Wt. of container	345.40
Wt. of dry sample, W_s	2,244.04

"WET SIEVE"

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	6.92	6.92	.3	99.7
4	23.66	30.58	1.4	98.6
10	41.60	72.18	3.2	96.8
20	31.96	104.14	4.6	95.4
40	40.21	144.35	6.4	93.6
60	62.41	206.76	9.2	90.8
140	80.12	286.88	12.8	87.2
200	7.37	294.25	13.1	86.9
PAN	1949.79	2244.04	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Technical Services

Job No. 4425.030

Location of Project: Sullivan Landfill

Boring No. _____ Sample No. 2

Description of Soil Clayey Topsoil

Depth of Sample _____

Tested By Lance Stack

Date of Testing September 30, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2,102.02
Wt. of container	191.73
Wt. of dry sample, W_s	1,910.29

"WET SIEVE"

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	27.18	27.18	1.42	98.58
10	59.57	86.75	4.54	95.46
20	40.46	127.21	6.66	93.34
40	45.45	172.66	9.04	90.96
60	95.07	267.73	14.02	85.98
140	143.37	411.10	21.52	78.48
200	11.46	422.56	22.12	77.88
PAN	1487.73	1910.29	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG Technical Services — Job No. 4425.030

Location of Project: Sullivan Landfill — Boring No. _____ Sample No. 3

Description of Soil: Silty Topsoil — Depth of Sample _____

Tested By: Greg Vaughn — Date of Testing September 30, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2206.72
Wt. of container	204.00
Wt. of dry sample, W_s	2002.72

"WET SIEVE"

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	0	0	0	100
3/4	0	0	0	100
3/8	28.72	28.72	1.43	98.57
4	19.81	48.53	2.42	97.58
8	30.32	78.85	3.94	96.06
16	29.86	108.71	5.43	94.57
30	52.81	161.52	8.07	91.93
50	125.45	286.97	14.33	85.67
100	228.91	515.88	25.7%	74.24
200	81.83	597.71	29.84	70.16
PAN	1405.01	2002.72	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG Technical Services

Job No. 4425.030

Location of Project: Sullivan Landfill

Boring No. _____ Sample No. 4

Description of Soil: SANDY TOPSOIL

Depth of Sample _____

Tested By: Greg Vaughn

Date of Testing September 30, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2174.64
Wt. of container	191.63
Wt. of dry sample, W_s	1983.01

"WET SIEVE"

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	0	0	0	100
3/4	28.34	28.34	1.43	98.57
3/8	137.29	165.63	8.38	91.62
4	111.08	276.71	14.00	86.00
8	85.18	361.89	18.31	81.69
16	54.26	416.15	21.05	78.95
30	59.74	475.89	24.07	75.93
50	201.43	677.32	34.26	65.74
100	212.89	890.21	45.03	54.97
200	51.06	941.27	47.61	52.39
PAN	1035.70	1976.97	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG Technical Services

Job No. 4425.030

Location of Project: Sullivan Landfill

Boring No. _____ Sample No. 5

Description of Soil: Clayey Silty Topsoil

Depth of Sample _____

Tested By: Greg Vaughn

Date of Testing September 30, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2473.71
Wt. of container	344.52
Wt. of dry sample, Ws	2129.19

"WET SIEVE"

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	1.74	1.74	.08	99.92
8	29.64	31.38	1.47	98.53
16	41.35	72.73	3.41	96.59
30	37.21	109.94	5.16	94.84
50	28.04	137.98	6.48	93.52
100	29.16	167.14	7.85	92.15
200	18.56	185.70	8.72	91.28
PAN	1944.03	2129.73	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - GRAVEL

Project: OBG Technical Services — Job No. 4425.030

Location of Project: Sullivan Landfill — Boring No. _____ Sample No. 6

Description of Soil: Brown Sandy Clayey Topsoil — Depth of Sample _____

Tested By: Greg Vaughn — Date of Testing September 30, 1994

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2115.91
Wt. of container	221.54
Wt. of dry sample, W_s	1894.37

"WET SIEVE"

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulative Wt. retained	Accumulative % retained	% passing
3	0	0	0	100
1 1/2	0	0	0	100
3/4	49.35	49.35	2.60	97.40
3/8	76.21	125.56	6.62	93.38
4	90.97	216.53	11.42	88.58
8	71.71	288.24	15.21	84.79
16	40.69	328.93	17.35	82.65
30	44.95	373.88	19.72	80.28
50	164.34	538.22	28.39	71.61
100	279.23	817.45	43.12	56.88
200	77.50	894.95	47.21	52.79
PAN	1000.72	1895.67	100	0

% passing = 100 -- Σ % retained

MOISTURE CONTENTS

PROJECT NAME OBG TECHNICAL SERVICES DATE OF TEST 9-29-94

PROJECT NO. 4425.030 TESTED BY GREG VAUGHN

Boring No.	Sample No.	Sample Depth	Sample Type	Sample Description	Wet Weight + Tare	Dry Weight + Tare	Tare No.	Tare Wt.	% Moist.
	1			TOPSOIL	167.44	144.90	Z-10	32.22	20.0
	1			TOPSOIL	884.27	742.02	#12	87.56	21.7
	2			CLAYEY TOPSOIL	848.53	714.82	B-2	92.35	21.5
	2			CLAYEY TOPSOIL	166.89	143.32	6	32.11	21.2
	3			SILTY TOPSOIL	780.00	715.24	FR	91.00	10.4
	3			SILTY TOPSOIL	172.53	159.44	A-4	31.41	10.2
	4			SANDY TOPSOIL	892.72	771.85	A2	89.23	17.7
	4			SANDY TOPSOIL	168.19	147.65	#1	32.16	17.8
	5			CLAYEY SILTY TOPSOIL	984.42	839.76	T	191.61	22.3
	5			CLAYEY SILTY TOPSOIL	190.55	163.14	A-3	32.12	20.9
	6			BROWN SANDY CLAYEY TOPSOIL	866.10	785.49	F	191.60	13.6
	6			BROWN SANDY CLAYEY TOPSOIL	179.94	161.77	B-1	31.64	14.0

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Tech. Services

Job No. 4425.030

Location of Project: Sullivan LandFill

Boring No. _____ Sample No. 7

Description of Soil Dark Brown Topsoil

Depth of Sample 6" - 12"

Tested By J. Medows

Date of Testing 11/22 - 11/25

Sample Arrival Date 11/21/94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1417.5
Wt. of container	250.5
Wt. of dry sample, W_s	1167

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	25.95	25.95	2.22	97.8
10	57.84	83.79	7.18	92.8
20	38.08	121.87	10.4	89.6
40	38.70	160.57	13.8	86.2
60	54.34	214.91	18.4	81.6
140	57.08	271.99	23.3	76.7
200	7.43	279.42	23.9	76.1
PAN	887.58	1167	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Tech. Services — Job No. 4425.030

Location of Project: Sullivan Land Fill — Boring No. _____ Sample No. 8

Description of Soil Dark Brown Topsoil — Depth of Sample 6"-12"

Tested By J. Meadows — Date of Testing 11/22 - 11/25

Soil Sample Size (ASTM D1140-54) — Sample Arrival Date 11/21/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2571.84
Wt. of container	245
Wt. of dry sample, Ws	2326.84

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	29.51	29.51	1.26	98.7
10	62.01	91.52	3.93	96.1
20	68.86	160.38	6.90	93.1
40	99.28	259.66	11.2	88.8
60	205.97	465.63	20.0	80.0
140	164.57	630.20	27.1	72.9
200	8.54	638.74	27.5	72.5
PAN	1687.26	2326.84	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Tech Services
Job No. 4425.030
Location of Project: Sullivan LandFill
Boring No. _____ Sample No. 9
Description of Soil Dark Brown Topsoil
Depth of Sample 6"-12"
Tested By J. Medows
Date of Testing 11/22 - 11/25
Sample Arrival Date 11/21/94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1748.93
Wt. of container	253
Wt. of dry sample, W_s	1495.93

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	4.28	4.28	0.286	99.7
10	22.13	26.41	1.77	98.2
20	29.84	56.25	3.76	96.2
40	111.91	168.16	11.2	88.8
60	131.85	300.01	20.1	79.9
140	165.16	465.17	31.1	68.9
200	13.56	478.73	32.0	68.0
PAN	1017.2	1495.93	100	0

% passing = 100 - Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Tech Services Job No. 4425.030

Location of Project: Sullivan Land Fill Boring No. _____ Sample No. 10

Description of Soil Dark Brown Topsoil Depth of Sample 6"-12"

Tested By J. Medows Date of Testing 11/22 - 11/25

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 11/21/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1700.99
Wt. of container	250
Wt. of dry sample, Ws	1450.99

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	14.7	14.70	1.00	99.0
10	1.42	16.12	1.11	98.9
20	47.8	63.92	4.41	95.6
40	84.83	148.75	10.3	89.7
60	104.87	253.62	17.5	82.5
140	160.83	414.45	28.6	71.4
200	18.16	432.61	29.8	70.2
PAN	1018.38	1450.99	99.8	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Techservices — Job No. 4425.030

Location of Project: Sullivan Landfill — Boring No. ____ — Sample No. 11

Description of Soil Dark Brown Topsoil — Depth of Sample 6" - 12"

Tested By J. Medows — Date of Testing 11/22 - 11/25

Soil Sample Size (ASTM D1140-54) — Sample Arrival Date 11/21/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1613.5
Wt. of container	245
Wt. of dry sample, W_s	1368.5

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	30.35	30.35	2.22	97.8
10	20.50	50.85	3.72	96.3
20	102.25	153.10	11.2	88.8
40	135.34	288.44	21.1	78.9
60	180.44	468.89	34.3	65.7
140	73.81	542.70	39.7	60.3
200	140.8	683.5	50.0	50.0
PAN	685	1368.5	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Tech. Services
Job No. 4425.030
Location of Project: Sullivan Land Fill
Boring No. _____ Sample No. 12
Description of Soil Dark Brown Topsoil
Depth of Sample 6" -12"
Tested By J. Medows
Date of Testing 11/22 - 11/25
Sample Arrival Date 11/21/94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1481.20
Wt. of container	249.4
Wt. of dry sample, W_s	1231.8

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	13.55	13.55	1.1	98.9
10	20.94	34.49	2.8	97.2
20	11.09	45.58	3.7	96.3
40	91.15	136.73	11.1	88.9
60	103.47	240.20	19.5	80.5
140	133.04	373.24	30.3	69.7
200	13.55	386.79	31.4	68.6
PAN			100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Tech Services
Job No. 4425.030
Location of Project: Sullivan Landfill
Boring No. _____ Sample No. 13
Description of Soil Dark Brown Topsoil
Depth of Sample 6"-12"
Tested By J. Meadows
Date of Testing 11/22 - 11/25
Sample Arrival Date 11/21/94

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1397.62
Wt. of container	244
Wt. of dry sample, W_s	1153.62

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	58.54	58.54	5.1	94.94
10	110.82	169.66	14.7	85.29
20	40.9	210.56	18.3	81.7
40	51.04	261.60	22.7	77.3
60	63.23	324.83	28.2	71.8
140	36.01	360.84	31.3	68.7
200	2.77	363.61	31.5	68.4
PAN	790.01	1153.62	100	0

% passing = 100 -- Σ % retained

TYREE BORROW STUDY

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project: SULLIVAN, MO Boring No. _____ Sample No. P-1

Description of Soil TOPSOIL Depth of Sample GRAB

Tested By J. Meadows Date of Testing 12/17/94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12/15/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1917.6
Wt. of container	247.3
Wt. of dry sample, W_s	1670.3

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	4.08	4.08	0.24	99.8
10	9.04	13.12	0.79	99.2
20	16.41	29.53	1.77	98.2
40	19.84	49.37	2.96	97.0
60	19.48	68.85	4.12	95.9
140	17.59	86.44	5.18	94.8
200	1.76	88.20	5.28	94.7
PAN	1582.10	1670.30	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG TECHNICAL SERVICES Job No. 4475.030

Location of Project: SULLIVAN, MO Boring No. _____ Sample No. P-2

Description of Soil TOPSOIL Depth of Sample GRAB

Tested By JJM Date of Testing 12-17-94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12-15-94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1870.6
Wt. of container	250.3
Wt. of dry sample, Ws	1620.3

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	1.83	1.83	0.11	99.9
4	0.22	2.05	0.13	99.9
10	2.15	4.20	0.26	99.7
20	9.30	13.50	0.83	99.2
40	15.50	29.01	1.79	98.2
60	14.60	43.61	2.69	97.3
140	13.38	56.99	3.52	96.5
200	1.42	58.41	3.60	96.4
PAN	1562.29	1620.7	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Technical Services Job No. 4425.030

Location of Project: Sullivan, MO Boring No. _____ Sample No. P-3

Description of Soil Topsoil Depth of Sample Grab

Tested By JJM Date of Testing 12/12/94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12/15/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1893.9
Wt. of container	250.3
Wt. of dry sample, W_s	1643.6

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	1.72	1.72	0.10	99.9
10	10.85	12.57	0.76	99.2
20	22.62	35.19	2.14	97.9
40	19.85	55.04	3.35	96.7
60	14.86	69.90	4.25	95.8
140	12.81	82.71	5.03	95.0
200	1.46	84.17	5.12	94.9
PAN	1560.07	1644.24	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project: SULLIVAN, MO Boring No. _____ Sample No. P-4

Description of Soil TOPSOIL Depth of Sample GRAB

Tested By JJM Date of Testing 12/17/94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12/15/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1899.24
Wt. of container	250.3
Wt. of dry sample, Ws	1648.9

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	.94	.94	0.06	100.0
10	11.8	12.74	0.77	99.2
20	24.24	36.98	2.24	97.8
40	21.68	58.66	3.56	96.4
60	15.2	73.86	4.48	95.5
140	12.37	86.23	5.23	94.8
200	1.42	87.65	5.31	94.7
PAN	1562.36	1650.01	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Technical Services Job No. 4425.030

Location of Project: Sullivan, MO Boring No. _____ Sample No. D-

Description of Soil Topsoil Depth of Sample Grab

Tested By JJM Date of Testing 12/12/94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12/15/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1918.3
Wt. of container	250.3
Wt. of dry sample, W_s	1668.0

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	0	0	0	100
4	.15	.15	0.01	100.0
10	16.62	16.77	1.01	99.0
20	30.86	47.63	7.86	97.1
40	19.03	66.66	4.00	96.0
60	11.53	78.19	4.69	95.3
140	9.68	87.87	5.27	94.7
200	1.20	89.07	5.34	94.7
PAN	179.11	1668.18	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING
& ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG TECHNICAL SERVICES Job No. 4425.030

Location of Project: SULLIVAN, MO Boring No. _____ Sample No. P-6

Description of Soil TOPSOIL Depth of Sample GRAB

Tested By JJM Date of Testing 12/12/94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12/15/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1900.7
Wt. of container	250.3
Wt. of dry sample, W_s	1650.4

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	53.04	53.04	3.21	96.8
3/8	27.54	80.58	4.88	95.1
4	13.65	94.23	5.71	94.3
10	21.12	115.35	6.99	93.0
20	28.9	144.25	8.74	91.26
40	31.61	175.86	10.7	89.3
60	24.41	200.27	12.1	87.9
140	21.87	222.14	13.5	86.5
200	2.58	224.72	13.6	86.4
PAN	1425.4	1650.15	100	0

% passing = 100 -- Σ % retained

IN PLACE SOIL QUALITY COTROL

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Technical Services Job No. 4425.030

Location of Project: Sullivan, MO Boring No. _____ Sample No. 1

Description of Soil Topsoil Depth of Sample Grab

Tested By J Meadows Date of Testing 12/9/94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12/6/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1921.1
Wt. of container	243.5
Wt. of dry sample, W_s	1677.6

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	15.56	15.56	0.928	99.1
3/8	18.75	34.31	2.05	98.0
4	51.14	85.45	5.10	94.9
10	47.31	132.76	7.92	92.1
20	26.94	159.70	9.53	90.5
40	35.28	194.98	11.6	88.4
60	111.86	306.84	18.3	81.7
140	128.76	435.60	26.0	74.0
200	6.86	442.46	26.4	73.6
PAN	1233.61	1676.07	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Technical Services Job No. 4425.030

Location of Project: Sullivan, MO Boring No. _____ Sample No. 2

Description of Soil Topsoil Depth of Sample Grab

Tested By J. Medows Date of Testing 12/17/94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12/15/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	2623.19
Wt. of container	1560.00
Wt. of dry sample, W_s	1063.19

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	32.54	32.54	3.06	96.9
3/8	26.75	59.29	5.58	94.4
4	63.05	122.34	11.5	88.5
10	66.72	189.06	17.8	82.2
20	38.95	228.01	21.5	78.5
40	41.21	269.22	25.3	74.7
60	105.49	374.71	35.3	64.7
140	114.67	489.38	46.1	53.9
200	7.65	497.03	46.8	53.2
PAN	565.70	1062.73	100	0

% passing = 100 -- Σ % retained

MIDWEST TESTING & ENVIRONMENTAL SERVICES

GRAIN SIZE ANALYSIS - MECHANICAL - SOILS

Project: OBG Technical Services Job No. 5[illegible]5.030

Location of Project: Sullivan, MO Boring No. _____ Sample No. 3

Description of Soil Topsoil Depth of Samp GRAB

Tested By J. Meadows Date of Testing 12/17/94

Soil Sample Size (ASTM D1140-54) Sample Arrival Date 12/15/94

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 Sieve	200
No. 4 Sieve	500
3/4 inc.	1500

Wt. of dry sample + container	1807.8
Wt. of container	250.3
Wt. of dry sample, Ws	1557.5

Sieve analysis and grain shape

Sieve no.	Wt. Retained	Accumulation Wt. retained	Accumulation % retained	% passing
1-1/2	0	0	0	100
1	0	0	0	100
3/4	0	0	0	100
3/8	18.50	18.50	1.19	98.8
4	15.32	33.82	2.17	97.8
10	30.49	64.31	4.13	95.9
20	23.08	87.39	5.61	94.4
40	42.36	129.75	8.33	91.7
60	105.08	234.83	15.1	84.9
140	152.72	387.55	24.9	75.1
200	8.47	396.02	25.4	74.6
PAN	1161.59	1557.61	100	0

% passing = 100 -- Σ % retained

TOPOGRAPHIC SURVEY DATA

VEGETATIVE LAYER ELEVATIONS

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MISCELLANEOUS SURVEY DATA

A. TOP OF SLOPE AREA

B. TOE OF SLOPE AREA

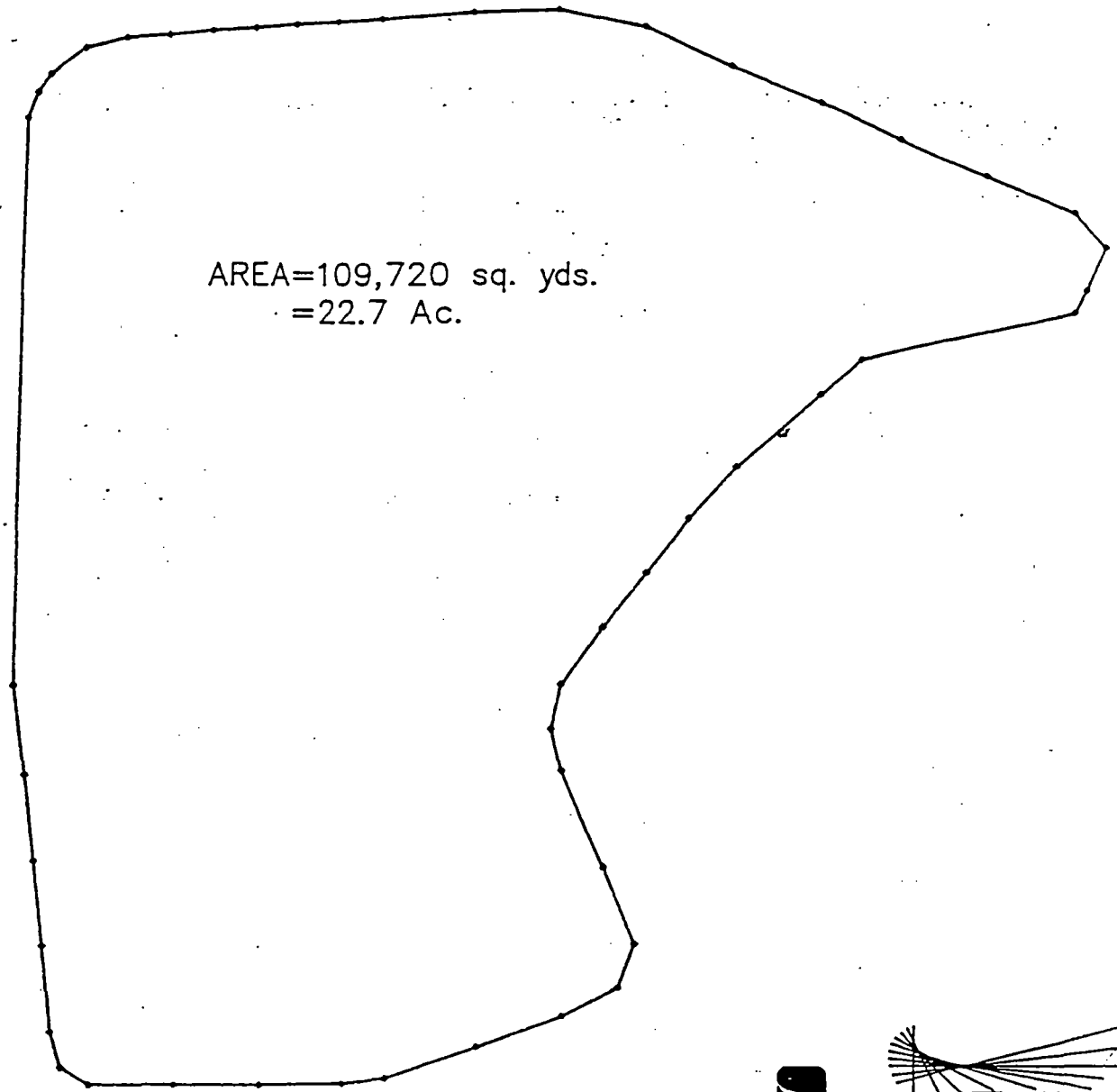
C. TEMPORARY SETTLEMENT PLATFORM DATA

D. ANCHOR TRENCH DESCRIPTION

TOP OF SLOPE FOR SULLIVAN LANDFILL CLOSURE, SULLIVAN, MO

PREPARED FOR

OBG TECHNICAL SERVICES, INC.



STACK & ASSOCIATES, INC.
Engineers • Architects • Surveyors

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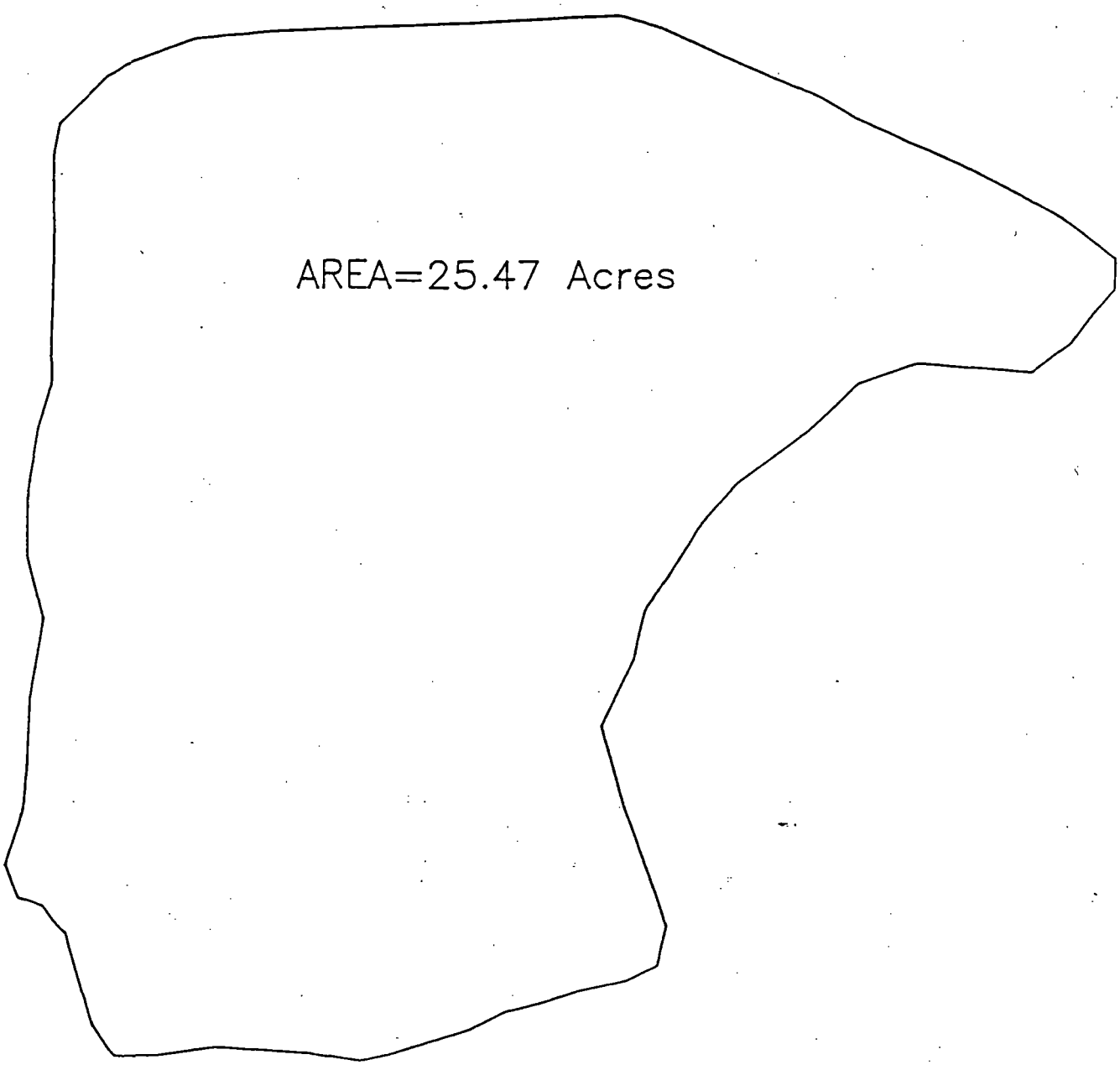
TOE OF SLOPE
AS PER ABB DRAWING



314-283-3731
P.O. Box 287
St. Joseph, Missouri

STACK & ASSOCIATES, INC.
Engineers • Architects • Surveyors

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TEMPORARY SETTLEMENT PLATFORM DATA

TEMPORARY SETTLEMENT PAD
(TSP)
JULY 7,1994

TSP#	ELEVATION
1	919.908
2	922.325
3	922.851
4	920.634
5	916.584
6	913.202
7	907.985
8	902.520
9	895.317
10	888.013

NOTE: Existing elevations of "X" in center of platform.

TEMPORARY SETTLEMENT PAD
(TSP)
JULY 21,1994

TSP#	ELEVATION
1	925.05
2	927.37
3	927.90
4	925.65
5	921.65
6	918.26
7	912.92
8	907.58
9	900.28
10	893.09

NOTE: Existing elevations of top of post.

TEMPORARY SETTLEMENT PAD
(TSP)
JULY 27,1994

TSP#	ELEVATION
1	925.04
2	927.36
3	927.90
4	925.63
5	921.61
6	918.23
7	912.90
8	907.54
9	900.25
10	893.09

NOTE: Existing elevations of top of post.

TEMPORARY SETTLEMENT PAD
(TSP)
AUGUST 15,1994

TSP#	ELEVATION
1	925.04
2	927.35
3	927.88
4	DESTROYED
5	921.56
6	918.17
7	912.81
8	907.53
9	900.25
10	893.09

NOTE: Existing elevations of top of post.

TEMPORARY SETTLEMENT PAD
(TSP)
AUGUST 23,1994

TSP#	ELEVATION
1	925.00
2	927.28
3	927.83
4	DESTROYED
5	921.57
6	918.19
7	912.78
8	907.54
9	900.26
10	893.06

NOTE: Existing elevations of top of post.

ANCHOR TRENCH PROPERTY DESCRIPTION

ANCHOR TRENCH PROPERTY DESCRIPTION

All that part of Lot 2 of the Northeast quarter of Section Three (3), Township Forty (40) North, Range Two(2) West of the 5th. P.M., described as follows: Commencing at the Southwest corner of Lot 2 of the Northeast quarter of said Section 3; thence with the West line thereof proceed North 0° 05' 02" West - 35.0 feet to an iron rod, thence North 33° 43' 56" East - 40.92 feet to a point, being the true point of beginning of the anchor trench hereinafter described; thence South 51° 37' 53" East - 38.21 feet to a point; thence South 69° 55' 15" East - 34.19 feet to a point; thence South 89° 10' 03" East - 164.9 feet to a point; thence North 88° 26' 44" East - 52.98 feet to a point; thence North 83° 37' 33" East - 125.16 feet to a point; thence North 70° 26' 01" East - 34.34 feet to a point; thence North 78° 52' 12" East - 45.92 feet to a point; thence North 82° 56' 13" East - 114.95 feet to a point; thence North 76° 52' 15" East - 22.15 feet to a point; thence North 64° 38' 50" East - 86.72 feet to a point; thence North 48° 14' 07" East - 24.10 feet to a point; thence North 08° 22' 08" East - 24.70 feet to a point; thence North 07° 03' 18" West - 23.42 feet to a point; thence North 19° 38' 02" West - 69.19 feet to a point; thence North 12° 50' 51" - 189.70 feet to a point; thence North 04° 16' 39" West - 25.71 feet to a point; thence North 07° 57' 38" East - 22.50 feet to a point; thence North 16° 11' 42" East - 23.20 feet to a point; thence North 20° 33' 47" East - 67.55 feet to a point; thence North 29° 40' 34" East - 21.78 feet to a point; thence North 36° 49' 21" East - 47.59 feet to a point; thence North 48° 01' 25" East - 87.04 feet to a point; thence North 43° 21' 02" East - 70.17 feet to a point; thence North 39° 59' 31" East - 60.04 feet to a point; thence North 46° 37' 50" East - 65.94 feet to a point; thence North 55° 39' 59" East - 81.55 feet to a point; thence North 88° 05' 38" - 137.90 feet to a point; thence North 61° 28' 18" East - 130.53 feet to a point; thence North 60° 49' 47" - 49.10 feet to a point; thence North 46° 57' 23" East - 33.20 feet to a point; thence North 22° 47' 21" East - 20.65 feet to a point; thence North 68° 14' 19" West - 15.38 feet to a point; thence North 62° 06' 02" West - 22.79 feet to a point; thence North 71° 42' 33" West - 23.02 feet to a point; thence North 70° 09' 26" - 45.16 feet to a point; thence North 63° 00' 35" West - 68.00 feet to a point; thence North 65° 15' 17" West - 67.99 feet to a point; thence North 62° 54' 10" West - 45.74 feet to a point; thence North 67° 17' 36" West - 22.34 feet to a point; thence North 62° 54' 02" West - 45.23 feet to a point; thence North 65° 33' 51" West - 23.17 feet to a point; thence North 79° 51' 30" West - 23.13 feet to a point; thence North 54° 39' 43" West - 25.27 feet to a point; thence North 64° 03' 51" - 158.30 feet to a point; thence North 61° 52' 03" West - 23.37 feet to a point; thence North 65° 10' 15" West - 46.21 feet to a point; thence North 67° 23' 16" West - 18.69 feet to a point; thence North 81° 26' 32" West - 45.08 feet to a point; thence South 88° 17' 57" West - 24.22 feet to a point; thence South 80° 45' 55" West - 40.31 feet to a point; thence South 79° 35' 46" West - 23.88 feet to a point; thence South 84° 17' 30" West - 137.29 feet to a point; thence South 84° 57' 21" West - 217.98 feet to a point; thence South 69° 35' 50" West - 43.98 feet to a point; thence South 51° 59' 00" West - 23.73 feet to a point; thence South 08° 13' 12" West - 67.05 feet to a point; thence South 07° 48' 25" West - 47.64 feet to a point; thence South 05° 19' 12" West - 90.47 feet to a point; thence South 06° 52' 08" West - 46.09 feet to a point; thence South 00° 27' 05" West - 91.28 feet to a point; thence South 05° 54' 35" West - 23.36 feet to a point; thence South 00° 54' 35" West - 90.57 feet to a point; thence South - 67.80 feet to a point; thence South 63° 26' 37" West - 2.68 feet to a point; thence South 01° 32' 37" West - 71.18 feet to a point; thence South 03° 32' 27" West 23.28 feet to a point; thence South 05° 58' 48" West - 46.01 feet to a point; thence South 01° 48' 34" East - 45.54 feet to a point; thence South 01° 13' 10" East - 45.05 feet to a point; thence South 03° 36' 55" East - 45.61 feet to a point;

thence South 03° 39' 13" East - 22.57 feet to a point; thence South 01° 48' 11" East - 68.55 feet to a point; thence South 02° 21' 44" West - 23.26 feet to a point; thence South 18° 15' 40" West - 48.18 feet to a point; thence South 10° 21' 46" East - 22.65 feet to a point; thence South 01° 46' 20" East - 46.50 feet to a point; thence South 03° 57' 26" East - 45.15 feet to a point; thence South 08° 25' 48" East - 45.77 feet to a point; thence South 22° 37' 39" East - 24.92 feet to the point of beginning.

Containing 23.8 acres, more or less.