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Quarterly Report Baseline Water Quality Conditions

Marion (Bragg) Landfill
Marion, Indiana
February 1990

Prepared on behalf of
Marion (Bragg) Landfill Group
November 1990

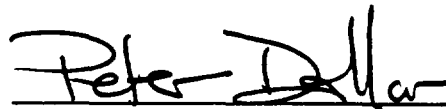
**QUARTERLY REPORT
BASELINE WATER QUALITY CONDITIONS
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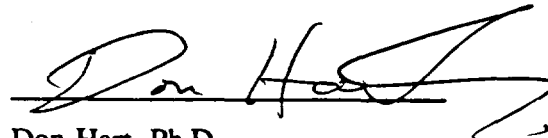
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1.0 INTRODUCTION

This report presents the results of initial quarterly monitoring event (February 1990) at the Marion (Bragg) Landfill in Marion, Indiana. This initial monitoring event was conducted to determine the baseline groundwater quality at the site before the implementation of the interim remedial activity. Chemistry data from subsequent monitoring events will be used to determine the effectiveness of this remedy. The remedial action plan (RAP) and the remedial design/remedial action workplan for the site were prepared by Environmental Resources Management, Inc. (ERM) for the Marion (Bragg) Landfill Group. The workplan was prepared according to the United States Environmental Protection Agency (US EPA) and Indiana Department of Environmental Management (IDEM) guidelines and is consistent with the Consent Decree for this site. Beak Consultants Limited (BEAK) is implementing the RAP at the site.

1.1 Site Description

The Marion (Bragg) Landfill is located at the southeastern edge of the City of Marion, Grant County, Indiana. Figure 1.1 shows the general location of the site (inset) and the site plan. The 72 acre site is bounded by the Mississinewa River to the north and east, a cemetery to the west, and a pond to the south ("offsite pond"). Approximately 45 of the site's 72 acres were used for landfilling purposes prior to its closure in 1975. At present, a pond ("onsite pond") covering approximately 15 acres occupies the central portion of the site. The Dobson Construction Company operates an asphalt plant in the southwestern corner of the site.

1.2 Previous Investigations

In 1982, a US EPA Field Investigation Team (FIT) conducted a site inspection. Following the FIT investigation, the Marion (Bragg) Landfill was scored by the state and was added to the US EPA National Priorities List in December 1982. In 1983, a Remedial Action Master Plan was prepared for the site. In February 1985, the state officially requested the US EPA to conduct a remedial investigation/feasibility study (RI/FS). Preliminary field work for the RI/FS was initiated in August 1985. The study was completed in August, 1987 with the submission of the final RI/FS reports.

1.3 Selected Remedy

The EPA and IDEM presented a remedy in the record of decision which consists of the following major components.

- Regrade and cap the site,
- Provide and maintain flood control measures,
- Construct and maintain a fence around the site perimeter,
- Provide three private use drinking water wells within the deep aquifer for water users who drink from the affected aquifer within the site boundary. Seal the existing shallow wells (if possible, keep one as a monitoring well.)
- Monitor the groundwater to complete the remaining groundwater and onsite pond operable units.

2.0 OBJECTIVES AND TECHNICAL SCOPE

2.1 Objectives

The technical program for this project was designed to monitor the effectiveness of the interim remedy at the Marion (Bragg) Landfill. The remedial design/remedial action workplan for the site was designed by ERM (1989) and implemented by BEAK. This report presents the results of the baseline chemistry data for groundwater, river water, and pond water samples collected at the site before the installation of the landfill cap. The groundwater and surface water data collected before, during and after the installation of the landfill cap are to be evaluated to determine the effectiveness of this interim remedy. Sediment samples from the river were not collected during this initial sampling event as the river was at high stage. Sediment samples will be collected during the August sampling event.

2.2 Technical Procedures

2.2.1 Introduction

The tasks performed to effectively monitor groundwater and surface water quality in the vicinity of the Marion (Bragg) Landfill and to provide documentation of the effectiveness of the proposed remedy include:

- installation of monitoring wells and sampling of groundwater
- sampling of river water and pond water
- collection of water level data (groundwater and surface water)

The methods and materials used to drill the boreholes, construct the monitoring wells, collect the groundwater samples, measure water levels and collect river water and pond water samples are outlined briefly in the following subsections and in greater detail in Appendix 1.

2.2.2 Borehole Drilling and Sediment Sample Collection

Ten new boreholes were drilled at the Marion (Bragg) Landfill by Moretrench American Corporation under the supervision of a BEAK hydrogeologist between November 1989 and January 1990 (Protocol 1, Appendix 1). The borehole locations are indicated on Figure 2.1. The locations for the 10 new monitoring wells were based on consideration of the following factors and concurrence of the US EPA and IDEM:

- wells were not to be drilled through waste
- the geology of the upper aquifer at the site is relatively simple, and
- the upper aquifer discharges directly to the Mississinewa River

Seven of the 10 soil borings (MB-1 through MB-7, see Figure 2.1) were drilled on the landfill property downgradient from areas of waste deposition ("source area") and upgradient of the Mississinewa River. Borehole MB-8 was drilled through waste, but the screened interval was positioned in undisturbed native sediments. The reason for drilling through waste and the precautions taken during drilling at MB-8 are described later in this section. Boreholes MB-9 and MB-10 were drilled along the southern property boundary of the site.

All boreholes were drilled with 4 1/4-inch inside diameter (ID) hollow stem augers. Continuous 24-inch split spoon samples were collected over the entire length of each of the boreholes. The split spoon samples were geologically logged and visually classified according to the Unified Soil Classification System. Subsamples from each split spoon sample were collected and stored in glass containers for future visual reference. Borehole logs that describe the stratigraphy and lithology of the materials encountered were prepared for each of the boreholes (Appendix 2).

The first two attempts to drill a borehole at location MB-8 encountered waste and were backfilled to ground surface with cement/bentonite grout. As it was impossible to drill on the steeply sloping river bank between the landfill waste and the river, borehole MB-8 was drilled through the waste. The new boring was drilled with 6-inch ID (11-inch OD) hollow stem augers. The augers were advanced until "clean" (no visible wastes) backfill sediments were encountered (a depth of approximately 11 feet). At this time the augers used to drill through the waste were removed from the borehole. A temporary steel casing was then inserted in the borehole and driven approximately 2 feet past the bottom of the borehole. The steel casing was sufficiently large to permit the entry of standard sized 4 1/4-inch ID hollow stem augers to be inserted within the casing. A 3-inch diameter split spoon sampler was then used to clean any well cuttings from the borehole prior to resuming drilling. The borehole was then drilled to a depth of 34.5 feet and a monitoring well installed. The temporary surface casing was slowly removed during grouting procedures.

Surface casing was installed at boring location MB-10 as a precautionary measure to prevent any glass fragments, plastic and asphalt from being carried down the boring during drilling activities. The surface casing consisted of 10-inch ID schedule 40 PVC pipe. The casing was installed to a depth of 5 feet below ground surface and grouted into place. The grout was allowed to set up for 36 hours. The grout was then drilled out of the borehole and the borehole was advanced to a total depth of 30 feet and a monitoring well was installed.

2.2.3 Monitoring Well Installation and Development

Ten monitoring wells were specifically designed and installed following Protocol 2 (Appendix 1) to provide an accurate indication of the groundwater quality at the site. Monitoring wells MB-1 through MB-8 inclusive were installed to monitor the quality of groundwater discharging to the Mississinewa River.

All wells were constructed of 2-inch ID flush-threaded schedule 40 polyvinyl chloride (PVC) pipe with teflon "O" ring seals. Well screens consisted of 10-foot sections of PVC pipe that were factory-perforated with 0.020-inch slots to permit the entry of water into the well. To minimize the risk of contamination of the groundwater, the well materials were factory-cleaned and sealed in plastic sleeves until the time of installation in the borehole. No lubricants or adhesives were used in the construction of the wells.

The PVC pipe and screen was positioned inside the annulus of the hollow stem augers after the borehole had been drilled to the appropriate depth. The annular space around the screen was packed with pre-washed No. 9 gravel (per approved design) to a maximum of 2.5 feet above the top of the screen during the gradual removal of the augers. A medium-grain silica sand filter 1-foot thick was then positioned on top of the gravel filter pack through the drill string annulus followed by 2 feet of 1/4-inch diameter bentonite pellets. Approximately 1 to 2 gallons of distilled water were poured down the inside of the augers to activate the pellets to form a seal. No water was added to boreholes in which sufficient water flowed into the borehole during the placement of the pellets. A cement/bentonite grout was then tremied from the top of the bentonite pellet seal to within 3 feet of the ground surface. To prevent surface water infiltration and to provide security, a stainless steel protective casing was then placed in the borehole and a concrete pad was poured. The concrete seal extends approximately 3 feet below the ground surface and is tapered away from the well casing.

Well development activities described in Protocol 3 (Appendix 1) were initiated after all monitoring well installations were complete. The monitoring wells were developed by removing water from the wells using dedicated Waterra hand pumps. The Waterra pumping system used for well development is described in Appendix 5. Development activities were continued until the pH, temperature and specific conductance of the water removed from the well had stabilized. After stabilization, additional water was developed from each of the wells to reduce the silt content and enhance performance of the well screen. Well development data for each of the monitoring wells are presented in Appendix 3.

2.2.4 Water Level Data

The water levels in the monitoring wells were measured using an electric water level tape or acoustic "sounder" following the method outlined in Protocol 4 (Appendix 1). The top of casing elevation in each of the wells was surveyed to within 1/100th of a foot relative to a local known elevation. The absolute elevation of the water levels in each of the wells, calculated from the water level data and the elevation data at each well, were contoured to provide a watertable or piezometric surface contour map.

2.2.5 Groundwater, Surface Water and Pond Water Sample Acquisition

2.2.5.1 Groundwater Samples

Groundwater samples were collected from the monitoring wells by BEAK personnel using dedicated Waterra pumps. The wells were evacuated in order from suspected lowest to highest chemical concentrations to minimize potential cross-contamination. Development activities continued until pH, specific conductance and temperature measurements had stabilized +/- 10% over three consecutive readings. A minimum of 3 casing volumes were removed ("purged") from each well. The total volume of water purged from the monitoring wells prior to sampling was recorded in the field book.

2.2.5.2 River Water Samples

River water samples were obtained from 6 locations in the Mississinewa River and Lugar Creek (Figure 2.1). Sampling points on the river were located at three locations adjacent to the landfill (SW-2, SW-3 and SW-4) and at one location downstream from the site (SW-1). Mississinewa River location (SW-5) and the Lugar Creek (SW-6) location are located upstream from the site. Sampling proceeded from the farthest downstream location and proceeded to upstream locations to minimize potential cross-contamination from suspended

material derived from sampling activities. The Mississinewa River sampling locations were positioned between the left bank (facing downstream) and midchannel to reflect conditions associated with the landfill. The Lugar Creek sampling location was in the middle of the creek, upstream from its confluence with the Mississinewa River. Samples were collected directly into the sample container upstream from the position of the sampler at a depth of 6 inches below the water surface. The following channel conditions were recorded in the field log book at each sampling location: water depth, channel width, channel configuration and flow velocity.

2.2.5.3 Pond Water Samples

Pond water samples were obtained from 2 onsite and 2 offsite pond locations (Figure 2.1). Samples were collected proceeding from pond outflow to pond inflow locations. A deep and a shallow water sample were collected from each pond. The deep sample was collected from within 3 feet of the pond bottom using a stainless-steel Kemmerer sampler and transferred to the appropriate sample container. The shallow sample was collected directly into the appropriate sample container at a depth of 6 inches below the water surface. The total depth to the pond bottom was measured in feet using a weighted measuring tape and recorded in the field book.

2.2.6 Field Water Quality Measurements

The pH, temperature, specific conductance and dissolved oxygen (DO) content of the groundwater, surface water and pond water samples were determined in the field. At the beginning of each day, the pH, specific conductance and DO meters were calibrated according to the methods outlined in Protocol 7 of Appendix 1. These calibrations were re-checked periodically during and at the end of each day to ensure that no significant drifting of the instrument calibrations had occurred.

2.2.7 Sample Preservation and Analysis

Water samples were collected for chemical analysis in the following order: target compound list volatile organic compounds (TCL volatiles), TCL semivolatile organic compounds (TCL semivolatiles) minus pesticides and PCBs, target analyte list metals (TAL metals), total cyanide, total suspended solids (TSS), chloride, chemical oxygen demand (COD) and ammonia-nitrogen ($\text{NH}_3\text{-N}$). Summaries of the sample containers, preservatives, analyses and holding times for the groundwater, river water, and pond water samples are presented in Tables 2.1 and 2.2. After all samples had been collected and properly preserved, the pH, temperature, specific conductance and dissolved oxygen content of the water were measured and recorded. A complete record of all samples collected was kept in the field book.

The water samples were shipped at the end of each sampling day by overnight air courier to CompuChem Laboratories, Research Triangle Park, North Carolina.

2.2.8 Quality Control Samples

Trip Blanks

Trip blanks originating from the laboratory were submitted for analysis of TCL volatiles with every cooler containing samples for TCL volatile analysis. These blanks were not opened.

Field Blanks

Field blanks were collected once per 10 investigative samples. The field blanks consisted of laboratory supplied deionized water poured through a decontaminated Kemmerer sampler or filtering apparatus. The field blank was analyzed for identical analyses as the water samples.

Field Duplicate Samples

Field Duplicate samples were collected once per 10 investigative samples. The duplicate sample was collected by filling a second set of sample containers after completing the initial water sample.

Matrix Spike/Matrix Spike Duplicate Samples

Triple sample volume was provided at the frequency of once per 10 investigative samples so that the laboratory could perform matrix spike/matrix spike duplicate analyses. The three sets of bottles to be used for these analyses were indicated on the traffic report form.

2.2.9 Sampling Equipment Decontamination Procedure

All water sampling equipment was decontaminated prior to each use according to the following procedure.

- manually scrub with Alconox soap solution,
- rinse with tap water,
- rinse with a 10% HNO_3 (only if to be analyzed for metals),
- rinse with reagent grade methanol,
- rinse thoroughly with deionized water, and
- allow apparatus to air dry.

3.0 GEOLOGY

3.1 Introduction

This chapter describes the stratigraphic units identified at the Marion (Bragg) Landfill.

The stratigraphic information presented in this chapter was obtained from the RI report and the continuous geologic core samples collected during the present study. The borehole logs for monitoring wells MB-1 through MB-10 drilled during the current study are presented in Appendix 2. The lithologic units encountered in the subsurface at the site from the ground surface downward are: landfill waste and natural backfill materials (where present), outwash sand and gravel deposits, a silty clay glacial till, and the Silurian limestone bedrock of the Waldron Formation.

3.2 Landfill Waste and Natural Backfill Materials

The surficial deposits at Marion (Bragg) Landfill are dominated by landfill waste overlain by a thin veneer of cover material. The cover materials consist of silty and clayey sands, and silty and clayey gravels. The cover ranges in thickness from 3 inches to 2 feet, with an average thickness of approximately 6 inches.

The boreholes drilled during the present study, near the site boundaries, encountered natural sediments that were backfilled at these locations. The backfilled materials ranged in thickness from 8 to 28 feet and consisted of silts and silty sands. These relatively fine grain materials are likely the residual sediments that were redeposited after sands and gravels were selectively removed.

3.3 Outwash Sands and Gravel Deposits

The native surficial materials at the site are glacial outwash materials that were deposited during the retreat of the Lake Wisconsin ice sheets. These deposits consist of silty sand through silty sandy gravel, similar to the cover materials. The deposits are light brown to grey in colour and showed some evidence of reddish oxidation. Particle size analysis performed on the outwash deposits during the RI indicated the following percent compositions:

- gravel 0 to 45%
- sand 37 to 93%
- silt 4 to 22%
- clay 1 to 4%

The outwash sands and gravels range in thickness from 32 feet on the eastern side of the site to 64 feet on the west side of the site based on borings drilled during the present study, the RI and private-use water well records.

3.4 Glacial Till

The glacial till unit encountered during the present study is composed of clayey silt to silty clay with occasional pebbles. The till is generally hard and compact with a medium plasticity. The relative percent composition of the till determined during the RI is:

- gravel 0 to 3%
- sand 12 to 16%
- silt 59 to 68%
- clay 2 to 6%

The RI particle size analysis of the till samples suggests that the materials consist of silts and sandy silt-sized materials.

The till ranges in thickness from 48 feet in RI boring MW-1 which penetrated the entire unit to 60 feet according to a water well record. The glacial till surface at the site slopes toward the west-southwest and has an approximate slope of 0.015 (1 foot vertically for every 65 feet horizontally) (Camp, Dresser and McKee, 1987).

3.5 Limestone Bedrock

The limestone bedrock encountered at the site during the RI is a fine-grained to sublithographic argillaceous limestone of the Waldron Formation. The limestone is sparsely fossiliferous, contains pyrite inclusions. Solution porosity is developed along bedding planes.

Bedrock was encountered at 88 and 112 feet below ground surface in RI boring MW-1 and a water well record, respectively.

4.0 HYDROGEOLOGY

4.1 Introduction

Three hydrostratigraphic units have been identified at the Marion (Bragg) landfill site; an upper unconfined aquifer, a confining aquitard layer and a lower confined bedrock aquifer. The upper unconfined aquifer includes the outwash sands and gravels. The upper aquifer is the focus of the present study and will be discussed in greater detail. The confining aquitard unit between the upper and lower aquifers is a very cohesive clayey silt till. The underlying lower aquifer occurs within limestone bedrock. Detailed descriptions of each of the hydrostratigraphic units and of the groundwater flow conditions beneath the site are presented below.

4.2 Upper Aquifer

The upper aquifer occurs within the outwash sands and gravels. The upper aquifer is unconfined (watertable conditions exist) with the watertable at 6 to 24 feet below ground surface in monitoring wells installed for this study.

4.2.1 Upper Aquifer Hydraulic Properties

Horizontal hydraulic conductivity values for the upper aquifer were determined from slug tests conducted during the RI. The hydraulic conductivity values selected ranged from 8.8×10^{-4} to 1.8×10^{-1} cm/sec, with an average (representative) value of 1.8×10^{-2} cm/sec. The effective porosity for the sands and gravels in the upper aquifer likely range from 25% (minimum) to 40% (maximum) (Freeze and Cherry, 1979).

4.2.2 Water Level Data and Hydraulic Gradients

Watertable elevations at 10 new monitoring wells installed for this study and the 5 remaining offsite RI monitoring wells were recorded at 5 time intervals during the period from 16 January to 24 April 1990. The static waterlevel measurement intervals correspond with the completion of well development activities (16 January 1990), the initiation of sampling activities (05 February 1990), the completion of sampling activities (16 February 1990) and monthly measurements taken 20 March and 24 April 1990. Static water level data and hydrographs for the 5 time intervals are presented in Appendix 3. Watertable elevation contour maps have been prepared using the 16 February 1990, 20 March 1990 and the 24 April 1990 waterlevel data (Figures 4.1, 4.2, 4.3).

Staff gauges were installed in the onsite pond, the offsite pond, and in the Mississinewa River at locations upstream and downstream of the site on 21 March, 1990, to provide surface water elevation data needed to determine groundwater flow directions. An earlier attempt to install the staff gauges in the Mississinewa River in February was foiled by high flow conditions.

The hydrographs for the downgradient monitoring wells near the river display a pronounced rise in waterlevels during February (Figures A3.1 and A3.2 of Appendix 3). The higher water elevations during this period are likely the result of snowmelt and high stage flow conditions in the Mississinewa River. The upgradient monitoring well locations are spatially removed from the influence of the river and display a constant steady increase in waterlevels with time indicating that the aquifer is being recharged.

The horizontal hydraulic gradients measured in the upper aquifer for the March, 1990 watertable elevation contours in Figure 4.2 range from 0.002 to 0.008 over the site, with an average gradient of 0.005.

Vertical hydraulic gradients were only obtained from a single monitoring well nest installed for this study (monitoring wells MB-3 and MB-4). The vertical gradients calculated from this well nest were near 0 with minor upward or downward fluctuations. These gradients suggest that groundwater is flowing primarily in a horizontal direction at the monitoring well nest location.

4.2.3 Groundwater Flow Conditions

Watertable elevation contours for 16 February 1990 (Figure 4.1) are approximate as there were no surface water elevations recorded. The Mississinewa River was at high stage (near flood) during the waterlevel recording period. In general, the groundwater flows northward from the offsite property to the south of the onsite pond in the southwestern and southcentral areas of the site. The groundwater entering the southeast corner of the site from the offsite property to the south will most likely flow north to the onsite pond, with a minor component flowing east to the Mississinewa River. Waterlevel data presented in the RI, also collected during a high stage event (21 March, 1986), predicted a similar distribution of flow in the southwest corner of the site. To the north of the pond, groundwater likely flows in a northwesterly direction.

The watertable elevation contours for the March and April recording periods (Figures 4.2 and 4.3 respectively) during normal river stages indicate that groundwater in the upper aquifer generally flows to the north and east at the site and ultimately discharges into the Mississinewa River. The northerly groundwater flow from the offsite property to the south of the site either discharges into the onsite pond or flows eastward into the river (see proposed groundwater flowpaths in Figure 4.2). Groundwater that discharges into the onsite pond is eventually recharged along the northwestern, northern and eastern banks of the pond. To the north of the pond, groundwater flows to the north and northwest toward the river while east of the pond, groundwater flows eastward to the river. The groundwater flow distributions are similar for both recording periods, with a slight drop in the watertable elevation during the April period.

Representative (average) horizontal groundwater velocities were calculated for the upper aquifer based on the hydraulic properties and hydraulic conductivity data discussed above. The calculation indicates that the representative horizontal groundwater velocity is approximately 0.75 ft/day across the site.

The travel times required for groundwater to flow across the site can be calculated from the above velocity determinations and a given length for the groundwater flow path (assuming the velocity data to be applicable over the entire flow path). For purposes of the time estimates, only the longest groundwater flow path across the site was considered. This flow path is identical to the flowpath used for the RI investigation calculation. The travel time estimate based on the longest flow path is designed to determine the maximum time needed for groundwater to flow across the site. In areas of the site where groundwater follows shorter flow paths, the time for groundwater to travel across the site will be reduced. As shown on Figure 4.2, the maximum distance (approximately 2500 feet) follows the westernmost flow line, from the southern edge of the landfill area near well MB-10 to the onsite pond and from the onsite pond to the south bank of the Mississinewa River northwest of monitoring well MB-1. The travel time calculated based on the representative data was estimated to be approximately 9 years based on the March 1990 watertable elevation contours. This value is consistent with the value noted in the RI report given the uncertainty associated with the hydraulic and storage parameters of the upper aquifer.

4.3 Confining Unit

The glacial till confining unit is 48 to 60 feet thick in boreholes drilled at the site. The glacial till confining unit behaves as an aquitard between the overlying sand and gravel aquifer and the underlying limestone bedrock aquifer, and retards groundwater flow between these two units. The presence of the confining unit accounts for the significant variation in hydraulic head between the bottom of the sand and gravel aquifer and the top of the limestone bedrock aquifer noted during the RI. Since the hydraulic head is greater in the bedrock aquifer, flow would be upward through the confining unit toward the sand and gravel aquifer.

Average linear velocities of groundwater flowing through the confining unit were estimated during the RI using hydraulic head and hydraulic conductivity data, and an estimate for porosity (40%). Laboratory triaxial permeability tests were performed on till samples to determine the hydraulic conductivity of the unit. The hydraulic conductivity values ranged from 1.01×10^{-7} cm/sec to 2.9×10^{-8} cm/sec (Camp, Dresser and McKee, 1987). The estimated average linear velocity of groundwater moving through the confining unit was estimated to be 1.2×10^{-4} ft/day. Based on this velocity calculation, it was predicted that it would take approximately 1400 years for water to migrate up through the confining layer to the upper aquifer from the lower aquifer.

4.4 Lower Aquifer

The lower aquifer occurs within the limestone bedrock at depths greater than 88 feet below ground surface at the site. Core samples retrieved during the RI indicated that solution porosity was developed along bedding planes and that the limestone was moderately fractured. The bedding planes and fractures may be factors controlling groundwater flow within the bedrock aquifer.

During the RI, the hydraulic head in the lower confined aquifer was measured at 12.5 feet above ground surface in monitoring well MW-1, indicating artesian conditions exist in the lower aquifer. The difference in hydraulic head distributions (or hydraulic gradient) between the lower and upper aquifers indicates that groundwater flow in the lower aquifer is upward through the confining unit. A horizontal flow direction in the lower aquifer was determined during the RI by triangulating historic potentiometric surface data from private-use water well records and RI monitoring well MW-1. The available data indicates the horizontal flow direction may be towards the northeast.

5.0 GEOCHEMISTRY

5.1 Introduction

The groundwater, river water and pond waters at the Marion (Bragg) Landfill site were sampled in February, 1990 to provide baseline chemistry data. This initial monitoring event was conducted to determine the water quality at the site before the implementation of the interim remedial activity. Chemistry data from subsequent monitoring events will be used to determine the effectiveness of this remedy.

This chapter presents the results of the sampling activities and provides a discussion of the water chemistry data. Groundwater samples from the 10 monitoring wells, the 6 river water samples and the 4 pond water samples were analyzed for target compound list (TCL) volatile and semivolatile organic compounds (less pesticides and PCBs). Inorganic analyses included the target analyte list (TAL) metals and cyanide. Samples were also analyzed for the list of indicator parameters presented in Table 5.1. CompuChem Laboratories, Inc. (CompuChem) of Research Triangle Park, North Carolina provided all TCL and TAL analyses in accordance with EPA methodologies described in the QAPP (ERM, 1990) as defined for the National Contract Laboratories Program (CLP). Samples for ammonia-nitrogen ($\text{NH}_3\text{-N}$), chemical oxygen demand (COD) and chloride analysis were subcontracted by CompuChem to Northeastern Analytical Corporation of Marlton, New Jersey. The standard operating procedures for CompuChem Laboratories and Northeastern Analytical Corporation's EPA approved non-CLP reference methods are included in Attachment 3 of the QAPP (ERM, 1990).

Analytical results are presented in several formats:

- laboratory data validation reports are presented in Appendix 6
- tabulated chemistry data by sample matrix in this chapter (Tables 5.4, 5.6, 5.8)

- tabulated chemistry data by parameter in Appendix 4
- tabulated QA/QC analyses in Appendix 4
- summary tables of chemistry data by sample matrix (Tables 5.3, 5.5, 5.7)

The remainder of Chapter 5.0 is divided into 5 major sections as follows:

- **Section 5.2** describes the data validation procedures used to verify the qualitative and quantitative reliability of the data. The data reduction process used to produce the analytical data tables and matrix summary tables included in this chapter is also discussed.
- **Section 5.3** describes the quality control samples that were submitted with the samples to evaluate the qualitative and quantitative reliability of the data.
- **Section 5.4** presents the results and a discussion of chemistry data for groundwater samples collected from the 10 monitoring wells installed for this study.
- **Section 5.5** presents the results and discussion of chemistry data for samples collected from the 6 surface water sampling locations in the Mississinewa River and Lugar Creek. The chemistry data from upstream (background) locations are compared to data from sampling locations adjacent to and downstream of the site to determine if the landfill is affecting surface water quality.
- **Section 5.6** presents the results and discussion of analytical data for samples from the onsite and offsite pond water sampling locations.

The groundwater, surface water and pond water data presented in the forementioned sections are also compared to applicable water quality standards and criteria in Chapter 6.0.

5.2 Data Validation and Reduction Procedures

All analytical data has undergone a rigorous data validation review to verify its qualitative and quantitative reliability. The review was performed in accordance with the "Laboratory Data Validation Functional Guidelines for Evaluating Organic (and Inorganic) Analyses" (US EPA 2/88, and 7/88). The data validation guidelines are designed to evaluate results which are not sample dependent, but rather are fully under the laboratories control. Based on the quality assurance review, qualifier codes presented in Table 5.2, have been placed next to specific sample results on the chemistry data tables. The detailed data validation review and interpretation of all data generated by CompuChem is presented in Appendix 6.

The validated analytical data for each sample (TCL volatiles, TCL semivolatiles, total and dissolved TAL metals, and indicator parameters) are presented in Tables 5.4, 5.6, and 5.8 for each sample matrix. The analytical data tables present the tabulated analytical results from CompuChem's analytical reports that have passed CLP data reduction guidelines. The data tables were prepared by first reviewing CompuChem's analytical reports and eliminating all compounds that were analyzed for, but were not detected. If all the data for a particular element or compound for any sample matrix were not detected, the data for that parameter was not entered into the data tables. However, if even one sample from a given sample matrix had a reportable value, the data for that particular compound or element would be included for all sample locations.

A table summarizing the analytical results is presented for each sample matrix (groundwater, river water and pond water). These tables present the analytical results that have satisfied the data reduction procedures. The summary tables present the parameter detection limits, frequency of detection and range of detectable concentrations for the samples. For the frequency of detection and range of detectable concentrations, only the highest concentration from a sample and field duplicate pair was used in the compilation of the summary tables. The higher value is the most conservative estimate of sample concentration.

The parameter detection limits presented are the contract required quantitation limits (CRQLs) for the TCL volatile and semivolatile organic compounds and the contract required detection limits (CRDLs) for the TAL metals, cyanide and the indicator parameters. The laboratory instrument detection limits (IDLs) are the same as the CRQLs for organic compounds, but are generally equal to or less than the CRDLs for inorganic parameters. The IDL was greater than the CRDL for ammonia and COD.

5.3 Quality Control Samples

To ensure the quality of the analytical data, a number of quality assurance/quality control (QA/QC) procedures were implemented during the field sampling program. Groundwater QA/QC samples consisted of laboratory prepared trip blank samples and field pH check samples for TCL volatile samples. Additional groundwater QA/QC analyses are not required since the sampling pumps used to collect the samples are dedicated to each monitoring well and stored inside the well bore. River water QA/QC samples consisted of trip blank samples for TCL volatile analyses and a field blank prepared for dissolved TAL metals analysis. Field blanks consisted of laboratory supplied deionized water poured through decontaminated sampling equipment. River water samples were collected directly into sample containers with the exception of the samples for dissolved TAL metals which required filtering. Pond water QA/QC samples consisted of field blanks prepared for the field filter used for filtering the dissolved TAL metals samples and for the kemmerer sampler used to collect the deep pond water samples. Prepared samples, including trip blanks, field blanks and pH check samples, were submitted to the laboratory for analysis. Detailed descriptions of these types of samples are presented in Appendix 1. The results of the QA/QC samples are briefly discussed below and are tabulated in Appendix 4.

The pH check samples for all TCL volatiles had pH values less than 2 indicating that these samples were properly preserved (Table A4.1, Appendix 4). Trip blanks originating from the laboratory submitted for analysis of TCL volatiles contained detectable concentrations of

acetone in 2 of the blanks associated with the river water samples (Table A4.2, Appendix 4). The trip blank samples associated with the groundwater and pond water samples did not contain any detectable TCL volatile compounds. The presence of acetone in the trip blank samples indicates that acetone detected in the associated river water samples may be unreliable. Acetone is a common laboratory contaminant. The dissolved TAL metals field blank sample submitted for the river water field filter contained detectable concentrations of calcium (33.7 µg/L), sodium (1820 µg/L), potassium (1560 µg/L), lead (3.3 µg/L), vanadium (2.2 µg/L) and zinc (6.5 µg/L) near the IDLs for these analytes. Field blank samples for pond water sampling equipment did not contain any TCL volatiles, cyanide, COD, NH₃-N, TSS or chloride. Calcium (152 µg/L), lead (7.3 µg/L) and zinc (12.2 µg/L) were detected in the pond water field blank sample. The analytes detected in the field blank samples may have been introduced to the sample from the field equipment, the sample bottles, the deionized water used to prepare the sample, or during laboratory analysis.

5.4 Groundwater Chemistry

This section presents and discusses the results of the groundwater sample analyses from the 10 monitoring wells installed for this study. The analytical data are summarized in Table 5.3 and presented in Table 5.4.

5.4.1 TCL Volatile Organic Compounds

Seven TCL volatile organic compounds (TCL volatiles) were identified in one or more of the groundwater samples from the monitoring wells.¹ These compounds are identified in Table 5.3. The detection frequency of TCL volatiles ranged from 1 out of 10 to 3 out of 10 for groundwater samples. 1,2 Dichloroethene (1,2-DCE) (total), trichloroethene (TCE) and vinyl

¹ Methylene chloride was also detected in the groundwater samples but concentrations were qualified as "UJ" because they were similar to concentrations detected in the laboratory blank.

chloride are the only TCL volatiles that were detected at concentrations above CRQLs/IDLs. All other volatiles were qualified as estimated quantities as they were detected at concentrations below CRQLs. Vinyl chloride and 1,2-DCE (total) were detected in samples from monitoring wells MB-1 and MB-2. The vinyl chloride concentrations were 22 and 12 $\mu\text{g/L}$ while the 1,2-DCE (total) concentrations were 140 $\mu\text{g/L}$ and 5 $\mu\text{g/L}$ in monitoring wells MB-1 and MB-2 respectively. 1,2-DCE (total) was also detected in monitoring well MB-10 at an estimated concentration of 2 $\mu\text{g/L}$. TCE was only detected in the sample from monitoring well MB-1 at a concentration of 18 $\mu\text{g/L}$. The distribution of 1,2-DCE (total), TCE and vinyl chloride in groundwater samples is limited to monitoring wells MB-1 and MB-2 in the northwest corner of the site.

The concentrations of acetone, benzene, chlorobenzene and toluene are all estimated values below CRQLs. Acetone was detected in samples from 2 out of 10 monitoring wells (MB-6 and MB-8) at estimated concentrations of 5 and 10 $\mu\text{g/L}$ respectively. Acetone is a common laboratory contaminant. Benzene was detected in samples from 2 monitoring wells (MB-2 and MB-6) at estimated concentrations of 2 and 1 $\mu\text{g/L}$ respectively. Chlorobenzene was only detected in the sample from monitoring well MB-6 at an estimated concentration of 2 $\mu\text{g/L}$ and toluene was only detected in the sample from monitoring well MB-10 at an estimated concentration of 1 $\mu\text{g/L}$.

5.4.2 TCL Semivolatile Organic Compounds

Bis (2-ethylhexyl) phthalate was the only TCL semivolatile organic compound (TCL semivolatiles) detected in groundwater samples. Six out of 10 monitoring well samples (MB-3, MB-5, MB-6, MB-7, MB-8 and MB-10) contained bis (2-ethylhexyl) phthalate at estimated concentrations (values less than CRQLs) ranging from 2 to 10 $\mu\text{g/L}$. Bis (2-ethylhexyl) phthalate is a common laboratory contaminant.

5.4.3 Dissolved TAL Metals and Cyanide

Fourteen dissolved TAL metals were detected above IDLs in groundwater samples from the monitoring wells. From most to least frequently detected, these metals are:

- barium, calcium, iron, magnesium, manganese, sodium
- arsenic, potassium, zinc
- vanadium
- aluminum
- copper
- cobalt, and
- nickel

The aluminum, cobalt, copper, nickel, vanadium, and zinc concentrations reported are all estimated values below CRDLs.

The following analytes were detected in monitoring well groundwater samples, but not at all sample locations. Aluminum was only detected in samples from monitoring wells on the eastern half of the site. Aluminum was detected at higher concentrations in the sample from monitoring well MB-9 (117 µg/L) relative to the other monitoring wells (MB-5, MB-6, MB-7, and MB-8) which also contained detectable concentrations of aluminum (28.5 to 94.4 µg/L). Arsenic was detected in 7 out of 10 monitoring wells (MB-1, MB-2, MB-3, MB-4, MB-6, MB-7 and MB-8) at concentrations ranging from 3.9 to 435 µg/L. The highest arsenic concentrations were detected in the samples from monitoring wells MB-6 and MB-8 near the southeastern site boundary (435 µg/L and 118 µg/L respectively). Cobalt was detected in monitoring wells MB-1 (9.4 µg/L), MB-2 (9.7 µg/L) and MB-6 (6.4 µg/L). Copper was detected in 4 out of 10 monitoring wells at concentrations ranging from 4.5 to 16.6 µg/L. Nickel was only detected in the groundwater sample from monitoring well (MB-2) at a concentration of 30.6 µg/L, very close to the IDL for nickel (29 µg/L). Potassium was detected in 8 out of 10 monitoring wells at concentrations ranging from 4350 to 34600 µg/L.

Vanadium and zinc were detected in 8 out of 10 and 9 out of 10 monitoring well groundwater samples at estimated concentrations between 2 and 13.8 µg/L.

Barium, calcium, iron, magnesium, manganese and sodium were detected in samples from all monitoring wells. The concentrations of barium, iron, magnesium and sodium were generally higher in all samples from monitoring wells MB-1 through MB-8 inclusive, relative to monitoring wells MB-9 and MB-10 with the exception of the relatively low iron concentration in the sample from monitoring well MB-5. The calcium concentrations ranged from 74000 to 153000 µg/L in the monitoring well groundwater samples. The manganese concentrations were generally less than 350 µg/L in most groundwater samples with the exception of the higher concentrations in samples from monitoring wells MB-1 (671 µg/L), MB-2 (1190 µg/L) and MB-6 (433 µg/L).

Cyanide was not detected in any groundwater samples.

5.4.4 Indicator Parameters - Laboratory

Ammonia was detected in samples from monitoring wells MB-2, MB-3, MB-5, MB-6, MB-7 and MB-8 at concentrations ranging from 3.1 mg/L to 20 mg/L. The elevated ammonia concentrations in the monitoring wells suggest that the landfill has affected the groundwater chemistry, possibly because the landfill wastes are being biologically degraded. Groundwater samples from 9 out of 10 monitoring wells had detectable COD concentrations. The COD concentrations wells ranged from 56 to 340 mg/L.

The chloride concentrations in samples from the monitoring wells were generally less than 40 µg/L with the exception of monitoring wells MB-6 and MB-7 (67 and 70 µg/L respectively).

The TSS concentrations detected in the monitoring well groundwater samples ranged from 650 to 6500 mg/L. The suspended solids in the wells are derived from the aquifer materials adjacent to the well screen. During purging and sampling activities, the suspended solids concentrations are increased as a result of pumping.

5.4.5 Indicator Parameters - Field

The temperature, pH, specific conductance and DO content of groundwaters were determined for all monitoring wells. The specific conductance values have been adjusted to 25°C using the formula presented in Appendix 4 (Table A4.14).

The temperatures of the monitoring well groundwater samples ranged from 11°C to 16°C. The pH values for the monitoring well samples ranged from 6.64 to 7.66. The specific conductance concentrations for the samples from the monitoring wells ranged from 745 to 2403 µmhos/cm. Samples from monitoring wells MB-2, MB-3, MB-5, MB-6, MB-7 and MB-8 all had specific conductance readings greater than 1300 µmhos/cm (see Table 5.4). Samples from these wells also contained detectable ammonia. The DO concentration of waters sampled from the monitoring wells ranged from 1.0 to 6.9 mg/L. The groundwater samples from monitoring wells MB-1 through MB-8 inclusive all had DO concentrations less than 3 mg/L. The DO concentrations in monitoring wells MB-9 and MB-10 were 6.9 and 5.5 mg/L respectively.

5.5 River Water Chemistry

This section presents and discusses the results of the river water sample analyses from the Mississinewa River and Lugar Creek sampling locations. The background surface water quality is determined upstream from the site in the Mississinewa River and Lugar Creek (locations SW-5 and SW-6), and the site-related sampling locations are located in the Mississinewa River adjacent to (locations SW-2, SW-3 and SW-4) and downstream from the site (location SW-1). The analytical data are summarized in Table 5.5 and are presented in Table 5.6.

5.5.1 TCL Volatile Organic Compounds

Acetone was the only TCL volatile detected in surface water samples from the Mississinewa River and Lugar Creek.² Acetone was detected in samples from nearsite locations SW-3 and SW-4 adjacent to the landfill at estimated concentrations of 3 µg/L and in a sample from upstream location SW-5 at an estimated concentration of 3 µg/L. Acetone, a common laboratory contaminant, was also detected in laboratory blanks and trip blanks associated with the surface water samples.

5.5.2 TCL Semivolatile Organic Compounds

TCL semivolatiles were not detected in any surface water samples from the Mississinewa River or Lugar Creek.

5.5.3 TAL Metals and Cyanide

Dissolved TAL Metals

Eighteen dissolved TAL metals were detected above IDLs in river water samples. From most to least frequently detected, these metals are:

- barium, calcium, magnesium, manganese, sodium, vanadium
- aluminum, zinc
- iron, potassium
- copper, lead
- cobalt
- antimony, beryllium, cadmium, chromium and silver.

² Methylene chloride was also detected in the surface water samples but concentrations were qualified as "UJ" because they were similar to concentrations detected in the laboratory blank.

The barium, copper, lead, vanadium and zinc concentrations reported are all estimated values below CRDLs.

Antimony, beryllium, cadmium, chromium and silver were only detected in samples from nearsite river water location SW-2 at concentrations of 88.7, 10.1, 11.3, 14.7, 10.7 and 6.3 $\mu\text{g/L}$ respectively. Copper was also only detected in samples from three nearsite/downstream sampling locations SW-1, SW-2 and SW-4 at estimated concentrations of 11.3, 19.6 and 6.3 $\mu\text{g/L}$ respectively.

Barium, calcium, magnesium, manganese, sodium and vanadium were detected in samples from all river water sampling locations. Barium, calcium and magnesium were detected at higher concentrations at nearsite/downstream sampling locations relative to upstream sample concentrations. The vanadium and sodium concentrations were similar in samples from all locations with the exception of the elevated concentrations of vanadium at nearsite sampling location SW-2 and sodium in the sample from Lugar Creek (SW-6). The manganese concentrations were highest in the sample from Lugar Creek (133 $\mu\text{g/L}$), lowest at the upstream Mississinewa River location (14.9 $\mu\text{g/L}$) and in between these concentrations at the nearsite/downstream sampling locations (21.0 to 31.0 $\mu\text{g/L}$).

The following analytes were detected in nearsite/downstream and upstream samples, but not at all sample locations. Aluminum and iron were detected at higher concentrations in upstream samples relative to nearsite downstream samples at surface water sampling locations where these analytes were detected. The zinc concentrations were highest in samples from nearsite sampling location SW-2 (18.8 $\mu\text{g/L}$) and upstream in Lugar Creek (9.9 $\mu\text{g/L}$). All other samples contained less than 3.5 $\mu\text{g/L}$ of zinc. The cobalt and potassium concentrations were similar in nearsite/downstream and upstream samples for each analyte. Lead was detected in samples from nearsite/downstream and upstream sampling locations at estimated concentrations below the CRDL.

The low level (<10 µg/L) lead, zinc, and vanadium concentrations may be unreliable as these analytes were detected in the associated field blank.

Total TAL Metals and Cyanide

Fifteen total TAL metals were detected above IDLs in surface water samples. From most to least frequently detected, these metals are:

- aluminum, barium, calcium, iron, magnesium, manganese, sodium, zinc
- copper
- lead, vanadium
- beryllium, chromium, cobalt and potassium.

The barium, beryllium, chromium, cobalt, copper and vanadium concentrations reported are all estimated values below the CRDLs.

Antimony, beryllium, cadmium and silver were only detected in the dissolved TAL metals sample from nearsite river water sampling location SW-2. These metals were not detected in the unfiltered total TAL metals sample.

Chromium and potassium were only detected in the river water sample from nearsite sampling location SW-3 at concentrations of 5.0 and 2920 µg/L respectively. Beryllium, cobalt, lead and vanadium were only detected in samples from upstream river water sampling locations. Beryllium was only detected in the sample from upstream Mississinewa River sampling location SW-5 at a concentration of 1.2 µg/L. Cobalt was only detected in the sample from upstream Lugar Creek sampling location SW-6 at a concentration of 4.3 µg/L. Lead and vanadium were detected at both upstream river sampling locations. The lead concentrations were 4.0 µg/L and 10.8 µg/L, while the estimated vanadium concentrations were 4.0 µg/L and 15.8 µg/L at sampling locations SW-5 and SW-6 respectively.

Aluminum, barium, calcium, iron, magnesium and manganese were detected in samples from all river water sampling locations. The calcium and magnesium concentrations were higher in all nearsite samples relative to the upstream sample concentrations. Conversely, the aluminum, iron and manganese sample concentrations were all higher at upstream sampling locations relative to nearsite/downstream sample concentrations. The barium concentrations were similar in all Mississinewa River samples (61.2 to 65.2 $\mu\text{g/L}$), but were slightly elevated in the upstream sample from Lugar Creek (88.5 $\mu\text{g/L}$). The total and dissolved aluminum, iron, manganese, and sodium concentrations detected in river water samples collected from Lugar Creek were higher than any samples collected from the Mississinewa River upstream, nearsite or downstream sampling locations.

The following analytes were detected in nearsite/downstream and upstream samples but not at all sampling locations. Copper was detected at higher concentrations in samples from nearsite/downstream sampling locations relative to upstream sampling location SW-6 in Lugar Creek. Copper was not detected in the upstream sample from the Mississinewa River. Sodium was detected in 3 out of 4 nearsite/downstream samples and both upstream samples, with concentrations ranging from 7470 to 21500 $\mu\text{g/L}$. The sodium concentrations were similar in all Mississinewa River samples in which sodium was detected, but they were slightly elevated in the upstream sample from Lugar Creek. The zinc concentrations in the upstream samples (33.8 and 55.0 $\mu\text{g/L}$) were higher than the concentrations detected in the downstream samples in which zinc was detected (18.7 to 26.8 $\mu\text{g/L}$).

Cyanide was detected at one river water sampling location (SW-2) at a concentration of 14 $\mu\text{g/L}$.

5.5.4 Indicator Parameters - Laboratory

Ammonia and COD were not detected in any river water samples.

The nearsite and downstream river water sample chloride concentrations ranged from 27 to 29 mg/L. The upstream Mississinewa River (SW-5) and Lugar Creek (SW-6) sampling locations had chloride concentrations of 28 mg/L and 47 mg/L respectively. The chloride concentrations are similar at all Mississinewa River sampling locations indicating that the chloride concentrations in the river are not being influenced by the site.

TSS concentrations were detected in 3 out of 4 nearsite and downstream sampling locations, and in both upstream sampling locations. The nearsite and downstream TSS concentrations ranged from 5.2 to 20 mg/L. The upstream Mississinewa River location SW-5 and Lugar Creek location SW-6 had higher TSS concentrations (170 and 610 mg/L respectively). The wide range of surface water TSS concentrations are likely a function of the particular climatic conditions at the time a specific sample was collected. The relatively low nearsite and downstream TSS concentrations were detected in samples collected during normal flow conditions while the elevated upstream Mississinewa River sample and Lugar Creek sample were collected during a storm event with relatively high flow conditions.

5.5.5 Indicator Parameters - Field

The temperature, pH, specific conductance and DO content were determined for waters from the Mississinewa River and Lugar Creek sampling locations.

The nearsite and downstream river water temperatures at locations SW-1 through SW-4 ranged from 4°C to 9°C. The water temperatures at upstream locations SW-5 (Mississinewa River) and SW-6 (Lugar Creek) were 3°C and 1°C respectively. Temperature variations for the river water samples are attributed to the wide variation in climatic conditions that occurred during surface water sampling activities. The air temperatures became increasingly cooler on successive sampling days with an increase in precipitation and river flow. The nearsite and downstream river water pH values ranged from 8.03 to 8.15 while the upstream pH values were lower (7.90 and 7.31). Similarly, the specific conductance values for nearsite and

downstream locations ranged from 737 to 1021 $\mu\text{mhos/cm}$. The specific conductance values for upstream sampling locations were also lower (652 $\mu\text{mhos/cm}$ and 561 $\mu\text{mhos/cm}$ respectively). The pH and specific conductance values were both higher at nearsite/downstream sampling locations relative to upstream locations indicating that the nearsite/downstream waters may be affected by the site. The DO concentrations of the nearsite and downstream surface waters ranged from 10.2 to 11.8 mg/L and were similar to the concentrations at upstream sampling locations (11.2 mg/L and 11.6 mg/L respectively). The river water DO concentrations do not appear to be affected by the site.

The temperature, pH and specific conductance values for the Lugar Creek sampling location were lower than the Mississinewa River samples for these parameters.

5.6 Pond Water Chemistry

This section presents and discusses the results of the water sample analyses from the pond water sampling locations. The analytical data are summarized in Table 5.7 and presented in Table 5.8.

5.6.1 TCL Volatile Organic Compounds

TCL volatiles were not detected in any pond water samples.³

5.6.2 TCL Semivolatile Organic Compounds

Bis (2-ethylhexyl) phthalate was the only TCL semivolatile compound detected in the pond water samples. Bis (2-ethylhexyl) phthalate was detected in only one sample from onsite pond

³ Methylene chloride was detected in pond water samples but concentrations were qualified as "UJ" because they were similar to concentrations in the laboratory blank.

location PW-2 at an estimated concentration of 5 µg/L. This is the same semivolatile identified in the groundwater samples. Bis (2-ethylhexyl) Phthalate is a common laboratory contaminant.

5.6.3 TAL Metals and Cyanide

Dissolved TAL Metals

Fourteen dissolved TAL metals were detected above IDLs in pond water samples. From most to least frequently detected, these metals are:

- barium, calcium, magnesium, sodium
- iron, vanadium, zinc
- aluminum, manganese, potassium
- copper, lead and mercury.

The aluminum, barium, copper, iron, lead, mercury, vanadium and zinc concentrations reported are all estimated values below CRDLs.

Lead, manganese and mercury were only detected in water samples from the onsite pond. Lead and mercury were each detected at 1 out of 2 onsite pond sampling locations at estimated concentrations of 2.2 and 0.22 µg/L respectively. Manganese was detected at both onsite pond sampling locations at concentrations of 8.7 µg/L and 16.4 µg/L.

Copper was only detected at offsite pond location PW-4 at an estimated concentration of 4.2 µg/L.

Barium, calcium, magnesium, potassium and sodium were detected in samples from all pond water sampling locations. The barium, magnesium and sodium concentrations were generally

higher in samples from the onsite pond relative to the offsite pond sampling locations. The calcium and potassium concentrations were similar at onsite and offsite pond sampling locations.

The following analytes were detected in samples from the onsite and offsite pond, but not at all sample locations. Zinc and iron concentrations were higher in samples from the onsite pond relative to the offsite pond when the analytes were detected. Conversely, the estimated aluminum concentration in the sample from the offsite pond sample (31.4 µg/L) was slightly higher than the concentration detected in the onsite pond sample (21.4 µg/L). The estimated vanadium concentrations were similar (2.6 to 4.9 µg/L) in onsite and offsite pond water samples in which vanadium was detected.

The zinc detected in the onsite pond water sample may be unreliable as this analyte was also detected in the associated field blank.

Total TAL Metals and Cyanide

Thirteen total TAL metals were detected above IDLs in pond water samples. From most to least frequently detected, these metals are:

- aluminum, barium, calcium, iron, magnesium, manganese, sodium
- zinc
- potassium
- cobalt, copper, lead and vanadium.

The aluminum, barium, cobalt, copper, iron, lead and vanadium concentrations reported are all estimated values below CRDLs.

Mercury was detected in one field-filtered sample but was not detected in the unfiltered sample for total metals analyses. Conversely, cobalt was detected in one unfiltered sample, but was not detected in the field-filtered sample for dissolved metals analysis.

Copper, lead and potassium were only detected in water samples from the onsite pond. Copper and lead were only detected in a sample from pond water location PW-2 at estimated concentrations of 9.0 and 5.1 µg/L respectively. Potassium was detected in samples from both onsite pond samples with concentrations of 4,650 and 7,540 µg/L. Cobalt and vanadium were only detected in samples from offsite pond location PW-3 at estimated concentrations of 3.7 and 2.9 µg/L respectively.

Aluminum, barium, calcium, iron, magnesium, manganese and sodium were all detected in samples from all pond water sampling locations. All analytes listed above, with the exception of calcium, were detected at higher concentrations in samples from the onsite pond relative to the offsite pond. Calcium was detected at similar concentrations in samples from both ponds.

Zinc was detected at a higher concentrations in the one sample from the onsite pond (23.2 µg/L) relative to offsite samples (2.1 and 2.5 µg/L respectively).

The lead and zinc concentrations in samples from the onsite pond may be unreliable as these analytes were also detected in the associated field blank.

Cyanide was not detected in any pond water samples.

5.6.4 Indicator Parameters - Laboratory

Ammonia was only detected in one onsite pond water sample (PW-2) at a concentration of 1.1 mg/L, near the IDL for ammonia. COD was not detected in any pond water samples.

Chloride concentrations at onsite pond sampling locations PW-1 and PW-2 were 28 mg/L and 29 mg/L respectively. The chloride concentrations at offsite pond sampling locations PW-3 and PW-4 were lower (15 mg/L and 16 mg/L respectively). The TSS concentrations in samples from onsite pond locations PW-1 and PW-2 were 7.8 mg/L and 48 mg/L respectively. A TSS concentration was only detected at 1 out of 2 offsite pond water sample locations (PW-4) at a concentration of 5.0 mg/L. The elevated onsite pond concentrations may result from vegetation clearing and grubbing activities occurring at the site during the sampling period or could be the result of prior landfilling activities.

5.6.5 Indicator Parameters - Field

The temperature, pH, specific conductance and DO contents were determined for water samples collected from the onsite and offsite ponds.

All pond water samples had a constant temperature reading of 5°C. The pH values of onsite pond waters at the onsite pond were 8.17 and 7.88 for sampling locations PW-1 and PW-2 respectively. The pH values of samples from the offsite pond locations were higher (8.25 and 8.28 respectively). The specific conductances of the onsite pond samples were 810 µmhos/cm and 704 µmhos/cm at locations PW-1 and PW-2 respectively. The offsite pond specific conductances were lower (533 µmhos/cm and 555 µmhos/cm) The DO concentrations for onsite and offsite ponds were consistent and ranged from 11.4 to 12.0 mg/L.

6.0 WATER QUALITY STANDARDS AND CRITERIA

6.1 Introduction

This chapter presents water quality standards and criteria for the analytical parameters detected in groundwater, river water and pond water samples at the Marion (Bragg) Landfill. The analyses are compared to applicable US EPA and State of Indiana water quality criteria. Criteria were derived from literature sources when no existing agency criteria could be found. A summary of the standards and criteria for the parameters detected is presented in Table 6.1. Chemical parameters with variable criteria dependent on temperature, pH or hardness (ammonia, cadmium, copper, lead, nickel, silver and zinc) are presented in Appendix 4. All analytical data from sampling locations which exceed water quality standards and criteria are presented in Table 6.2.

6.2 Standards and Criteria Selection Procedures

Water quality criteria were taken wherever possible from existing regulations, with the following order of preference for regulatory agency criteria:

- Indiana Department of Environmental Management (IDEM)
- United States Environmental Protection Agency (US EPA)

The State of Indiana water quality criteria were given preference over US EPA because the state criteria were generally similar to or more stringent than the federal guidelines.

Criteria were gathered in four categories according to the following criterion rationale:

- acute protection of aquatic life,
- chronic protection of aquatic life,

- protection of human health (primarily fish consumption, limited consumption of raw water),
- drinking water maximum contamination limits (MCLs).

Since all criteria are designed for application to unfiltered raw water, only the river water and pond water total TAL metals analyses were compared with the criteria for metals. The dissolved TAL metals analyses for the groundwater samples were also used for comparison with the criteria.

Criteria for human protection based on direct drinking water are meant to apply to a water supply at the point of intake to the water treatment/distribution system (Indiana Register, 1990). There is no known or likely drinking water use of groundwater, river water or pond water at the Marion (Bragg) Landfill site.

The agency source of each criterion is indicated with a letter code in Table 6.1 (I = IDEM, E = US EPA). Criteria without a letter code were derived by BEAK from literature sources, only when no existing agency criterion could be found. The rationale for each of these unofficial criteria is briefly described in the following paragraphs.

Acute criteria were derived from the literature for acetone (10,000 µg/L) and chlorobenzene (1,950 µg/L). The acetone criterion is the acute LC50 of *Daphnia magna* (Verschueren, 1983). The chlorobenzene criterion is 1/10 of the Species Mean Acute Value for monochlorobenzene based on exposure of bluegill (EPA, 1980).

Chronic criteria were derived from the literature for acetone (222 µg/L), benzene (118 µg/L), methylene chloride (4,289 µg/L) and toluene (389 µg/L). The acetone criterion is 1/45 of the acute criterion (Verschueren, 1983, above). The benzene criterion is 1/45 of the acute criterion (EPA, 1986). The methylene chloride criterion is 1/45 of the Species Mean Acute Value based on exposure of the fathead minnow (EPA, 1980). The toluene criterion is 1/45 of the acute criterion (EPA, 1986).

Human protection criteria based primarily on fish consumption were derived from the literature for chlorobenzene (2,026 µg/L), cyanide (24,242 µg/L), cadmium (60 µg/L), chromium (3,389 µg/L), lead (51 µg/L) and silver (6,061 µg/L). The chlorobenzene criterion is based on a bioconcentration factor (BCF) of 75 for monochlorobenzene (Frietag, 1984), standard water and fish consumption (0.01 L/d and 0.0065 kg/d), and an allowable daily intake (ADI) of 1.008 mg/d for a 70 kg man (EPA, 1980). The cyanide criterion is based on a BCF of 1 (assumed) and an ADI of 0.4 mg/d (from the IDEM drinking water standard and a 2 L/d water consumption). The cadmium criterion is based on a BCF of 50 (Reeder, 1979) and an ADI of 0.02 mg/d (from the IDEM drinking water standard). The chromium criterion is for Cr VI based on a BCF of 3 (EPA, 1980) and an ADI of 0.1 mg/d (from the IDEM drinking water standard). The lead criterion is based on a BCF of 300 (Thompson *et al.*, 1972) and an ADI of 0.1 mg/d (from the IDEM drinking water standard). The silver criterion is based on a BCF of 1 (EPA, 1980) and an ADI of 0.1 mg/d (from the IDEM drinking water standard).

Water quality criteria were only derived for chemicals of demonstrated concern with respect to protection of aquatic life and/or human health. Chemicals such as calcium, magnesium, sodium and potassium are not of concern, and would not be appropriate for criteria development.

For groundwater chemical parameters with variable criteria (dependent on temperature, pH or hardness), generic criteria displayed in Table 6.1 were computed based on worst-case conditions of the receiving water ($T = 5^{\circ}\text{C}$, $\text{pH} = 7$, hardness = 161 mg/L). Sample-specific criteria displayed below the sample results in Appendix 4 were computed based on the actual temperature, pH and hardness conditions of the sample at the time of collection. For groundwater samples in particular, the temperature and pH of the receiving water may be more relevant to effects on exposed organisms than *in situ* sample conditions.

6.3 Comparison of Analytical Data to Standards and Criteria

The analytical results from the groundwater, river water and pond water samples are compared to the standards and criteria described above. A summary of the samples from all matrices that exceeded the 4 applicable categories of criteria discussed above is presented in Table 6.2.

6.3.1 Groundwater

The analytical results from the monitoring well samples are compared to the appropriate standards and criteria. If the standards or criteria are exceeded by the concentration in a groundwater sample from a single monitoring well, the results from the well are averaged with the other wells within the zone (ERM, 1989). In the event that a parameter is not detected in a monitoring well from a zone, a value equal to 1/2 of the IDL for the parameter has been used for averaging purposes (US EPA, 1988). The monitoring wells are grouped into the three zones that are presented below:

- Zone I - monitoring wells MB-1, MB-2, MB-3 and MB-4
- Zone II - monitoring wells MB-5 and MB-6
- Zone III - monitoring wells MB-7 and MB-8

The groundwater samples exceeded the water quality criteria for the widest range of parameters. If the groundwater beneath the site are compared to MCLs, then arsenic, TCE and vinyl chloride would exceed the criteria. The arsenic concentrations in samples from monitoring wells MB-2, MB-6 and MB-8 exceed the MCLs. The vinyl chloride concentrations detected in samples from monitoring wells MB-1 and MB-2 exceeded MCLs. The groundwater sample from monitoring well MB-1 exceeds the MCL for TCE and also exceeds the proposed MCL for 1,2-Dichloroethene.

If the groundwater samples are compared to protection of human health criteria (primarily fish consumption, limited consumption of raw water), then the arsenic values exceed the criteria in most monitoring wells (MB-1, MB-2, MB-3, MB-4, MB-6, MB-7 and MB-8). Similarly, if the groundwater beneath the site is compared to fresh water aquatic criteria, then arsenic (MB-6), bis (2-ethylhexyl) phthalate (MB-8) and unionized ammonia (MB-2, MB-3, MB-4, MB-5, MB-6 and MB-7) exceed the chronic aquatic criteria. The arsenic concentration in monitoring well MB-6 (435 µg/L) and the iron concentrations in most monitoring wells (MB-1, MB-2, MB-3, MB-4, MB-6 and MB-8) exceeded acute aquatic criteria.

When the groundwater data that exceeded water quality criteria are averaged with other data other wells from within the same zone (see Table 6.2). The human health, acute aquatic criteria and chronic aquatic criteria continue to be exceeding most groundwater samples. The drinking water MCLs are exceeded in samples from MB-1 (TCE and vinyl chloride), MB-2 (vinyl chloride), and MB-7, MB-8 (arsenic).

The concentrations of chemical parameters discharging from the groundwater to the Mississinewa River were calculated using the flow data from the RI report. The calculation is based on a Mississinewa River average flow of 627 cfs, a calculated average groundwater flow of .35 cfs, discharging to the river and the average concentration of chemical parameters from each monitoring zone according to the equation presented below.

$$C_T = \frac{C_W Q_W}{Q_T}$$

where: C_T = concentration of total pollutant immediately after complete mixing.
 C_W = effluent concentration.
 Q_W = effluent flow
 Q_T = combined effluent flow plus upstream flow

After dilution and total mixing are incorporated into the model, none of the groundwaters exceed the water quality criteria.

6.3.2 River Water

The human health protection (primarily fish consumption, limited consumption of raw water) criterion for zinc was only exceeded in the upstream sample from Lugar Creek. Cyanide and lead exceeded the chronic aquatic criteria at surface water location SW-2 adjacent to the site and upstream from the site in Lugar Creek, respectively.

6.3.3 Pond Waters

Comparisons of pond water chemistry data to available standards and criteria indicate that the sample from location PW-2 exceeded the chronic aquatic criteria for bis (2-ethylhexyl) phthalate.

7.0 CONCLUSIONS

Groundwater flow directions at the Marion (Bragg) Landfill have been predicted from monitoring well waterlevel data collected during the preliminary phase of interim remedial activities. In general, groundwater flows to the north and east at the site and ultimately discharges into the Mississinewa River. However, during periods of high stage river conditions (near flood) and rising watertable elevations (resulting from snow melt), almost all groundwater entering the site flows in a northerly direction and discharges into the large onsite pond. The groundwater likely flows in a northwesterly direction to the Mississinewa River from the pond during high stage river events.

Travel times for groundwater to migrate across the site are estimated based on the March 1990 waterlevel data (a representative horizontal hydraulic gradient of 0.005), an estimate for effective porosity (33%) and a representative hydraulic conductivity value of 1.8×10^{-2} cm/s derived from the RI report data. The average linear groundwater velocity calculated from the above data predicts a flow rate of approximately 0.75 ft/day. When the longest flow path across the site is selected (approximately 2500 feet), the estimated travel time for groundwater to traverse the site is approximately 9 years. This value is consistent with the 2.2 year estimate presented in the RI report given the uncertainty associated with the hydraulic and storage parameters of the upper aquifer. In areas of the site where the flowpaths are shorter, the estimated travel times will be reduced. More water level data will be required to determine if the horizontal hydraulic gradients calculated from the March 1990 waterlevel data are consistent with time.

The analytical results from the groundwater, river water and pond water samples are presented to provide a baseline indication of water quality at and near the site. The landfill appears to have introduced or increased the concentrations of TCL volatiles (acetone, 1,2-DCE, TCE, and vinyl chloride), TCL semivolatiles (bis[2-ethylhexyl] phthalate) and TAL metals (aluminum, arsenic, barium, cobalt, copper, iron, magnesium, manganese, potassium and sodium) in

downgradient monitoring wells. The ammonia, COD, chloride and specific conductance values are also increased. A reasonably good correlation between ammonia concentration and an increase in the specific conductance exists in most samples. The pH and DO concentrations were both lower in downgradient monitoring wells. The elevated aluminum and COD concentrations in samples from monitoring well MB-9 suggest that this well may not reflect background groundwater quality conditions.

Arsenic, iron, TCE, vinyl chloride, bis (2-ethylhexyl) phthalate and unionized ammonia are the only groundwater parameters that exceeded water quality criteria. However, no criteria were exceeded when taking dilution into account as it occurs in the river. With the exception of iron, none of these parameters were detected in river water samples. In the case of iron, the highest river water concentrations were detected in samples upstream from the site.

The increase in barium, calcium, chromium, copper, cyanide, magnesium, pH and specific conductance concentrations in samples from nearsite/downstream river water sampling locations suggests that they may be affected by the landfill.

Lead, zinc and cyanide were the only river water parameters that exceeded water quality criteria. None of these parameters exceeded water quality criteria in any of the monitoring well groundwater samples.

The landfill also appears to have caused an increase in bis (2-ethylhexyl) phthalate, barium, iron, lead, magnesium, manganese, potassium, sodium and zinc concentrations in samples from the onsite pond. The ammonia, chloride, specific conductance and TSS concentrations also increased in samples from the onsite pond. The pH values for onsite pond samples were lower than the offsite pond pH values.

Bis (2-ethylhexyl) phthalate was the only pond water parameter that exceeded water quality criteria. However, the sample concentration was an estimated quantity near the criterion limit

and bis (2-ethylhexyl) phthalate is a common laboratory contaminant.

The increases in concentrations in the site-related groundwater, river water and pond water samples may be due to direct contribution by the landfill, biological activity as the result of landfill materials, or ion exchange in the aquifer as the result of leachate impact. Further sampling is needed for all groundwaters, river waters, and pond waters to verify the presence/absence of all parameters.

Based on the results of this initial baseline monitoring event and the application of the decision tree for future studies, no further action beyond monitoring is necessary at this time. Future evaluation of the decision tree for future studies will be made after the August 1990 water and sediment chemistry data have been evaluated.

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Table 2.1 Summary of groundwater sample analytical parameters

Matrix	Number of Samples	Number of Trip Blanks*	Number of Field Blanks	Number of Field Duplicates	Number of Matrix Spike/Matrix Spike Duplicate Samples**	Matrix Total	Analysis	Container and Preservation	Holding Time
Groundwater	10	3	1	1	2	15	LABORATORY TCL Volatiles	2-40 ml screw cap vials w/ Teflon lined septa. HCl to pH $\leq$ 2. Cool to 4° C.	14 days
							pH Check	1-40 ml screw cap vial w/ teflon lined septa. HCl to pH $\leq$ 2. Cool to 4°C.	
							TCL Semivolatiles	2-1 liter amber glass w/ teflon lined enclosure. Cool to 4° C.	7 days until extraction, 40 days after extraction.
							Dissolved TAL Metals	Dissolved samples will be field filtered through a 0.45 μ m filter prior to preservation.	6 months (28 days for Hg)
								1-plastic liter. HNO ₃ to pH $\leq$ 2.	
							Total Cyanide	1-liter plastic w/ Teflon lined enclosure. NaOH to pH $\geq$ 12. Cool to 4°C.	14 days until distillation
							TSS, Chloride	1-500ml plastic. Cool to 4° C.	7 days (TSS), 28(CI)
							COD, NH ₃ -N	2-1 liter glass w/ Teflon lined enclosure. H ₂ SO ₄ to pH $\leq$ 2. Cool to 4°C.	28 days (both)
							FIELD pH, Conductivity D.O. and Temp.	Measure in field immediately after collection	In field

* Trip blanks are required for volatile organic analysis at a frequency of one per cooler shipped containing volatile organic analysis.

** Triple the volume for ground water and surface water locations will be collected for matrix spike/matrix spike duplicate analyses at a frequency of one per 20 investigative samples.
Inorganic analyses will include a single matrix spike and a laboratory duplicate versus a matrix spike duplicate.

Table 2.2 Summary of river water and pond water sample analytical parameters

Matrix	Number of Samples	Number of Trip Blanks*	Number of Field Blanks	Number of Field Duplicates	Number of Matrix Spike/Matrix Spike Duplicate Samples**	Matrix Total	Analysis	Container and Preservation	Holding Time
River water (8) and pond water (4) samples	10	3	1	1	2	15	LABORATORY TCL Volatiles	2-40 ml screw cap vials w/ Teflon lined septa. HCl to pH $\leq$ 2. Cool to 4° C.	14 days
							pH Check	1-40 ml screw cap vial w/ teflon lined septa. HCl to pH $\leq$ 2. Cool to 4° C.	
							TCL Semivolatiles	2-1 liter amber glass w/ teflon lined enclosure. Cool to 4° C.	
							Total & Dissolved TAL Metals	Dissolved samples will be field filtered through a 0.45 um filter prior to preservation.	6 months (28 days for Hg)
								1-liter plastic. HNO3 to pH $\leq$ 2.	
							Total Cyanide	1-liter plastic w/ Teflon lined enclosure. NaOH to pH $\geq$ 12. Cool to 4° C.	14 days until distillation
							TSS, Chloride	1-500ml plastic. Cool to 4° C.	7 days (TSS), 28 (Cl)
							COD, NH3-N	2-1 liter glass w/ Teflon lined enclosure. H2SO4 to pH $\leq$ 2. Cool to 4° C.	28 days (both)
							FIELD pH, Conductivity D.O. and Temp.	Measure in field immediately after collection	in field

* - Trip blanks are required for volatile organic analysis at a frequency of one per cooler shipped containing volatile organic analysis.
** - Triple the volume for ground water and surface water locations will be collected for matrix spike/matrix spike duplicate analyses at a frequency of one per 20 investigative samples.
Inorganic analyses will include a single matrix spike and a laboratory duplicate versus a matrix spike duplicate.

TABLE 5.1: INDICATOR PARAMETER LIST

Laboratory

Total Suspended Solids (TSS)

Chemical Oxygen Demand (COD)

Ammonia-Nitrogen (NH₃-N)

Chloride

Field

Temperature

pH

Specific Conductance

Dissolved Oxygen

TABLE 5.2: DATA QUALIFIER DEFINITIONS (US EPA, 1988)

For the purposes of this report the following US EPA code letters and associated definitions are provided.

Data Qualifier	Parameter	Definition
U	Organic	The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
	Inorganic	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	Organic/ Inorganic	The associated numerical value is an estimated quantity.
N	Organic	Presumptive evidence of presence of material.
NJ	Organic	Presumptive evidence of the presence of the material at an estimated quantity.
UJ	Organic	The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
	Inorganic	The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
NUJ	Organic	Presumptive evidence of presence of material. The material was analyzed for but not detected. The sample quantitation limit is an estimated quantity.
L	Ammonia COD	The material was analyzed for, but was not detected. The associated value is the sample detection limit.

**Table 5.3 Summary of Groundwater Chemistry Data
February 1990**

<u>Parameter</u>	<u>Frequency of Detection</u>	<u>Range of Detectable Concentrations</u>	<u>IDL (µg/L)</u>	<u>CRQL (µg/L)</u>
TCL Volatiles (µg/L)				
Acetone	2/10	5-10	10	10
Benzene	2/10	1-2	5	5
Chlorobenzene	1/10	2	5	5
1,2-Dichloroethene (total)	3/10	2-140	5	5
Methylene Chloride	0/10	-	5	5
Toluene	1/10	1	5	5
Trichloroethene	1/10	18	5	5
Vinyl Chloride	2/10	12-22	10	10
TCL Semivolatiles (µg/L)				
bis(2-Ethylhexyl) Phthalate	6/10	2-10	10	10
Dissolved TAL Metals and Cyanide (µg/L)			<u>CRDL (µg/L)</u>	
Aluminum	5/10	28.5-117	16	200
Arsenic	7/10	3.9-435	3	10
Barium	10/10	44.3-825	1	200
Calcium	10/10	58100-153000	17	5000
Cobalt	3/10	6.4-9.7	3	50
Copper	4/10	4.5-16.6	4	25
Iron	10/10	13.4-13100	4	100
Magnesium	10/10	18500-64600	56	5000
Manganese	10/10	13.7-1190	1	15
Nickel	1/10	30.6	29	40
Potassium	8/10	4350-34600	1260	5000
Sodium	10/10	10500-148000	1490	5000
Vanadium	8/10	2.4-7.8	2	50
Zinc	9/10	2.0-13.8	1	20
Cyanide	0/10	-	10	10
Indicator Parameters (mg/L)			<u>(mg/L)</u>	<u>(mg/L)</u>
Laboratory				
TSS (mg/L)	10/10	650-6500	5	5
Chloride (mg/L)	10/10	15-70	3	3
COD (mg/L)	9/10	56-340	50	20
Ammonia (mg/l)	6/10	3.1-20	1	0.1
Field				
Temperature (°C)		11-16		
pH		6.64-7.66		
Specific Conductance (µmhos/cm)*		745-2403		
DO (mg/L)		1.0-6.9		

- Not detected

* - Value corrected to 25°C

IDL - Instrument detection limit

CRQL - Contract required quantitation limit

CRDL - Contract required detection limit

Table 5.4 Groundwater Chemistry Data - February 1990

Monitoring Well Location in Aquifer	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	Duplicate MB-8	MB-9	MB-10
	Bottom	Top	Top	Bottom	Top	Bottom	Top	Bottom	Bottom	Top	Top
CL Volatiles (µg/L)											
Acetone	5 UJ	10 U	10 U	10 U	10 U	5 J	10 U	10 J	9 J	6 UJ	7 UJ
Benzene	5 U	2 J	5 U	5 U	5 U	1 J	5 U	5 U	5 U	5 U	5 U
Bichlorobenzene	5 U	5 U	5 U	5 U	5 U	2 J	5 U	5 U	5 U	5 U	5 U
1,2-dichloroethene (total)	140	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 J
Ethylene Chloride	4 UJ	2 UJ	2 UJ	2 UJ	1 UJ	3 UJ	4 UJ	3 UJ	1 UJ	2 UJ	5 U
Toluene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 J
Trichloroethene	18	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	22	12	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tentatively Identified Compounds											
Dichlorofluoro-Methane	-	-	-	-	-	-	-	-	9 NJ	-	-
CL Semi-Volatiles (µg/L)											
Bis(2-Ethylhexyl) Phthalate	10 U	10 U	3 J	10 U	2 J	2 J	2 J	5 J	10 J	10 U	2 J
Tentatively Identified Compounds											
Benzothiazonolone	-	-	-	-	-	50 NJ	-	-	-	-	-
Butoxyethanolphosphate	-	-	-	-	-	18 NJ	-	-	-	-	-
1-Chloro-2-Phosphate Ethanol	-	-	-	-	-	-	-	14 NJ	-	-	-
1,2'-Azobis[2-Methyl] Propanenitrile	-	-	-	-	-	30 NJ	-	-	-	-	-
Tetramethylpentadecane	-	-	-	-	-	-	-	-	40 NJ	-	-
Blank Contaminant	-	-	-	-	-	-	-	-	-	-	14 NUJ
Solvent Contaminant	-	-	-	-	-	14 NUJ	14 NUJ	28 NUJ	-	-	22 NUJ
Unknown Alcohol	-	-	-	-	-	60 NJ	-	16 NJ	-	-	-
Unknown Hydrocarbons (Total)	-	-	-	-	-	-	-	-	94 NJ	-	-
Unknowns (Total)	12 NJ	56 NJ	-	-	-	6.0 NJ	-	10 NJ	78 NJ	-	-
Dissolved TAL Metals and Cyanide (µg/L)											
Aluminum	16 U	16 U	16 U	16 U	29.4 J	28.5 J	69.8 J	94.4 J	34.8 J	117 J	16 U
Arsenic	11.3	61.7	24.7	8.3 J	3 U	436	3.9 J	109	118	3 U	3 U
Barium	193 J	825	595	359	212	539	461	153 J	156 J	44.3 J	101 J
Calcium	110000 J	153000 J	87000 J	58100 J	99600 J	112000 J	83000 J	59400 J	61300 J	74000 J	127000 J
Cobalt	9.4 J	9.7 J	3 U	3 U	3 U	6.4 J	3 U	3 U	3 U	3 U	3 U
Copper	4 U	4 U	4 U	4 U	16.6 J	4 U	10.9 J	4 U	4 U	5.3 J	4.5 J
Iron	2990	9070	4580	1840	13.4 J	13100	274	4280	4280	80.8 J	26.7 J
Magnesium	32000 J	44600 J	35500 J	32400 J	34300 J	47900 J	52500 J	63000 J	64800 J	18500 J	34800 J
Manganese	671	1190	324	330	313	433	264	162	164	306	13.7 J
Nickel	29 U	30.6 J	29 U	29 U	29 U	29 U	29 U	29 U	29 U	29 U	29 U
Potassium	1260 U	16400	10100	8410	5060	34600	27400	26000	26400	1260 U	4350 J
Sodium	23400	43600	46200	40800	41800	118000	148000	132000	136000	10500	16300
Titanium	7.8 J	2 U	3.2 J	3.2 J	2 U	4.4 J	3.7 J	4.4 J	4.7 J	2.4 J	10.1 J
Zinc	11.8 J	13.8 J	2.0 J	7.0 J	12.6 J	7.7 J	8.4 J	1 U	1 U	12.2 J	6.2 J
Cyanide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Table 5.4 (cont'd) Groundwater Chemistry Data - February 1990

Monitoring Well Location in Aquifer	MB-1 Bottom	MB-2 Top	MB-3 Top	MB-4 Bottom	MB-5 Top	MB-6 Bottom	MB-7 Top	MB-8 Bottom	Duplicate MB-8 Bottom	MB-9 Top	MB-10 Top
Indicator Parameters (mg/L)											
Laboratory											
Ammonia	1 L	16	7.1	1 L	3.1	5.6	20	16	4.6	1 L	1 L
Chemical Oxygen Demand	58	170	230	160	140	250	160	300	340	300	60 L
Total Suspended Solids	2100	1300	4600	1100	650	1100	1100	3600	3200	6500	660
Chloride	25	40	30	30	30	67	70	36	36	15	40
Field											
Temperature (°C)	12	11	14	14	14	14	15.5	16		13	12
pH	7.14	6.72	6.98	7.36	7.08	6.64	6.97	7.28		7.66	7.14
Specific Conductance (µmhos/cm) (1)	670	900	700	520	690	1150	1100	1130		380	595
Specific Conductance (µmhos/cm) (2)	1078	1912	1373	1020	1318	2403	2214	2246		745	1067
Dissolved Oxygen (mg/L)	1.7	2.2	2.4	1.3	2.6	1.0	1.8	1.2		6.9	5.6

- Not detected

(1) Field measurement

(2) Value corrected to 25°C

Data Qualifier Definitions

U - organics: The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

- inorganics: The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.

J - The associated value is an estimated quantity.

UJ - organics: The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

- inorganics: The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

NJ - Presumptive evidence of the presence of the material at an estimated quantity.

NUJ - Presumptive evidence of presence of material. The material was analyzed for but not detected. The sample quantitation limit is an estimated quantity.

L - The material was analyzed for, but was not detected. The instrument detection limit is greater than the contract required detection limit.

Table 5.5 Summary of River Water Chemistry Data - February 1990

	Nearsite and Downstream		Upstream			
Parameter	Frequency of Detection	Range of Detectable Concentrations	Frequency of Detection	Range of Detectable Concentrations	IDL (µg/L)	CRQL (µg/L)
TCL Volatiles (µg/L)						
Methylene Chloride	0/4	—	0/2	—	5	5
Acetone	2/4	3-3	1/2	3	10	10
TCL Semivolatiles (µg/L)						
None Detected	0/4	—	0/2	—		
Dissolved TAL Metals (µg/L)						CRDL (µg/L)
Aluminum	3/4	32.7-69.7	2/2	149-262	16	200
Antimony	1/4	88.7	0/2	—	21	60
Barium	4/4	52.2-67.6	2/2	22.1-32.1	1	200
Beryllium	1/4	10.1	0/2	—	1	5
Cadmium	1/4	11.3	0/2	—	5	5
Calcium	4/4	76200-91400	2/2	36300-46200	17	5000
Chromium	1/4	14.7	0/2	—	5	10
Cobalt	1/4	10.7	1/2	7.2	3	50
Copper	3/4	6.3-19.6	0/2	—	4	25
Iron	2/4	10.8-20.1	2/2	163-262	4	100
Lead	2/4	2.1-3.0	1/2	2.1	2	5
Magnesium	4/4	24700-30000	2/2	9420-14600	56	5000
Manganese	4/4	21.2-31.0	2/2	14.9-133	1	15
Potassium	3/4	1560-3070	1/2	2300	1260	5000
Silver	1/4	6.3	0/2	—	4	10
Sodium	4/4	10400-13900	2/2	11600-25400	1490	5000
Vanadium	4/4	4.8-13.1	2/2	2.6-7.2	2	50
Zinc	3/4	2.8-18.8	2/2	2.5-9.9	1	20
Total TAL Metals and Cyanide (µg/L)						
Aluminum	4/4	304-623	2/2	1850-7940	16	200
Antimony	0/4	—	0/2	—	21	60
Barium	4/4	63.5-65.2	2/2	61.2-88.5	1	200
Beryllium	0/4	—	1/2	1.2	1	5
Cadmium	0/4	—	0/2	—	5	5
Calcium	4/4	78800-84000	2/2	41900-53200	17	5000
Chromium	1/4	5.0	0/2	—	5	10
Cobalt	0/4	—	1/2	4.3	3	50
Copper	2/4	8.3-14.1	1/2	6.5	4	25
Iron	4/4	548-827	2/2	2730-12000	4	100
Lead	0/4	—	2/2	4.0-10.8	2	5
Magnesium	4/4	26400-27400	2/2	13700-18500	56	5000
Manganese	4/4	30.8-30.9	2/2	115-318	1	15
Potassium	1/4	2920	0/2	—	1260	5000
Silver	0/4	—	0/2	—	4	10
Sodium	4/4	7470-12900	2/2	9880-21500	1490	5000
Vanadium	0/4	—	2/2	4.0-15.8	2	50
Zinc	4/4	18.7-26.8	2/2	33.8-55	1	20
Cyanide	1/4	14	0/2	—	10	10

Table 5.5 (cont'd) Summary of River Water Chemistry Data - February

<u>Parameter</u>	<u>Nearsite and Downstream</u>		<u>Upstream</u>		<u>IDL (mg/L)</u>	<u>CRDL (mg/L)</u>
	<u>Frequency of Detection</u>	<u>Range of Detectable Concentrations</u>	<u>Frequency of Detection</u>	<u>Range of Detectable Concentrations</u>		
Indicator Parameters (mg/L)						
Laboratory						
TSS	3/4	5.2-20	2/2	170-610	5	5
Chloride	4/4	27-29	2/2	28-47	3	3
COD	0/4	—	0/2	—	50	20
Ammonia	0/4	—	0/2	—	1	0.1
Field						
Temperature (°C)		4-9		1-3		
pH		8.03-8.15		7.31-7.90		
Specific Conductance (µmhos/cm)*		737-1021		561-652		
DO (mg/L)		10.2-11.8		11.2-11.6		

— Not detected

* - Value corrected to 25°C

IDL - Instrument detection limit

CRQL - Contract required quantitation limit

CRDL - Contract required detection limit

Table 5.6 River Water Chemistry Data - February 1990

River Location	Nearsite and Downstream				Upstream		
	SW-1	SW-2	SW-3	Duplicate SW-3	SW-4	SW-5	SW-6
TCL Volatiles (µg/L)							
Methylene Chloride	1 U	1 U	3 U	2 U	2 U	5 U	5 U
Acetone	10 U	10 U	3 J	3 J	3 J	3 J	10 U
TCL Semivolatiles (µg/L)							
None detected							
Tentatively Identified Compounds							
Unknown	-	-	6.0 NJ	-	-	-	-
Dissolved TAL Metals (µg/L)							
Aluminum	65.0 J	69.7 J	32.7 J	22.3 J	16 U	149 J	262
Antimony	21 U	88.7	21 U	21 U	21 U	21 U	21 U
Barium	52.2 J	67.6 J	63.2 J	52.6 J	59.6 J	32.1 J	22.1 J
Beryllium	1 U	10.1	1 U	1 U	1 U	1 U	1 U
Cadmium	5 U	11.3	5 U	5 U	5 U	5 U	5 U
Calcium	76200 J	81600 J	91400 J	78100 J	88600 J	46200 J	36300 J
Chromium	5 U	14.7	5 U	5 U	5 U	5 U	5 U
Cobalt	3 U	10.7 J	3 U	3 U	3 U	7.2 J	3 U
Copper	11.3 J	19.6 J	4 U	4 U	6.3 J	4 U	4 U
Iron	10.8 J	20.1 J	4 U	4 U	4 U	163	262
Lead	2 U	2 U	2.1 J	2 U	3.0 J	2.1 J	2 U
Magnesium	24700 J	26700 J	30000 J	25600 J	29100 J	14600 J	9420 J
Manganese	23.9	31.0	20.2	12.2 J	21.2	14.9 J	133
Potassium	1560 J	1260 U	1780 J	3070 J	2490 J	1260 U	2300 J
Silver	4 U	6.3 J	4 U	4 U	4 U	4 U	4 U
Sodium	10600	10400	13200	11600	13900	11600	25400
Vanadium	5.5 J	13.1 J	4.2 J	4.8 J	4.9 J	7.2 J	2.6 J
Zinc	3.4 J	18.8 J	1 U	1 U	2.8 J	2.5 J	9.9 J
Total TAL Metals and Cyanide (µg/L)							
Aluminum	623	509	462	469	304	1850 J	7940 J
Antimony	21 U	21 U	21 U	21 U	21 U	21 U	21 U
Barium	63.5 J	63.7 J	65.2 J	63.3 J	64.4 J	61.2 J	88.5 J
Beryllium	1 U	1 U	1 U	1 U	1 U	1.2 J	1 U
Cadmium	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Calcium	80600	82300	84000	74900	78800	53200	41900
Chromium	5 U	5 U	5 U	5.0 J	5 U	5 U	5 U
Cobalt	3 U	3 U	3 U	3 U	3 U	3 U	4.3 J
Copper	4 U	4 U	5.0 J	8.3 J	14.1 J	4 U	6.5 J
Iron	827	755	732	627	548	2730 J	12000 J
Lead	2 U	2 U	2 U	2 U	2 U	4.0 J	10.8
Magnesium	26400	26800	27400	25700	26700	18500	13700
Manganese	30.8	30.8	30.8	30.8	30.9	115 J	318 J
Potassium	1260 U	1260 U	2920	1260 U	1260 U	1260 U	1260 U
Silver	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Sodium	9520	9990	12900	5760	7470	9880	21500
Vanadium	2 U	2 U	2 U	2 U	2 U	4.0 J	15.8 J
Zinc	22.0	25.7	26.8	21.6	18.7 J	33.8 J	55.0 J
Cyanide	10 U	14	10 U	10 U	10 U	10 U	10 U
Hardness (mg/L)	309.74	315.63	322.34	292.62	306.47	208.85	160.92

Table 5.6 (cont'd) River Water Chemistry Data - February 1990

River Location	Nearsite and Downstream				Upstream		
	SW-1	SW-2	SW-3	Duplicate SW-3	SW-4	SW-5	SW-6
Indicator Parameters (mg/L)							
Laboratory							
Ammonia	1 L	1 L	1 L	1 L	1 L	1 L	1 L
Chemical Oxygen Demand	50 L	50 L	50 L	50 L	50 L	50 L	50 L
Total Suspended Solids	5.2	5 U	20	19	19	170	610
Chloride	27	27	28	28	29	28	47
Field							
Temperature (°C)	8	9	5	5	4	3	1
pH	8.05	8.15	8.03	8.03	8.15	7.90	7.31
Specific Conductance (µmhos/cm) (1)	380	400	350	350	330	250	200
Specific Conductance (µmhos/cm) (2)	737	753	1021	1021	996	652	561
Dissolved Oxygen (mg/L)	11.6	11.8	10.2	10.2	10.8	11.2	11.6

- Not detected

(1) Field measurement

(2) Value corrected to 25°C

Data Qualifier Definitions

U - organics: The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

- inorganics: The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.

J - The associated value is an estimated quantity.

UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

NJ - Presumptive evidence of the presence of the material at an estimated quantity.

L - The material was analyzed for, but was not detected. The instrument detection limit is greater than the contract required detection limit.

Table 5.7 Summary of Pond Water Chemistry Data - February 1990

Parameter	Onsite Pond		Offsite Pond		IDL (µg/L)	CRQL (µg/L)
	Frequency of Detection	Range of Detectable Concentrations	Frequency of Detection	Range of Detectable Concentrations		
TCL Volatiles (µg/L)						
Methylene Chloride	0/2	—	0/2	—	5	5
TCL Semivolatiles (µg/L)						
bis(2-Ethylhexyl) Phthalate	1/2	5	0/2	—	10	10
Dissolved TAL Metals (µg/L)					CRDL (µg/L)	
Aluminum	1/2	21.4	1/2	31.4	16	200
Barium	2/2	159-173	2/2	60.6-61.2	1	200
Calcium	2/2	49500-50200	2/2	48800-49800	17	5000
Cobalt	0/2	—	0/2	—	3	50
Copper	0/2	—	1/2	4.2	4	25
Iron	1/2	18.5	2/2	7.9-10.6	4	100
Lead	1/2	2.2	0/2	—	2	5
Magnesium	2/2	30500-31700	2/2	26100-26500	56	5000
Manganese	2/2	8.7-16.4	0/2	—	1	15
Mercury	1/2	0.22	0/2	—	0.2	0.2
Potassium	1/2	10100	1/2	7990	1260	5000
Sodium	2/2	31100-32800	2/2	10000-11600	1490	5000
Vanadium	1/2	4.6	2/2	2.6-4.9	2	50
Zinc	1/2	20.6	2/2	10-14.6	1	20
Total TAL Metals and Cyanide (µg/L)						
Aluminum	2/2	69.4-74.4	2/2	41.8-48.8	16	200
Barium	2/2	164-169	2/2	61.3-62.0	1	200
Calcium	2/2	44100-45600	2/2	43200-43700	17	5000
Cobalt	0/2	—	1/2	3.7	3	50
Copper	1/2	9.0	0/2	—	4	25
Iron	2/2	198-244	2/2	151-163	4	100
Lead	1/2	5.1	0/2	—	2	5
Magnesium	2/2	28800-29800	2/2	23900-24400	56	5000
Manganese	2/2	22.8-24.4	2/2	16.7-16.7	1	15
Mercury	0/2	—	0/2	—	0.2	0.2
Potassium	2/2	4650-7540	0/2	—	1260	5000
Sodium	2/2	29300-31000	2/2	9230-9350	1490	5000
Vanadium	0/2	—	1/2	2.9	2	50
Zinc	1/2	23.2	2/2	2.1-2.5	1	20
Cyanide	0/2	—	0/2	—	10	10
Indicator Parameters (mg/L)					(mg/L)	(mg/L)
Laboratory						
TSS	2/2	7.8-48	1/2	5.0	5	5
Chloride	2/2	28-29	2/2	15-16	3	3
COD	1/2	1.1	0/2	—	50	20
Ammonia	1/2	0.0102	0/2	—	1	0.1
Field						
Temperature (°C)		5-5		5-5		
pH		7.88-8.17		8.25-8.28		
Specific Conductance (µmhos/cm)*		704-810		533-555		
DO (mg/L)		11.4-11.8		11.6-12.0		

— Not detected

CRQL - Contract required quantitation limit

IDL - Instrument detection limit

* - Value corrected to 25°C

CRDL - Contract required detection limit

Table 5.8 Pond Water Chemistry Data - February 1990

Pond Location Sample Depth	Onsite Pond		Offsite Pond	
	PW-1 Shallow	PW-2 Deep	PW-3 Shallow	PW-4 Deep
TCL Volatiles (µg/L)				
Methylene Chloride	1 UJ	5 U	1 UJ	5 U
TCL Semivolatiles (µg/L)				
bis(2-Ethylhexyl) Phthalate	10 U	5 J	10 U	10 U
Dissolved TAL Metals (µg/L)				
Aluminum	16 U	21.4 J	16 U	31.4 J
Barium	159 J	173 J	60.6 J	61.2 J
Calcium	49500 J	50200	48800	49800
Cobalt	3 U	3 U	3 U	3 U
Copper	4 U	4 U	4 U	4.2 J
Iron	4 U	18.5 J	10.6 J	7.9 J
Lead	2.2 J	2 U	2 U	2 U
Magnesium	30500 J	31700	26100	26500
Manganese	8.7 J	16.4	1 U	1 U
Mercury	0.2 U	0.22 J	0.2 U	0.2 U
Potassium	10100	4910 UJ	4750 UJ	7990 U
Sodium	32800	31100	10000	11600
Vanadium	4.6 J	2 U	2.6 J	4.9 J
Zinc	1 U	20.6	14.6 J	10 J
Total TAL Metals and Cyanide (µg/L)				
Aluminum	69.4 J	74.4 J	48.8 J	48.1 J
Barium	169 J	164 J	61.3 J	62.0 J
Calcium	45600	44100	43200	43700
Cobalt	3 U	3 U	3.7 J	3 U
Copper	4 U	9.0 J	4 U	4 U
Iron	198 J	244 J	151 J	163 J
Lead	2 U	5.1 J	2 U	2 U
Magnesium	29800	28800	23900	24400
Manganese	22.8 J	24.4 J	16.7 J	16.7 J
Mercury	0.2 U	0.2 U	0.2 U	0.2 U
Potassium	7540	4650 J	1260 U	1260 U
Sodium	31000	29300	9350	9230
Vanadium	2 U	2 U	2.9 J	2 U
Zinc	1 U	23.2	2.1 J	2.5 J
Cyanide	10 U	10 U	10 U	10 U

Table 5.8 (cont'd) Pond Water Chemistry Data - February 1990

Pond Location Sample Depth	Onsite Pond		Offsite Pond	
	PW-1 Shallow	PW-2 Deep	PW-3 Shallow	PW-4 Deep
Indicator Parameters (mg/L)				
Laboratory				
Ammonia	1 L	1.1	1 L	1 L
Chemical Oxygen Demand	50 L	50 L	50 L	50 L
Total Suspended Solids	7.8	48	5 U	5.0
Chloride	28	29	16	15
Field				
Temperature (°C)	5	5	5	5
pH	8.17	7.88	8.25	8.28
Specific Conductance (µmhos/cm) (1)	380	330	250	260
Specific Conductance (µmhos/cm) (2)	810	704	533	555
Dissolved Oxygen (mg/L)	11.8	11.4	11.6	12.0

– Not detected

(1) Field measurement

(2) Value corrected to 25°C

Data Qualifier Definitions

U - organics: The material was analyzed for, but was not detected. The associated value is the sample quantitation limit

- inorganics: The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.

J - The associated value is an estimated quantity

UJ - organics: The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

- inorganics: The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

L - The material was analyzed for, but was not detected. The instrument detection limit is greater than the contract required detection limit.

Table 6.1 Water Quality Criteria

Parameter	Acute Aquatic Criteria	Chronic Aquatic Criteria	Human Health	MCL	Proposed MCL	IDL
TCL Volatiles (µg/L)						
Acetone	10000 +	222 +	-	-	-	10
Benzene	5300 E	118 +	400 I	5 E	-	5
Chlorobenzene	1950 +	50 E	2026 +	-	-	5
1,2-dichloroethene (total)	-	-	-	-	70 E	5
Methylene Chloride	193000 E	4289 +	157 E	-	-	5
Toluene	17500 E	389 +	424000 I	-	2000 E	5
Trichloroethene	45000 E	21900 E	807 I	5 E	-	5
Vinyl Chloride	-	-	5246 I	2 E	-	10
TCL Semivolatiles (µg/L)						
Phthalate Esters	940 E	3 E	50000 I	-	-	10
TAL Metals and Cyanide (µg/L)						
Aluminum	-	-	-	-	-	16
Antimony	-	-	-	-	-	21
Arsenic	360 I	190 I	0.175 I	50 E	-	3
Barium	-	-	-	1000 E	-	1
Beryllium	-	-	-	-	-	1
Cadmium*	6.7 I	1.6 I	60 +	10 E	-	5
Calcium	-	-	-	-	-	17
Chromium	16 I	11 I	3389 +	50 E	-	5
Cobalt	-	-	-	-	-	3
Copper*	28 I	18 I	-	-	-	4
Cyanide	22 I	5.2 I	24242 +	-	-	10
Iron	1000 E	-	-	-	-	4
Lead*	150 I	5.8 I	51 +	50 E	-	2
Magnesium	-	-	-	-	-	56
Manganese	-	-	-	-	-	1
Nickel*	2100 I	240 I	100 I	-	-	29
Potassium	-	-	-	-	-	1260
Silver*	9.2 I	0.12 E	6061 +	50 E	-	4
Sodium	-	-	-	-	-	1490
Vanadium	11000 +	100 +	-	-	-	2
Zinc*	175 I	160 I	48 I	-	-	1
IDEM Parameters (mg/L)						
Ammonia						
Total	-	-	-	-	-	1
Unionized**	0.0270 I	0.0024 I	-	-	-	-
COD	-	-	-	-	-	50
Chloride	860 I	230 I	-	-	-	-
TSS	-	-	-	-	-	-

* - Acute and chronic criteria calculated based on hardness = 161 mg/L

** - Acute and chronic criteria calculated based on T = 5°C, pH = 7.0

- Criteria not developed

IDL - Instrument Detection Limit

MCL - Maximum Contaminant Level

Source of Data

E - US EPA

I - IDEM

+ - See Section 6.2 of text for source of data

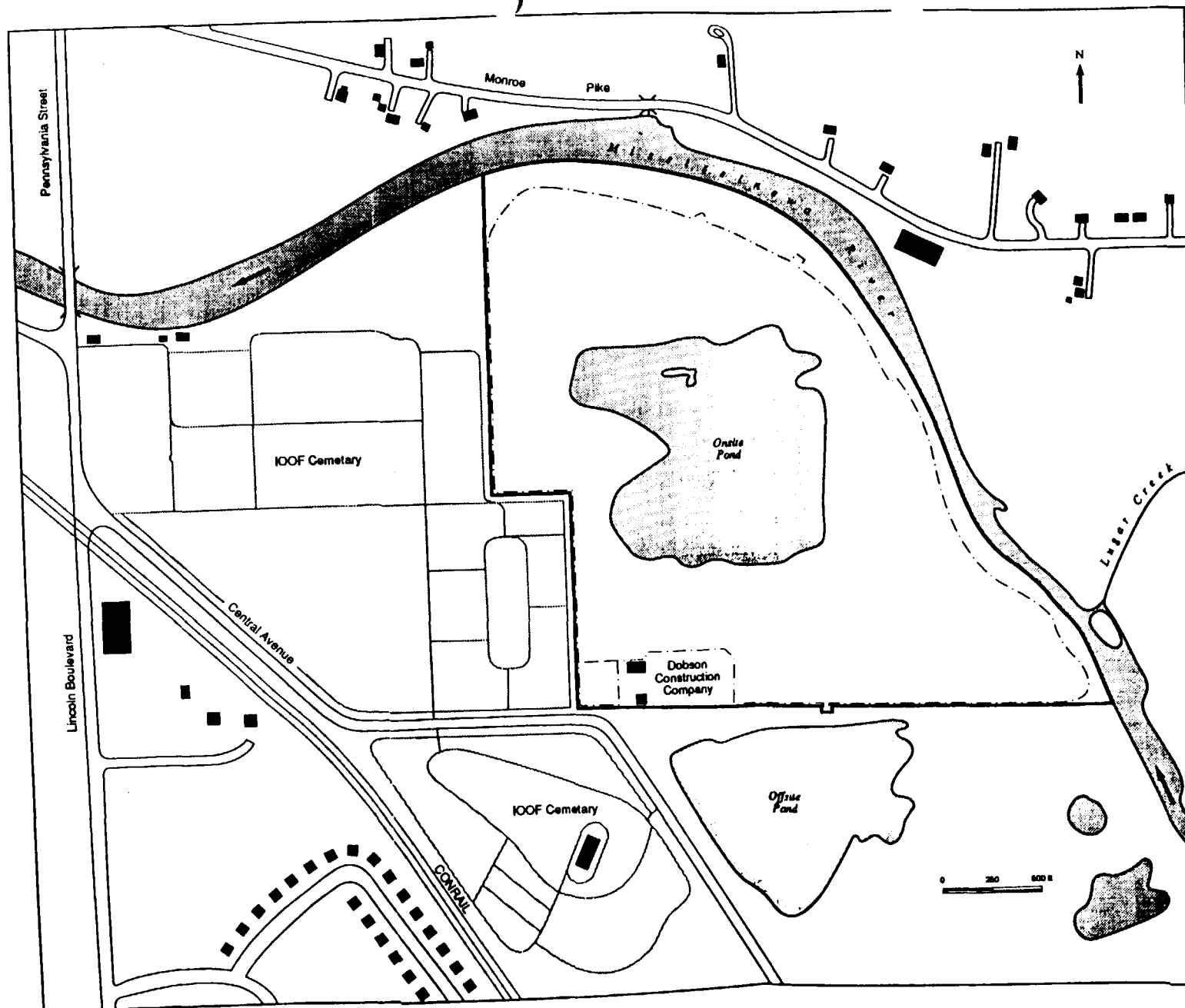
Table 6.2: Sampling Locations Exceeding Water Quality Criteria

			Monitoring	Sample		Criteria	Average		Diluted		
Parameter	Matrix	Sample Location	Well Zone	Concentration (ug/L)	Criteria Exceeded	Concentration (ug/L)	Concentration of Zone (ug/L)	Exceeds Criteria	Concentration After Mixing (ug/L)	Exceeds Criteria	
1,2-dichloroethene	Groundwater	MB-1	I	140	proposed MCL	70	E	38	NO	0.0212	NO
Trichloroethene	Groundwater	MB-1	I	18	MCL	5	E	6	YES	0.0033	NO
Vinyl Chloride	Groundwater	MB-1	I	22	MCL	2	E	14	YES	0.0078	NO
		MB-2	I	12	MCL	2	E	14	YES	0.0078	NO
bis(2-ethylhexyl) Phthalate	Groundwater	MB-8 (dup)	III	10	CAC	3	E	6	YES	0.0033	NO
	Pond Water	PW-2	-	5	CAC	3	E	-	-	-	-
Arsenic	Groundwater	MB-1	I	11.3	HH	0.175	I	24	YES	0.0134	NO
		MB-2	I	51.7	HH	0.175	I	24	YES	0.0134	NO
		MB-2	I	51.7	MCL	50	I	24	NO	0.0134	NO
		MB-3	I	24.7	HH	0.175	I	24	YES	0.0134	NO
		MB-4	I	8.3	HH	0.175	I	24	YES	0.0134	NO
		MB-6	II	435	HH	0.175	I	219	YES	0.1216	NO
		MB-6	II	435	CAC	190	I	219	YES	0.1216	NO
		MB-6	II	435	AAC	360	I	219	NO	0.1216	NO
		MB-6	II	435	MCL	50	E	219	YES	0.1216	NO
		MB-7	III	3.9	HH	0.175	I	61	YES	0.034	NO
		MB-8 (dup)	III	118	HH	0.175	I	61	YES	0.034	NO
		MB-8 (dup)	III	118	MCL	50	E	61	YES	0.034	NO
Iron	Groundwater	MB-1	I	2990	AAC	1000	E	4620	YES	2.58	NO
		MB-2	I	9070	AAC	1000	E	4620	YES	2.58	NO
		MB-3	I	4580	AAC	1000	E	4620	YES	2.58	NO
		MB-4	I	1840	AAC	1000	E	4620	YES	2.58	NO
		MB-6	II	13100	AAC	1000	E	6557	YES	3.66	NO
		MB-8	III	4280	AAC	1000	E	2277	YES	1.27	NO
Lead	River Water	SW-6	-	10.8	CAC	5.8	I	-	-	-	-
Zinc	River Water	SW-6	-	55.0	HH	4.8	I	-	-	-	-
Cyanide	River Water	SW-2	-	14	CAC	5.2	I	-	-	-	-
Unionized Ammonia	Groundwater			(mg/L)		(mg/L)		(mg/L)		(mg/L)	
		MB-2	I	0.0197	CAC	0.0024	I	0.0074	YES	0.000004	NO
		MB-3	I	0.0087	CAC	0.0024	I	0.0074	YES	0.000004	NO
		MB-5	II	0.0038	CAC	0.0024	I	0.0054	YES	0.000003	NO
		MB-6	II	0.0069	CAC	0.0024	I	0.0054	YES	0.000003	NO
		MB-7	III	0.0246	CAC	0.0024	I	0.022	YES	0.00001	NO

AAC - Acute Aquatic Criteria
CAC - Chronic Aquatic Criteria

HH - Human Health
MCL - Maximum Contaminant Level

* Source of Criteria
E - U.S. E.P.A.
I - State of Indiana



- site boundary
- - - fence
- building
- private road (cemetary)
- railroad

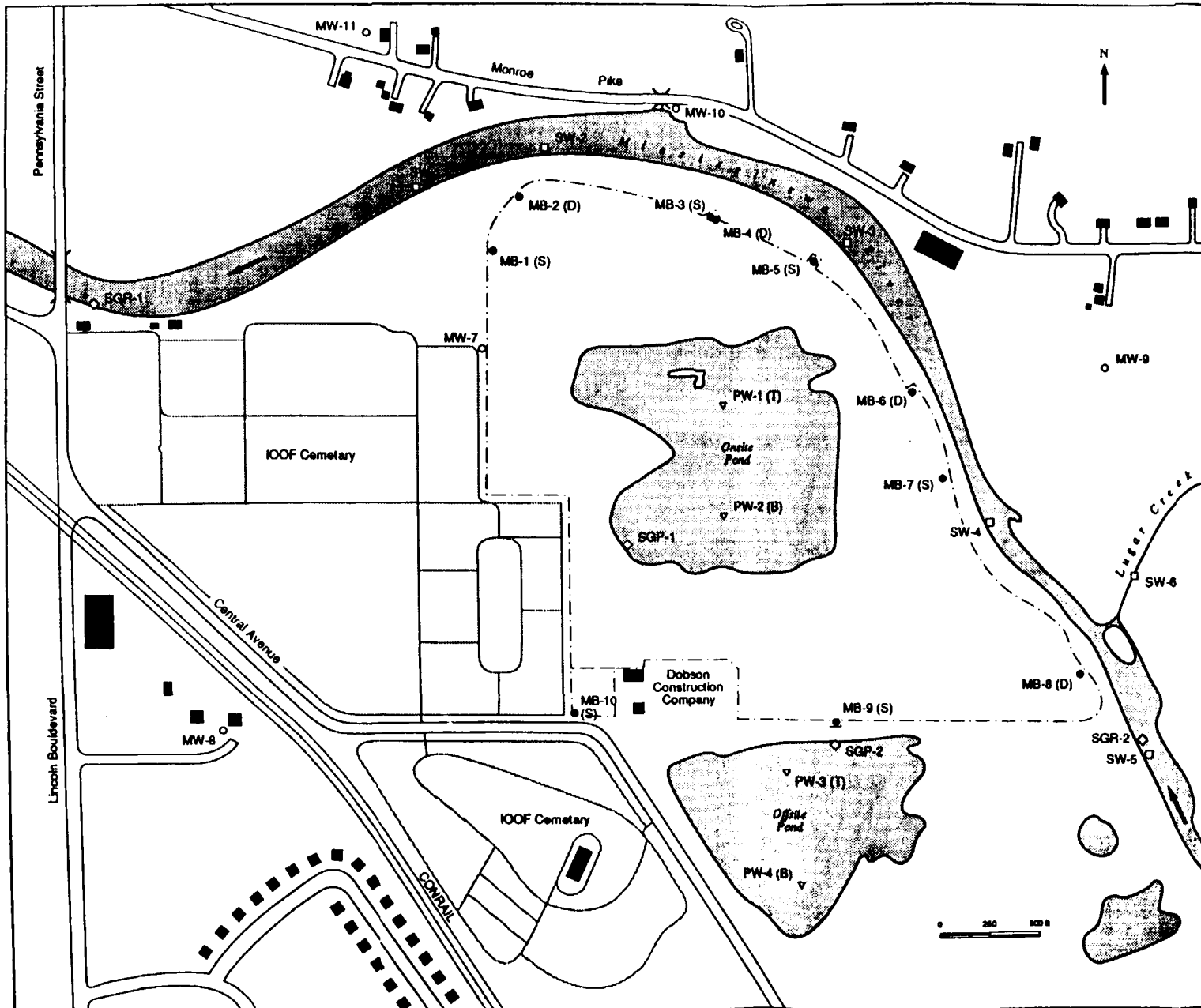
Marion (Bragg) Landfill Site and Area

beak

beak
consultants
limited

Figure
1.1

20 Ju
Rev



Monitoring Wells

- MB-1 ● new monitoring well
- MW-7 ○ remedial investigation monitoring well
- (S) shallow zone of upper aquifer
- (D) deep zone of upper aquifer

Staff Gauges

- SGR-1 ◇ river location
- SGP-1 ◇ pond location

Surface Water Samples

- SW-1 □ surface water sample location

Pond Water Samples

- PW-1 ▽ pond water sample location
- (T) sample collected near water surface
- (B) sample collected near pond bottom

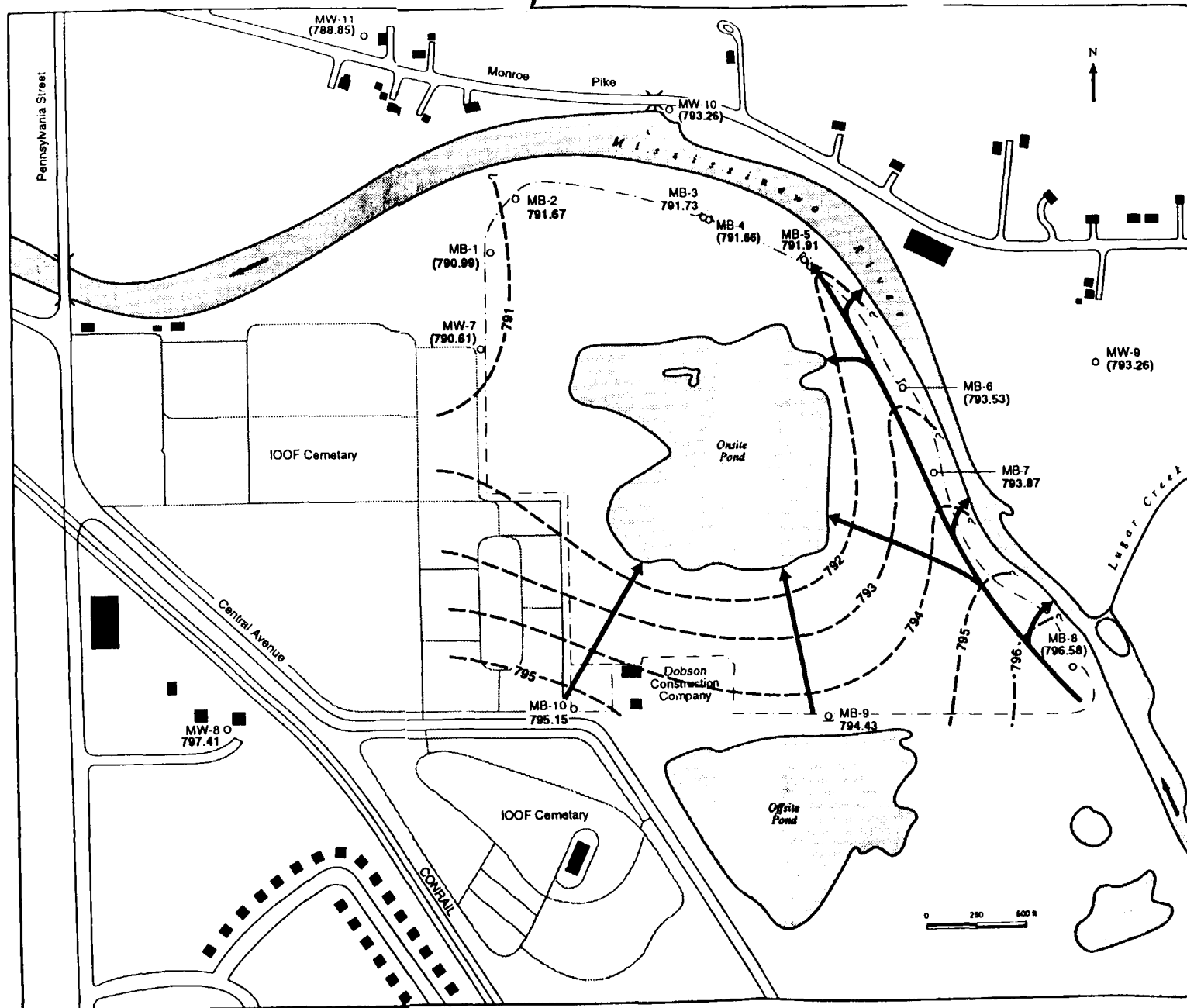
Groundwater, Surface Water and Pond Water Sampling Locations

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Figure
2.1

20 June 94
Rev. 00



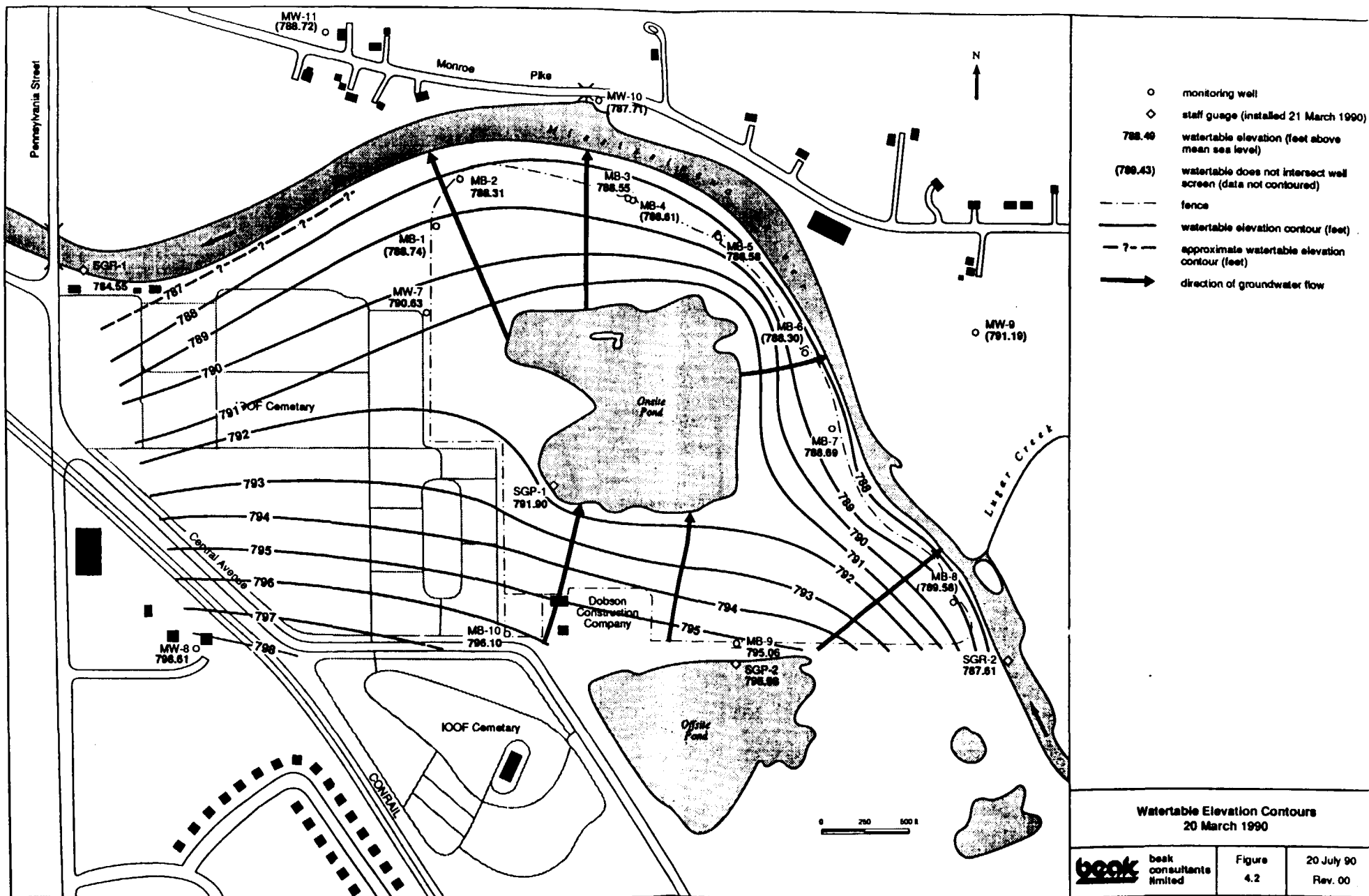
Watertable Elevation Contours
16 February 1990

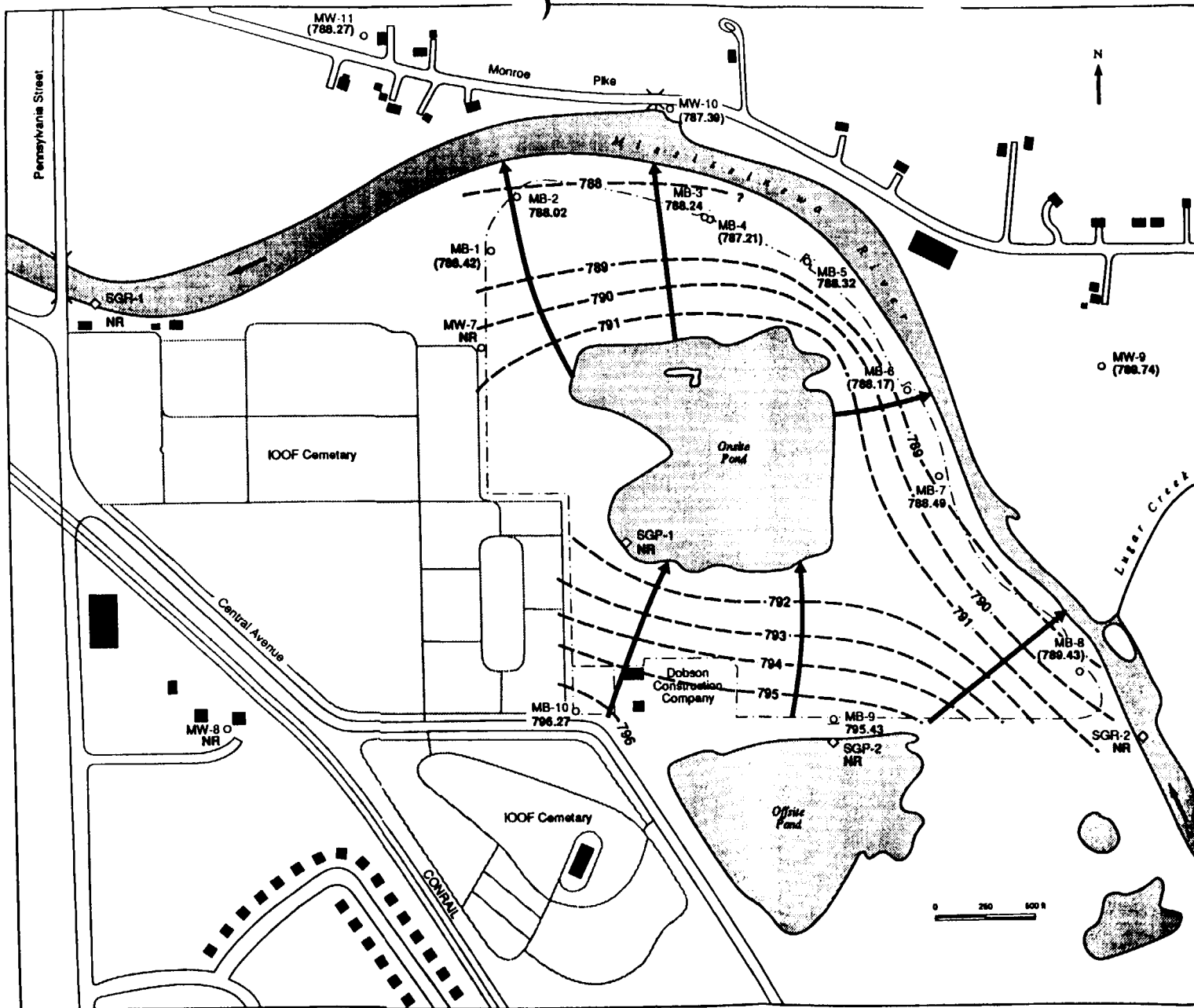
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Figure
4.1

20 July 91
Rev. 00





- monitoring well
- ◇ staff gauge
- 788.48 watertable elevation (feet above mean sea level)
- (788.43) watertable does not intersect well screen (data not contoured)
- NR data not recorded
- - - fence
- - - approximate watertable elevation contour (feet)
- direction of groundwater flow

Watertable Elevation Contours
24 April 1990

beek beek consultants limited	Figure 4.3	20 July 90
		Rev. 00

APPENDIX 1

PROTOCOLS

PROTOCOL NO. 1

**SUPERVISION OF EXPLORATORY BOREHOLES
FOR MONITORING WELLS**

SUPERVISION OF EXPLORATORY BOREHOLES FOR MONITORING WELLS

1.1 Introduction

This document describes the procedures followed during the drilling and sampling of exploratory boreholes at the Marion (Bragg) Landfill in Marion, Indiana. A total of 10 boreholes were drilled as part of this investigation. Wells designed to intersect either the watertable or the top of underlying till unit were installed in each of the boreholes. At one location, a shallow and a deep borehole were drilled within 10 feet (laterally) of one another to create a well nest. Water level data from a well nest can be used to determine groundwater flow directions and vertical hydraulic gradients.

1.2 Drilling Methods

Exploratory boreholes were drilled using either a Mobile B-61 or Mobile B-57 truck mounted drill rig equipped with 4 1/4 inch inside diameter (8 inch OD) hollow stem augers.

No drilling fluids or additives were used during drilling of the exploratory boreholes with the exception of borehole MB-1. Approximately 60 gallons of clean water from the municipal water supply was poured down the borehole to prevent the sands from heaving into the augers during well point placement. Additionally, no greases or petroleum-based solvents were used during the borehole drilling procedures.

A BEAK hydrogeologist attended the drilling activities continuously to specify the rate of drill penetration, depth of sample collection, and total depth of borehole.

1.3 Drilling Rig Decontamination

Drilling equipment was decontaminated prior to initial use, between borehole locations and at the completion of drilling activities. The following items were manually scrubbed and thoroughly steam cleaned to remove foreign material:

- back of drill rig
- auger flights
- drilling rods and other down-hole equipment
- split spoon samplers

1.4 Sample Logging

Continuous 24-inch split spoon samples were collected over the entire length of the borehole and were described in the field log book. The samples were visually classified according to the Unified Sediment Classification System. A detailed borehole log containing the geologic description was constructed for each borehole and is presented in Appendix 2. The borehole logs also contain observations noted during the drilling procedure, the location from which split spoon samples were recovered, notes on sample recovery, blow counts per foot, OVA and combustible gas readings and well construction details. Representative samples from each split spoon were collected and stored in glass jars for future reference.

PROTOCOL NO. 2

WELL INSTALLATIONS

PROTOCOL NO. 2

WELL INSTALLATIONS

2.1 Introduction

This document describes procedures followed during well installation at the Marion (Bragg) Landfill in Marion, Indiana.

A single monitoring well was installed in each of the 10 exploratory boreholes. Each monitoring well was designed to display the potentiometric surface and permit the collection of water samples from selected intervals in which the filter pack is positioned. The interval to be intersected by the well screen was selected based on observation of sediment core samples and moisture content in each of the borings, and either the position of the watertable or the occurrence of the confining till unit at the base of the upper aquifer. The well screen extends above the normal expected watertable elevation for the shallow watertable wells completed at the top of the upper aquifer. This design conforms with routine monitoring well specifications and allows for fluctuations in the watertable. Monitoring well construction followed the procedures outlined in the following sections.

2.1.1 Screen and Riser Pipe

The monitoring wells were constructed from schedule 40 polyvinyl chloride (PVC) flush threaded casing. The inside diameter of the casing is sufficiently large (2-inches) to permit the entry of water level measuring and water sampling devices. The well screens consist of casing material which is factory slotted (slot width = .020") to permit the entry of water into the well. The bottom of the screens were plugged with appropriately sized screw-in well points. The appropriate number of risers were coupled with the 10-foot screen sections via threaded joints to construct the well. Suitably-sized teflon O-rings were placed between the sections of the

PVC monitoring wells to prevent the entry of water through the threads of the joint. No PVC cements or other solvents were used in the construction of the wells.

2.1.2 Setting Screens, Riser Casings and Filter Materials

The augers were left in the borehole upon completion of the drilling to prevent the borehole from collapsing. The necessary well materials were assembled and lowered to the bottom of the borehole. The bottom of the well point was positioned flush with the bottom of the borehole and sufficient lengths of riser were added until approximately 3 feet of the riser protruded above the ground surface.

After the monitoring well assembly had been lowered to the bottom of the borehole, No. 9 gravel was added through the inside of the augers to fill the annular space created between the outside of the well and the inside of the borehole by the slow removal of the augers. The top of the gravel was constantly plumbed with a weighted measuring tape as the gravel was being poured to ensure that the filter material was passing through the annulus of the augers without obstruction and flowing evenly into the open borehole around the well screen. Gravel was added until the level of the gravel in the borehole was between 1 to 2 feet above the top of the screened interval. A layer of silica sand 1 foot thick was then added above the gravel pack.

2.1.3 Setting Seals and Grouting

Once the top of the sand pack was verified to be in the correct position, a layer of bentonite pellets was placed on top of the silica sand to seal the screened interval of the well off from the overlying fluids/geologic materials in all wells. Sufficient bentonite pellets 1/4-inch in diameter were poured down the inside of the augers to produce a 2- to 3-foot thick layer above the sand. After the depth to the final top of the bentonite was verified using a weighted measuring tape, approximately 1 to 2 gallons of distilled water were poured down the inside

of the augers onto the pellets. This water interacted with the pellets, causing them to begin to swell, thereby immediately sealing off the well screen/filter pack from any fluids migrating down from above. In the deep wells (MB-1, MB-4, MB-6, MB-8) sufficient water flowed into the borehole during the placement of the well materials to wet the bentonite pellets as they settled onto the top of the sand. In these wells no distilled water was added to the borehole.

A cement/bentonite grout seal was then tremied to within 3 feet of the ground surface. The grout was composed of only Type II Portland cement and bentonite, with no synthetic material.

2.1.4 Capping the Wells

The tops of the wells were capped to prevent the entry of foreign material using PVC caps. The caps are sealed with O-rings and are held in place with stainless steel screws. To prevent surface water infiltration and to provide security, a stainless steel protective casing was cemented in place over each of the wells. The concrete seal around the protective casing extends approximately 3 feet below the ground surface and is sloped away from the well casing at the ground surface.

2.1.5 Documentation of Monitoring Well Configuration

Scaled diagrams of the wells constructed in each of the boreholes are included with the borehole geologic logs in Appendix 2.

2.2 Cleaning of Well Materials

The PVC risers and screens from which the wells were constructed were factory cleaned by scrubbing and soaking in detergent, rinsed in clean water and allowed to dry. The PVC well materials were individually sealed in 6-mil polyethylene sleeves prior to shipment to the site.

Immediately prior to the construction of the monitoring well, the PVC well materials were removed from their plastic bags by persons wearing clean disposable latex gloves.

PROTOCOL NO. 3

DEVELOPMENT OF MONITORING WELLS

PROTOCOL NO. 3

DEVELOPMENT OF MONITORING WELLS

3.1 Introduction

This document describes the well development procedures undertaken at the Marion (Bragg) Landfill site in Marion, Indiana.

3.2 Well Development

After the monitoring well installations were completed and had been allowed to set for at least 48 hours, the wells were developed by pumping until the pH and specific conductance had stabilized. Water was pumped from the well casings using a Waterra pump dedicated to the well and stored in the well bore. The pH, specific conductance, temperature and total volume of water pumped were monitored during development and were recorded in the field log book. Well development proceeded after the pH and specific conductance had stabilized to remove as much silt as possible from the well and enhance the performance of the well screen/filter pack. Well development data are presented in Appendix 3.

3.3 Waterra Pump Assembly

The Waterra pump assembly consists of a stainless steel foot valve attached to a length of stiff 5/8 inch OD teflon tubing equal to the depth of the well. Oscillation of the tubing, together with the action of the foot valve, forces water to the ground surface. The entire pump assembly is stored in each well. A complete description of the Waterra pump system is presented in Appendix 5.

PROTOCOL NO. 4

WATER LEVEL MONITORING

PROTOCOL NO. 4

WATER LEVEL MONITORING

4.1 Introduction

This document describes the procedures which were followed during water level monitoring activities at the Marion (Bragg) Landfill in Marion, Indiana.

4.2 Water Level Measurements

All water level measurements obtained since the installation of the wells were collected using a battery operated water level tape. The water level tape is marked at 1/20 of a foot intervals for accurate measurements to the nearest 1/100 of a foot. The probe used to measure water levels consists of a stainless steel electrode with a circuit insulating gap. The circuit is completed when the probe contacts water and a buzzer is activated. The electric sounder consists of a contact electrode that is suspended down the well. Current flows through the electrode when it contacts the water surface and a buzzer sounds.

The procedure used for measuring water levels is as follows:

- switch on;
- lower the weighted electric tape slowly into the well until the buzzer or light indicates a closed circuit;
- note the length of tape which corresponds to the top of the well casing (reference point is marked on casing); and
- record the resultant value as the water level to the nearest 1/100 of a foot below the top of the casing.

All water level measurements collected by BEAK personnel were recorded in the field log book. Additional water level measurements were collected by de maximis, inc. after personnel from BEAK had left the site.

4.3 Equipment Cleaning

Care was taken not to immerse the electrode/tape any further into the well than necessary so that only the stainless steel probe would come in contact with the water during a water level measurement. The probe and approximately 2 feet of the polyethylene tape were decontaminated according to the following procedure:

- manually scrub with an Alconox soap solution,
- rinse with tap water,
- rinse with reagent grade methanol,
- rinse thoroughly with deionized water, and
- allow apparatus to air dry.

PROTOCOL NO. 5

GROUNDWATER SAMPLING

PROTOCOL NO. 5

GROUNDWATER SAMPLING

5.1 Introduction

This document describes the procedures followed during the collection of groundwater samples at the Marion (Bragg) Landfill Site in Marion, Indiana. BEAK carried out the sampling and analysis plan prepared by ERM in accordance with general EPA guidance and as requested in the Consent Decree for the site.

5.2 Presampling Activities

The depth to water was measured in each monitoring well to nearest 1/100 of a foot using an electronic water level indicator (see Protocol 4). This data was used to calculate the volume of water (gallons) in each well based on the total depth of the particular well and the inside diameter of the well casing. The 2-inch inside diameter of the casing used to construct the monitoring wells has a volume of 0.163 gallons of fluid per foot of depth. The calculated well volume of each well was then multiplied by three (3) to get the required well evacuation volume.

5.2.1 Well Evacuation

A minimum of three times (3x) the volume calculated above of water standing in each well will be removed using the dedicated Waterra Pump. The well will be evacuated until pH, conductivity and temperature measurements stabilize to +/- 10% over three (3) consecutive readings. If the well can not sustain a yield, it will be purged to dryness. The volume of fluid evacuated from each well will be measured in a bucket of known volume.

The pump placement within the well will be dependent on well yield. High yielding wells necessitate the placement of the pump at the top of the water column. Low yielding wells require pump placement to be at the bottom of the well. Proper pump placement will insure complete and proper evacuation. Observations on the physical appearance and odour of the development water should also be noted.

5.3 Sample Acquisition

Clean plastic sheeting will be placed on the ground surface adjacent to the well. Equipment and supplies to be used during sampling will be stored on a table or plastic sheeting adjacent to the sampling location.

The sample containers will then be filled in the following order:

- TCL volatiles,
- TCL semivolatiles,
- TAL metals and cyanide, and
- indicator parameters.

The sample for TAL metals will be filtered (0.45 μ m membrane) in the field using in-line Sample Pro disposable filters to remove unwanted suspended sediment.

Chemical preservation of the samples will be checked using sterile, disposable pipets to withdraw aliquots for pH testing. Adjustments will be made as necessary.

All bottles will be labelled and the necessary chain of custody forms filled out. Samples will be placed immediately into insulated coolers and packed for overnight shipment to the laboratory as described in Section 5 of the QAPP (ERM, 1990).

5.4 Field Measurements

Calibrate the pH, dissolved oxygen and conductivity meters according to the specific manufacturers instructions (see Protocol No. 7). Record all instrument serial numbers, calibration information and standard sources in the field log book.

After samples have been procured for chemical analysis, a clean glass beaker will be filled to measure pH, dissolved oxygen, specific conductance and temperature.

The pH of the sample will be measured with a pH meter calibrated to the temperature of the well fluid. The pH probe will be lowered into the sample and gently stirred to allow equilibration before the reading is taken. Dissolved oxygen and specific conductance will be measured by placing the probe into the sample and taking readings immediately. All measurements will be recorded in the field log book. Each probe will be rinsed initially and between use with a stream of distilled water.

5.5 Quality Control Samples

5.5.1 Trip Blanks

Trip blanks originating from the laboratory will be submitted for analysis of TCL volatiles each day of sampling. Trip blanks will be placed inside the cooler containing the samples for TCL volatile analysis. These blanks are not to be opened.

5.5.2 Field Duplicate Samples

Field duplicate samples will be collected once per ten investigative samples. The duplicate sample will be collected by filling a second set of sample containers after completing the initial water sample. The duplicate sample will be given a fictitious identification so it is "blind" to the lab.

5.5.3 Matrix Spike/Matrix Spike Duplicate Samples

Triple sample volume must be provided at the frequency of once in every 20 investigative samples so that the laboratory can perform matrix spike and matrix spike duplicate analyses. The three sets of samples to be used for these analyses will be indicated on the traffic report form.

5.6 Sampling Equipment Decontamination Procedure

All groundwater sampling equipment will be decontaminated prior to each use according to the following procedure:

- manually scrub with Alconox soap solution,
- rinse with tap water,
- rinse with a 10% nitric acid solution (only if to be analysed for metals),
- rinse with reagent grade methanol,
- rinse thoroughly with deionized water, and
- allow apparatus to air dry.

All water used for decontamination procedures will be collected and stored in barrels and disposed of in an appropriate manner.

PROTOCOL NO. 6

RIVER WATER AND POND WATER SAMPLING

PROTOCOL NO. 6

RIVER WATER AND POND WATER SAMPLING

6.1 Introduction

This document describes the procedures followed during the collection of river water and pond water samples at the Marion (Bragg) Landfill Site in Marion, Indiana. BEAK carried out the sampling and analysis plan prepared by ERM (1990) in accordance with general EPA guidance and as requested in the Consent Decree for the site.

6.2 Presampling Activities

6.2.1 Mississinewa River and Lugar Creek

Sampling of the Mississinewa River and Lugar Creek will proceed from the farthest downstream location and proceed to upstream locations to minimize potential cross-contamination from suspended material derived from sampling activities. The Mississinewa River sampling locations will be positioned between mid-river and the left bank (facing downstream) to reflect conditions associated with the landfill. The Lugar Creek sampling location will be in the mid-channel of the creek, upstream from its confluence with the Mississinewa River. Samples will be collected upstream from the position of the sampler at a depth of 6 inches below the water surface.

The following channel conditions will be recorded at each sampling location:

- water depth
- channel width
- channel configuration
- flow velocity

6.2.2 Onsite and Offsite Ponds

The total depth in feet to the bottom of the pond will be determined at each sampling location. Samples will be collected proceeding from the outflow location to the inflow location.

A deep water sample (within 3 feet of pond bottom) and a shallow water sample will be collected from each pond.

6.3 Sample Acquisition

6.3.1 Mississinewa River and Lugar Creek

Dependent upon the depth and stream velocity at the time of sampling, the river or creek sample will be collected directly in the sample container or using a long handled polyethylene grab sampler from the bank. All attempts should be made to use a consistent method of procurement, but seasonal and safety conditions must be taken into account.

6.3.2 Onsite and Offsite Ponds

The deep pond water samples will be collected within 3 feet of the pond bottom using a stainless steel Kemmerer sampler. The shallow pond samples will be collected directly into the appropriate sample containers at a depth of 6 inches below the water surface.

6.3.3 Surface Water Sample Collection

Equipment and supplies to be used during surface water sampling activities will be set on plastic sheeting adjacent to the sampling location.

The sample containers will be filled in the following order:

- TCL volatiles,
- TCL semivolatiles,
- TAL metals and cyanide, and
- indicator parameters.

All sample bottles will be labelled and the necessary chain of custody forms filled out as described in Section 5 of the QAPP (ERM, 1990).

Samples will be collected for both total and dissolved TAL metals. The dissolved TAL metals sample will be filtered (0.45 μ m membrane) in the field before being transferred to the sample container.

Chemical preservation of samples will be checked using sterile, disposable pipets to withdraw sample aliquots for pH testing. Adjustments will be made as necessary.

Samples will be placed immediately into insulated coolers and packed for overnight shipment to the laboratory as described in section 5 of the QAPP. (ERM, 1990).

6.4 Field Measurements

The pH, dissolved oxygen and conductivity meters will be calibrated according to the specific manufacturers instructions (see Protocol No. 7). All instrument serial number, calibration information and standard sources will be recorded in the field book.

After samples have been procured for chemical analysis, a clean glass beaker will be filled to measure pH, dissolved oxygen, conductivity and temperature. If possible these measurements will be measured *in situ*.

The pH will be measured by means of a pH meter calibrated to the temperature determined from the surface water sample. The probe will be lowered into the sample and gently stirred to allow equilibration before the reading is taken. The dissolved oxygen and conductivity will be measured by placing the probe into the sample and the reading will be immediately taken. Each measurement probe will be rinsed initially and between use with a stream of distilled water. All field measurements will be recorded in the field log book.

6.5 Quality Control Samples

6.5.1 Trip Blanks

Trip blanks originating from the laboratory will be submitted for analysis of TCL volatiles each day of sampling. Trip Blanks will be placed inside the cooler containing the samples for TCL volatile analysis. These blanks are not to be opened.

6.5.2 Field Blanks

Field blanks will be collected once per 10 investigative samples. The field blanks will consist of laboratory supplied deionized water poured through a decontaminated Kemmerer sampler or grab sampler. The field blank will be analyzed for identical analyses as the surface water samples.

6.5.3 Field Duplicate Samples

Field duplicate samples will be collected once per 10 investigative samples. The duplicate sample will be collected by filling a second set of sample containers after completing the initial surface water sample. The duplicate sample will be given a fictitious identification so it is "blind " to the laboratory.

6.5.4 Matrix Spike\Matrix Spike Duplicate Samples

Triple sample volume will be provided at the frequency of once in every 20 investigative samples so that the laboratory can perform matrix spike and matrix spike duplicate analyses. The three sets of sample bottles to be used for these analyses will be indicated on the traffic report form.

6.6 Sampling Equipment Decontamination Procedure

All surface water sampling equipment will be decontaminated will decontaminated prior to each use according to the following procedure:

- manually scrub with Alconox soap solution,
- rinse with tap water,
- rinse with a 10% nitric acid solution (only if to be analyzed for metals),
- rinse with reagent grade methanol,
- rinse thoroughly with deionized water, and
- allow apparatus to air dry.

All water used for decontamination procedures will be collected and stored in barrels and disposed of in an appropriate manner.

PROTOCOL NO. 7

**FIELD INSTRUMENTATION,
CALIBRATION AND OPERATION PROCEDURES**

PROTOCOL NO. 7

**FIELD INSTRUMENTATION,
CALIBRATION AND OPERATION PROCEDURES**

1.0 FISHER PH METER 119, MODEL NO. 3D, SERIAL NO. 302026

Range:	0 to 14 pH
Relative Accuracy:	+ or - 0.03 pH
Resolution:	0.05 pH
Temperature Compensation:	Manual 0 to 100 ° C

1.1 Calibration Procedure

- Step 1: Measure temperature of calibration buffer solutions using a mercury-filled thermometer or equivalent and record.
- Step 2: Set temperature dial on pH meter dial to the temperature of the buffer solution.
- Step 3: Insert pH meter probe into 7.00 pH buffer solution.
- Step 4: Obtain the temperature-corrected value for the pH 7.00 buffer solution from table supplied from the manufacturer.
- Step 5: Adjust the standardize dial so the instrument readout reads the temperature-corrected pH value determined in Step 4.
- Step 6: Remove the meter probe from the 7.00 pH buffer solution and rinse with distilled water.

- Step 7: Insert probe into 4.01 pH buffer solution.
- Step 8: Obtain the temperature-corrected value for the pH 4.01 buffer solution from table supplied from the manufacturer.
- Step 9: Using a small screwdriver adjust the span set screw so that the instrument readout indicates the temperature-corrected pH value determined in Step 8. The instrument is now calibrated.

1.2 Instrument Operation Procedure

- Step 1: Measure temperature of subject water to be analyzed.
- Step 2: Set temperature dial on the pH meter to the temperature of the subject water.
- Step 3: Place probe in subject water and record pH value after readout has stabilized.
- Step 4: Record reading, remove meter probe from subject water and rinse with distilled water.

2.0 YSI DISSOLVED OXYGEN METER MODEL NO. 57, SERIAL NO. 7307

Range:	0 to 5/10/20 mg/liter oxygen
Accuracy:	+ or - 1%
Temperature Measurement:	Range -5 to +45 ° C; temperature is automatically compensated
Response Time:	90% in 10 seconds at 30 ° C

2.1 Calibration Procedure (Probe in Air Method)

- Step 1: Switch instrument control knob to redline and check meter needle alignment with redline mark. Using the redline adjust knob align meter needle as necessary.
- Step 2: Switch instrument control knob to zero and check meter needle alignment with zero mark. Using the zero adjust knob align meter needle as necessary.
- Step 3: Switch instrument control knob to temperature and record reading.
- Step 4: Determine the topographic elevation of the survey site and record.
- Step 5: Obtain the correction factor for the site elevation from table supplied from instrument manufacturer and record.
- Step 6: Obtain a standard dissolved oxygen value for the corresponding air temperature measured in Step 3 from table supplied by the instrument manufacturer.
- Step 7: Multiply the standard dissolved oxygen value, obtained in Step 6, by the correction factor for site elevation determined in Step 5. This corrected dissolved oxygen value is the value to which the instrument will be set as a standard in the next step.

Step 8: Switch the instrument control knob to the appropriate scale for dissolved oxygen (0-5 mg/L, 0-10 mg/L or 0-20 mg/L) and adjust calibrate control knob to the elevation-corrected standard dissolved oxygen value from Step 7. The instrument is now calibrated.

2.2 Instrument Operation Procedure

Step 1: Place meter probe into subject water.

Step 2: Switch instrument to either the 0-5/10/20 mg/L dissolved oxygen scale.

Step 3: Agitate subject water with immersed probe with a steady up and down motion.

Step 4: Observe instrument reading and set the 0-5/10/20 scale setting for dissolved oxygen as necessary based on needle response.

Step 5: Record instrument reading when needle on dial has stabilized after 20-30 seconds of probe agitation in sample vessel.

3.0 YSI CONDUCTIVITY/SALINITY/TEMPERATURE METER MODEL 33, SERIAL NO. 3574

Range: Specific conductance: Three-scale meter with selector that reads specific conductance 0-500, 0-5,000 and 0-50,000 $\mu\text{mhos/cm}$.

Salinity: 0-40 parts per thousand.

Temperature: -2 to +50 $^{\circ}\text{C}$

Accuracy: Specific conductance: + or - 3%

Salinity: + or - 1.1 ppt at 40 ppt above 4 $^{\circ}\text{C}$.

Temperature: + or - 0.1 degrees C at -2 $^{\circ}\text{C}$.

+ or - 0.6 degrees C at 45 $^{\circ}\text{C}$.

3.1 Calibration Procedure

Step 1: Switch mode control knob to off and check zero reading on the instrument dial. If necessary zero the needle with the set screw located at the center base of dial.

Step 2: Switch mode control knob to redline and adjust to redline mark on dial face using redline control knob.

Step 3: Place probe into standard conductivity solution (1,413 $\mu\text{mhos/cm}$) and switch mode control to temperature.

Step 4: Record temperature of solution. Adjust temperature compensation dial to the temperature of solution.

Step 5: Switch mode control to the X10 conductivity setting and record instrument reading for the standard solution.

Step 6: Remove probe from solution and rinse with distilled water. Instrument is calibrated and ready for use.

3.2 Instrument Operation Procedure

Step 1: Place probe into subject water and switch mode control knob to temperature.

Step 2: Record temperature. Adjust temperature compensation dial to the temperature of the subject water.

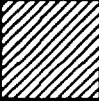
Step 3: Switch mode control knob to either the X100, X10, or X1 conductivity scale as appropriate. Record dial reading as a field conductivity reading.

APPENDIX 2

BOREHOLE LOGS

LEGEND

Unified Soil Classification System Symbols

	GM	silty gravels, gravel-sand-silt mixtures
	SW	well-graded sands, gravelly sands, little or no fines
	SP	poorly-graded sands, gravelly sands, little or no fines
	SM	silty sands, sand-silt mixtures
	ML	inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
	CL	inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

Borehole Log

Reference Elevation: 799.57 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (t/tft)	blow counts/ft	OVA	combustible gases		
			FILL: dark brown sandy silt to silty sand, dry, stiff to loose, porcelain debris noted 0-2' below grade, soil is slightly cohesive 4-6' -becomes moist		1.5/2	9	ND	ND		ground 797.07 ft
					1.5/2	9	ND	ND		top gravel 773.57 ft
5			6-10' -becomes stiff to medium dense	SM/ML	1.5/2	9	ND	ND		bot. gravel 762.07 ft
			9' -thin 4" gravel layer noted some mottled iron staining and rootlets		1.5/2	11	ND	ND		
			NATIVE SEDIMENTS—Glacial Outwash Deposits: brown sandy gravel, wet, medium dense to dense, pebbles up to 1" in diameter, cohesionless, moderate silt content		2/2	13	ND	ND		
10					1/2	17	ND	ND		
				GM	1/2	18	ND	ND		
15					2/2	23	ND	ND		
			grey-brown sand with silt, coarse-grained, wet, dense		1.5/2	45	ND	ND		
					2/2	44	ND	ND		
20				SM	2/2	27	ND	ND		
					2/2	38	ND	ND		
25			grey-brown sandy gravel, wet, pebbles up to 3/4", cohesionless	GM	2/2	46	ND	ND		

Depth	feet	Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
				unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			grey-brown sandy gravel, wet, dense to very dense, contains silt, pebbles up to 1"	GM	1.5/2	35	ND	ND		No. 9 gravel
					1/2	22	ND	ND		
					2/2	39	ND	ND		
					1.5/2	93	ND	ND		
					1.5/2	84	ND	ND		
			Glacial Till Deposit: grey silty clay with occasional pebbles, hard, very cohesive	CL						35' -bottom of screen cavings
										37' -total depth of borehole



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Borehole No: MB-2

page 1 of 1

Borehole Log

Project No: 7017.1

Client: de maximis

Geologist: P. Dollar

Drilling Co.: Moretrench American Corporation

Completion Date: 11 December 1989

Project Name: Marion (Bragg) Landfill

Location: Marion, IN

Drilling Method: Hollow Stem Auger

Casing: 2-inch I.D. Schedule 40 PVC

Reference Elevation: 801.75 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			FILL: dark brown silty sand to sandy silt, soft to loose, slightly cohesive, paper and plastic debris noted		1/2	4	ND	ND		ground 798.95 ft
				SM/ML	1.5/2	8	ND	ND		top gravel 792.45 ft
					0/2	9	—	—		bot. gravel 781.95 ft
5					2/2	11	ND	ND		protective casing
			brown silty sand, dry, loose to medium dense, not cohesive	SM	1.5/2	9	ND	ND		concrete cap
10			10-12' -becomes dense, slightly moist		1.5/2	35	ND	ND		3' -top of bentonite seal
				SM/ML	1/2	20	ND	ND		1/4-inch bentonite pellets
			brown silty sand to sandy silt, moist, slightly cohesive		1/2	20	ND	ND		5.5' -top of sand pack sand
15			NATIVE SEDIMENTS—Glacial Outwash Deposits: brown sandy gravel, wet, medium dense, poorly sorted, pebbles up to 1", minor amount of silt	GM	0/2	23	ND	ND		6.5' -top of gravel pack
										7' -top of screen
										No. 9 gravel
20										17' -bottom of screen
										cavings
25										18' -total depth of borehole



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Borehole No: MB-3

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Borehole Log

Project No: 7017.1

Project Name: Marion (Bragg) Landfill

Client: de maximis

Location: Marion, IN

Geologist: P. Dollar

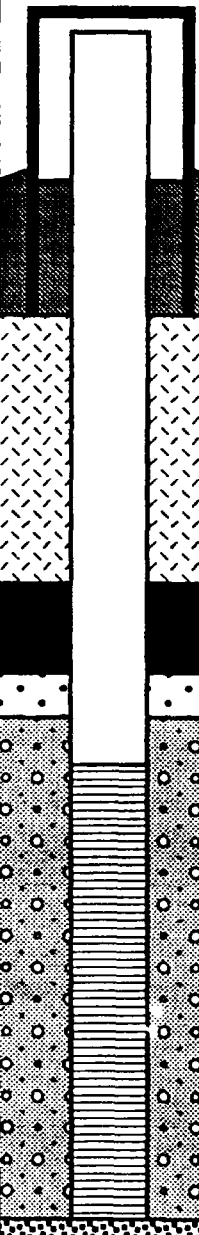
Drilling Method: Hollow Stem Auger

Drilling Co.: Moretrench American Corporation

Casing: 2-inch I.D. Schedule 40 PVC

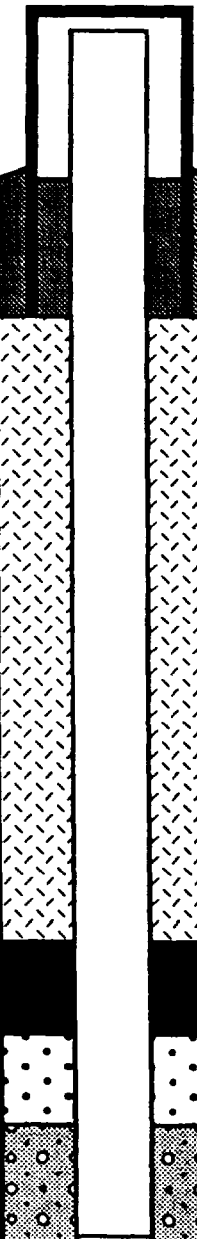
Completion Date: 03 January 1990

Reference Elevation: 806.15 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (t/ft)	blow counts/ft	OVA	combustible gases		
			FILL: dark brown sandy silt to silty sand, dry, slightly cohesive, loose to soft, note some iron staining	SM/ML	1.5/2	4	ND	ND		ground 803.45 ft
					1.5/2	8	ND	ND		top gravel 791.45 ft
5			reddish brown silty sand, dry, less cohesion, loose to medium dense	SM	1/2	7	ND	ND		bot. gravel 780.45 ft
					1.5/2	10	ND	ND		
					no sample	—	—	—		
10			grey sandy silt, slightly moist, stiff to very stiff, moderately cohesive	ML	0.5/2	7	ND	ND		protective casing
					1.5/2	8	ND	ND		concrete cap
					1.5/2	12	ND	ND		3' -top of grout
15			17' -blackened decayed wood fragment	GM/SP	0/2	25	—	—		cement/bentonite grout
					1/2	18	ND	ND		9' -top of bentonite seal
20			NATIVE SEDIMENTS—Glacial Outwash Deposits: grey sandy gravel to gravelly sand, wet, poorly sorted, no cohesion, pebbles up to 1"		1.5/2	78	ND	ND		1/4-inch bentonite pellets
			grey gravelly sand, wet, very dense, to medium dense, no cohesion	SP	0/2	13	ND	ND		11' -top of sand pack sand
										12' -top of gravel pack
25										13' -top of screen
										No. 9 gravel
										23' -bottom of screen
										cavings
										24' -total depth of borehole

Borehole Log

Reference Elevation: 805.96 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			FILL: brown silty sand to sandy silt, dry, slightly cohesive, contains some white fibrous material, glass fragments noted @ 3.5', rootlets also noted	SM/ML	1/2	4	ND	ND		ground 803.36 ft
					2/2	9	ND	ND		top gravel 782.36 ft
					2/2	9	ND	ND		bot. gravel 770.36 ft
5			reddish brown fine-grained sand, dry, no cohesion, some fine rootlets noted	SM	2/2	8	ND	ND		
			brown silty sand to sandy silt, slightly moist, slightly cohesive	SM/ML	2/2	13	ND	ND		
10			dark brown sandy silt, moderate cohesion, firm	ML	2/2	5	ND	ND		
			12.5' -colour changes to grey, increase in sand content		2/2	6	ND	ND		
15			light grey sandy silt to silty sand, moist, soft, mottled iron staining	ML/SM	2/2	4	ND	ND		
			dark grey silty sand, moist, poorly sorted, slightly cohesive	SP	1.5/2	19	ND	ND		
			NATIVE SEDIMENTS-Glacial Outwash Deposits: medium grey sandy gravel, wet, medium dense, coarse-grained sand, pebbles up to 1"	GM/SP	2/2	21	ND	ND		
20					2/2	20	ND	ND		
			light brown medium-grained sand, wet, slightly cohesive, very dense	SW	2/2	40	ND	ND		
25					2/2	42	ND	ND		
			dark brown to light grey sandy silt, moderately cohesive	SM						

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Borehole No: MB-5

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Borehole Log

Project No: 7017.1

Project Name: Marion (Bragg) Landfill

Client: de maximis

Location: Marion, IN

Geologist: P. Dollar

Drilling Method: Hollow Stem Auger

Drilling Co.: Moretrench American Corporation

Casing: 2-inch I.D. Schedule 40 PVC

Completion Date: 14 December 1898

Reference Elevation: 806.87 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			FILL: dark brown sandy silt to silty sand, dry, very soft to very loose, white debris fragments noted	SM/ML	0.5/2	2	ND	ND		ground 803.87 ft
			medium brown silty sand, dry, loose, decaying vegetation noted		1.5/2	4	ND	ND		top gravel 793.37 ft
			4-6' becomes moist	SM	2/2	7	ND	ND		bot. gravel 782.37 ft
5			7-8' becomes dry		2/2	8	ND	ND		
			light brown sand, dry, medium dense, fine-grained, moderate sorting, cohesionless		2/2	11	ND	ND		protective casing
					2/2	12	ND	ND		concrete cap
					2/2	10	ND	ND		3' -top of grout
					2/2	16	ND	ND		cement/bentonite grout
10				SW						7.5' -top of bentonite seal
										1/4-inch bentonite pellets
										9.5' -top of sand pack
										10.5' -top of gravel pack
										11.5' -top of screen
15										
			light brown silty sand, moist, medium dense, slightly cohesive	SM	2/2	10	ND	ND		No. 9 gravel
			NATIVE SEDIMENTS-Glacial Outwash Deposits: light brown gravelly sand, wet, cohesionless, medium dense	SP	2/2	18	ND	ND		
20			grey sandy gravel, wet, medium dense, contains silt		0.5/2	11	ND	ND		21.5' -bottom of screen
				GM	1/2	18	ND	ND		cavings
25										24' -total depth of borehole



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Borehole No: MB-6

page 1 of 2

Borehole Log

Project No: 7017.1

Client: de maximis

Geologist: P. Dollar

Drilling Co.: Moretrench American Corporation

Completion Date: 19 December 1989

Project Name: Marion (Bragg) Landfill

Location: Marion, IN

Drilling Method: Hollow Stem Auger

Casing: 2-inch I.D. Schedule 40 PVC

Reference Elevation: 803.58 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			FILL: red-brown silty sand to sandy silt, moist, loose to stiff, moderately cohesive, roots noted		1.5/2	9	ND	ND		ground 800.08 ft
				SM/ML	2/2	12	ND	ND		top gravel 784.08 ft
5					2/2	6	ND	ND		bot. gravel 773.08 ft
			light brown sand, dry, loose to med. dense, trace silt, cohesionless	SW	2/2	11	ND	ND		
10			NATIVE SEDIMENTS-Glacial Outwash Deposits: brown gravelly sand, dry, very dense, pebbles up to 1", poorly sorted	SP	0.5/2	60	ND	ND		
					1/2	36	ND	ND		
					0.5/2	52	ND	ND		
15			brown sandy gravel, wet, medium dense to dense, poorly sorted, cohesionless, pebbles up to 3/4"	GM	1/2	24	ND	ND		
					1/2	29	ND	ND		
20			grey sand, wet, med. dense, mod. sorted, coarse-grained	SW	1.5/2	32	ND	ND		
			grey sandy gravel, wet	GM						
			brown silt with occasional pebbles, moderate cohesion	ML	2/2	80	ND	ND		
			grey sandy gravel, wet, very dense, pebbles up to 3 cm, iron staining near base	GM	2/2	78	ND	ND		
25			brown gravelly sand, wet, dense, increase in silt content with depth	SM	2/2	31	ND	ND		
			Glacial Till Deposit							

protective casing
concrete cap
3' -top of grout
cement/bentonite grout
13' -top of bentonite seal
1/4-inch bentonite pellets
15' -top of sand pack
16' -top of gravel pack
17' -top of screen
No. 9 gravel

Borehole Log

[illegible]

Borehole No: MB-7

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Borehole Log

Project No: 7017.1

Project Name: Marion (Bragg) Landfill

Client: de maximis

Location: Marion, IN

Geologist: P. Dollar

Drilling Method: Hollow Stem Auger

Drilling Co.: Moretrench American Corporation

Casing: 2-inch I.D. Schedule 40 PVC

Completion Date: 20 December 1989

Reference Elevation: 812.66 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			FILL: dark brown sandy silt to silty sand, frozen in upper 4', roots and decaying vegetation noted.		1.5/2	8	ND	ND		ground 809.66 ft
			4-6' becomes dry, cohesive with occasional pebbles		0/2	5	ND	ND		top gravel 791.16 ft
5				SM/ML	2/2	11	ND	ND		bot. gravel 780.16 ft
					1.5/2	7	ND	ND		
					1.5/2	20	ND	ND		
10			NATIVE SEDIMENTS-Glacial Outwash Deposits: brown gravelly sand, dry, very dense, poorly sorted, trace silt, pebbles up to 1"		1/2	13	ND	ND		
			16-18'-note 4" thick silty clay bed, moist, very cohesive		1.5/2	93	ND	ND		
15					2/2	53	ND	ND		
					1.5/2	39	ND	ND		
20				SP	1/2	70	ND	ND		
					0/2	95	-	-		
					0.5/2	76	ND	ND		
25			24-25' -becomes more gravelly, wet		1/2	>100	ND	ND		

[illegible]

Borehole Log

Reference Elevation: 810.73 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			FILL: dark brown sandy silt to silty sand, debris noted: brick fragments, glass, white fibrous material		1/2	7	ND	ND		ground 807.73 ft
					1.5/2	6	ND	ND		top gravel 785.73 ft
5			6-8' -orange brick fragments noted		0.5/2	1	ND	ND		bot. gravel 773.23 ft
					0.5/2	2	ND	ND		
10			10-11' -abundant white fibrous material noted	SM/ML	1/2	7	ND	ND		
					2/2	6	ND	ND		
					1.5/2	9	ND	ND		
15					1.5/2	13	ND	ND		
					1.5/2	12	ND	ND		
20			NATIVE SEDIMENTS-Glacial Outwash Deposits: brown gravelly sand to sandy gravel, very coarse-grained sand		1.5/2	5	ND	ND		
			20-22' -colour changes to grey-black		1.5/2	6	ND	ND		
				SM/GM	2/2	7	ND	ND		
25			24-26' -becomes very dense, wet		0.5/2	83	ND	ND		

Borehole Log

[illegible]

Borehole No: MB-9

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Borehole Log

Project No: 7017.1

Client: de maximis

Geologist: S. Neville

Drilling Co.: Moretrench American Corporation

Completion Date: 14 November 1989

Project Name: Marion (Bragg) Landfill

Location: Marion, IN

Drilling Method: Hollow Stem Auger

Casing: 2-inch I.D. Schedule 40 PVC

Reference Elevation: 814.73 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
feet	waterlevel			unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			FILL: brown silty sand to sandy silt, medium dense to very stiff, no debris materials noted, contains 10% sub-rounded pebbles							ground 811.93 ft top gravel 796.93 ft bot. gravel 784.93 ft
										protective casing concrete cap
					1.5/2	22	ND	ND		3' -top of grout
5										
										cement/bentonite grout
10				SM/ML	1.5/2	19	ND	ND		
					2/2	19	ND	ND		12' -top of bentonite seal 1/4-inch bentonite pellets
15					2/2	19	ND	ND		14' -top of sand pack sand
					2/2	11	ND	ND		15' -top of gravel pack No. 9 gravel
					2/2	4	ND	ND		17' -top of screen
20			20' -sample is wet		2/2	7	ND	ND		
					2/2	6	ND	ND		
			23-25' -note chunk of blackened wood in sample tube		2/2	6	ND	ND		
25			25-27' -material becomes more clayey, note asphalt-like debris		2/2	6	ND	ND		

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Borehole Log

[illegible]

Borehole No: MB-10

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Borehole Log

Project No: 7017.1

Project Name: Marion (Bragg) Landfill

Client: de maximis

Location: Marion, IN

Geologist: S. Neville

Drilling Method: Hollow Stem Auger

Drilling Co.: Moretrench American Corporation

Casing: 2-inch I.D. Schedule 40 PVC

Completion Date: 08 November 1989

Reference Elevation: 822.35 ft

Depth		Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments	
feet	waterlevel			unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		ground	
			4-8" -asphalt cover							819.25 ft	
			FILL: sandy gravel, coarse-grained sand with chunks of broken glass and plastic debris (electronic parts)	GW		7	ND	ND		801.25 ft	
			brown silt, slightly moist, stiff to very stiff, low plasticity	ML		20	ND	ND			
5						11	ND	ND			
			NATIVE SEDIMENTS-Glacial Outwash Deposits: light brown to grey gravelly sand, slightly moist to dry, medium dense, contains 10-20% gravel clasts, sand is coarse to very coarse-grained, traces of decayed vegetation noted, trace silt	SP		21	ND	ND			
10						28	ND	ND			
						23	ND	ND			
						18	ND	ND			
15						16	ND	ND			
						38	ND	ND			
			brown to grey sandy gravel to gravelly sand, slightly moist, dense, 20-40% gravel clasts in very coarse to coarse-grained sand matrix, trace silt and traces of decayed vegetation	GP/SP	2/2	31	ND	ND			
20											
			23' -cobble layer refusal with drive sampler	GP	no sample						
			reddish-brown sandy gravel, wet, dense, trace silt, very coarse-grained sand, iron oxide staining								
25						28	ND	ND			

PVC surface casing

protective casing

concrete cap

cement/bentonite grout

15' -top of bentonite seal

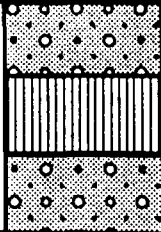
1/4-inch bentonite pellets

17' -top of sand pack sand

18' -top of gravel pack

20' -top of screen

No. 9 gravel

Depth	feet	Stratigraphy	Lithologic Description	Geologic Samples					Well Configuration	Elevations & Comments
				unified soils classification	recovery (ft/ft)	blow counts/ft	OVA	combustible gases		
			28.5' -colour changes to gray, sand matrix becoming medium to coarse-grained	GP	2/2	35	ND	ND		ground 819.25 ft top gravel 801.25 ft bot. gravel 789.25 ft
			reddish-brown silt, wet, stiff to very stiff, low plasticity	ML	1/1	22	ND	ND		No. 9 gravel 30' -total depth of borehole

APPENDIX 3

PHYSICAL DATA

- 1. WELL DEVELOPMENT DATA**
- 2. WATER LEVEL DATA**
- 3. HYDROGRAPHS**

1. WELL DEVELOPMENT DATA

Table A3.1 Well Development Data

Date	Time	Volume Removed (US gallons)	Cumulative Volume Removed (US gallons)	Temp. (°C)	pH	Specific Conductance (µmhos/cm)
Monitoring Well MB-1						
10-Jan-90	14:43	0.5	0.5	10	7.17	500
	14:50	9.5	10	10	7.21	510
	14:54	5	15	10	7.20	510
	14:59	5	20	10	7.25	510
	15:05	5	25	10	7.20	505
	15:09	5	30	10	7.21	505
	15:09	5	30	10	7.21	505
11-Jan-90	10:05	5	35	11	7.42	570
	10:15	10	45	11	7.41	550
	10:30	10	55	11	7.27	550
15-Jan-90	11:00	20	75	12	7.23	530
Monitoring Well MB-2						
10-Jan-90	15:43	0.5	0.5	9	6.94	880
	15:52	4.5	5	10	6.85	880
	16:02	5	10	11.5	6.75	930
	16:07	5	15	11.5	6.73	950
	16:11	5	20	11.5	6.67	980
	16:17	5	25	11.5	6.66	980
	16:23	5	30	11.5	6.65	900
	16:23	5	30	11.5	6.65	900
15-Jan-90	10:15	10	40	12	6.88	1030
Monitoring Well MB-3						
11-Jan-90	9:10	2	2	10	7.32	630
15-Jan-90	9:50	5	7	14	7.07	620
	9:57	5	12	14	7.00	630
	10:01	5	17	14	6.99	610
	10:11	5	22	15	6.95	600
	10:19	5	27	14	6.98	600
	10:26	5	32	15	6.94	610
	10:26	5	32	15	6.94	610

Table A3.1 (cont'd) Well Development Data

<u>Date</u>	<u>Time</u>	<u>Volume Removed (US gallons)</u>	<u>Cumulative Volume Removed (US gallons)</u>	<u>Temp. (°C)</u>	<u>pH</u>	<u>Specific Conductance (µmhos/cm)</u>
Monitoring Well MB-4						
11-Jan-90	9:30	5	5	11	7.38	570
	9:37	5	10	13	7.44	520
	9:43	5	15	13	7.37	570
	9:50	5	20	14	7.40	540
	9:54	5	25	14.5	7.42	550
	10:00	5	30	15	7.39	505
	10:12	5	35	13.5	7.38	520
	10:18	5	40	14	7.39	530
	10:28	5	45	13.5	7.43	480
	10:40	10	55	14	7.41	500
15-Jan-90	9:28	1	56	14	7.19	500
	9:32	4	60	15	7.39	520
	9:47	5	65	14	7.22	505
	9:57	5	70	14	7.36	505
	10:01	5	75	14.5	7.39	520
Monitoring Well MB-5						
11-Jan-90	11:22	0.1	0.1	9	7.30	670
	11:26	0.4	0.5	11.8	7.12	710
15-Jan-90	10:57	0.1	0.6	13	6.85	750
	11:13	4.9	5.5	14	6.95	750
	11:40	5	10.5	14	7.15	700
	1:29	5	15.5	14	7.03	700
	1:49	5	20.5	14	6.96	700
	2:10	5	25.5	14.5	7.03	690
Monitoring Well MB-6						
11-Jan-90	1:44	0.1	0.1	15	6.95	1250
	1:48	4.9	5	16	6.84	1210
	1:51	5	10	15.5	6.82	1280
	1:57	5	15	16	6.81	1210
	2:04	5	20	15	6.86	1240
	2:10	5	25	16	6.76	1280
	2:16	5	30	16	6.76	1280
	2:25	5	35	15	6.77	1180
	2:37	10	45	15.5	6.72	1270
	2:41	5	50	16	6.76	1190
	2:47	5	55	16	6.79	1240
	2:51	5	60	16	6.75	1250

Table A3.1 (cont'd) Well Development Data

<u>Date</u>	<u>Time</u>	<u>Volume Removed (US gallons)</u>	<u>Cumulative Volume Removed (US gallons)</u>	<u>Temp. (°C)</u>	<u>pH</u>	<u>Specific Conductance (µmhos/cm)</u>
Monitoring Well MB-7						
11-Jan-90	3:20	0.1	0.1	10	8.40	700
15-Jan-90	2:27	2	2.1	16	7.11	1100
	2:38	3	5.1	16	7.22	1000
	2:50	5	10.1	16	7.13	1100
	3:04	5	15.1	16	7.04	1150
	3:13	5	20.1	16	7.00	1120
	3:26	5	25.1	16	7.12	1100
	3:39	5	30.1	16	6.99	1140
Monitoring Well MB-8						
11-Jan-90	4:30	2	2	8	7.47	700
	4:46	5	7	14	7.12	1120
	4:49	6	13	14	7.17	1200
	4:54	5	18	14	7.16	1190
	4:58	5	23	14	7.16	1150
	5:02	5	28	14	7.14	1170
	5:06	4	32	14	7.17	1170
	5:11	5	37	14	7.14	1150
	5:14	6	43	14	7.14	1170
	5:18	5	48	14	7.13	1180
	5:23	4	52	14	7.15	1130
	5:26	3	55	14	7.15	1150
Monitoring Well MB-9						
12-Jan-90	11:09	0.5	0.5	11	8.84	380
15-Jan-90	4:01	2	2.5	14	9.20	310
	4:12	3	5.5	14.5	9.34	305
	4:37	5	10.5	15	9.07	310
	5:02	5	15.5	14	8.30	350
	5:21	2.5	18	14	8.34	370
	5:35	2.5	20.5	14	8.17	370
Monitoring Well MB-10						
12-Jan-90	2:43	0.1	0.1	9	7.15	600
	2:48	3.4	3.5	12	7.25	600
	2:52	1.5	5	12	7.24	600
	3:05	5	10	12	7.31	300
	3:19	5	15	12	7.13	600
	3:27	5	20	11	7.19	590
	3:34	5	25	12	7.16	600

2. WATER LEVEL DATA

Table A3.2 Water Level Data, Marion (Bragg) Landfill 1990

Monitoring Location	Top of Casing Elevation (ftmsl)	Stick-up (ft)	Ground Surface Elevation (ftmsl)	Water Level (ftbc) 16-Jan-90	Water Elevation (ftmsl) 16-Jan-90	Water Level (ftbc) 5-Feb-90	Water Elevation (ftmsl) 5-Feb-90	Water Level (ftbc) 16-Feb-90	Water Elevation (ftmsl) 16-Feb-90	Water Level (ftbc) 20-Mar-90	Water Elevation (ftmsl) 20-Mar-90	Water Level (ftbc) 24-Apr-90	Water Elevation (ftmsl) 24-Apr-90
Monitoring Well													
B - 1	799.57	2.50	797.07	12.27	787.30	9.46	790.11	8.58	790.99	10.83	788.74	11.15	788.42
B - 2	801.75	2.80	798.95	14.67	787.08	11.44	790.31	10.08	791.67	13.44	788.31	13.73	788.02
B - 3	806.15	2.70	803.45	18.77	787.38	15.52	790.63	14.42	791.73	17.60	788.55	17.91	788.24
B - 4	805.96	2.60	803.36	18.58	787.38	15.35	790.61	14.30	791.66	17.35	788.61	18.76	787.20
B - 5	806.87	3.00	803.87	19.45	787.42	16.06	790.81	14.96	791.91	18.29	788.58	18.55	788.32
B - 6	803.58	3.50	800.08	16.45	787.13	12.24	791.34	10.05	793.53	15.28	788.30	15.41	788.17
B - 7	812.66	3.00	809.66	25.11	787.55	21.15	791.51	18.79	793.87	23.97	788.69	24.17	788.49
B - 8	810.73	3.00	807.73	22.26	788.47	17.78	792.97	14.15	796.58	21.15	789.58	21.30	789.43
B - 9	814.73	2.80	811.93	21.05	793.68	20.65	794.08	20.30	794.43	19.87	795.08	19.30	795.43
B - 10	822.35	3.10	819.25	27.95	794.40	27.67	794.68	27.20	795.15	26.25	796.10	26.08	796.27
W - 7	802.36	2.82	799.54	13.76	788.60	NR	-	11.75	790.61	11.73	790.63	NR	-
W - 8	810.87	3.08	807.79	14.41	796.46	NR	-	13.46	797.41	12.26	798.61	NR	-
W - 9	806.04	2.57	803.47	NR	-	NR	-	12.78	793.28	14.85	791.19	16.30	789.74
W - 10	803.17	2.27	800.90	16.64	786.53	NR	-	9.44	793.73	15.46	787.71	15.78	787.39
W - 11	811.09	2.83	808.26	24.46	786.63	NR	-	22.24	788.85	22.37	788.72	22.82	788.27
Staff Gauge													
GR - 1	788.90	-	-	-	-	-	-	-	-	4.35	784.55	NR	-
GR - 2	791.91	-	-	-	-	-	-	-	-	4.30	787.61	NR	-
GP - 1	793.21	-	-	-	-	-	-	-	-	1.31	791.90	NR	-
GP - 2	797.03	-	-	-	-	-	-	-	-	1.05	795.98	NR	-

NR - not recorded
ftmsl) - feet above mean sea level
ftbc) - feet below top of casing
Note: staff gauges installed 21 March 1990

3. HYDROGRAPHS

Figure A3.1 Hydrographs for Deep Upper Aquifer Monitoring Wells

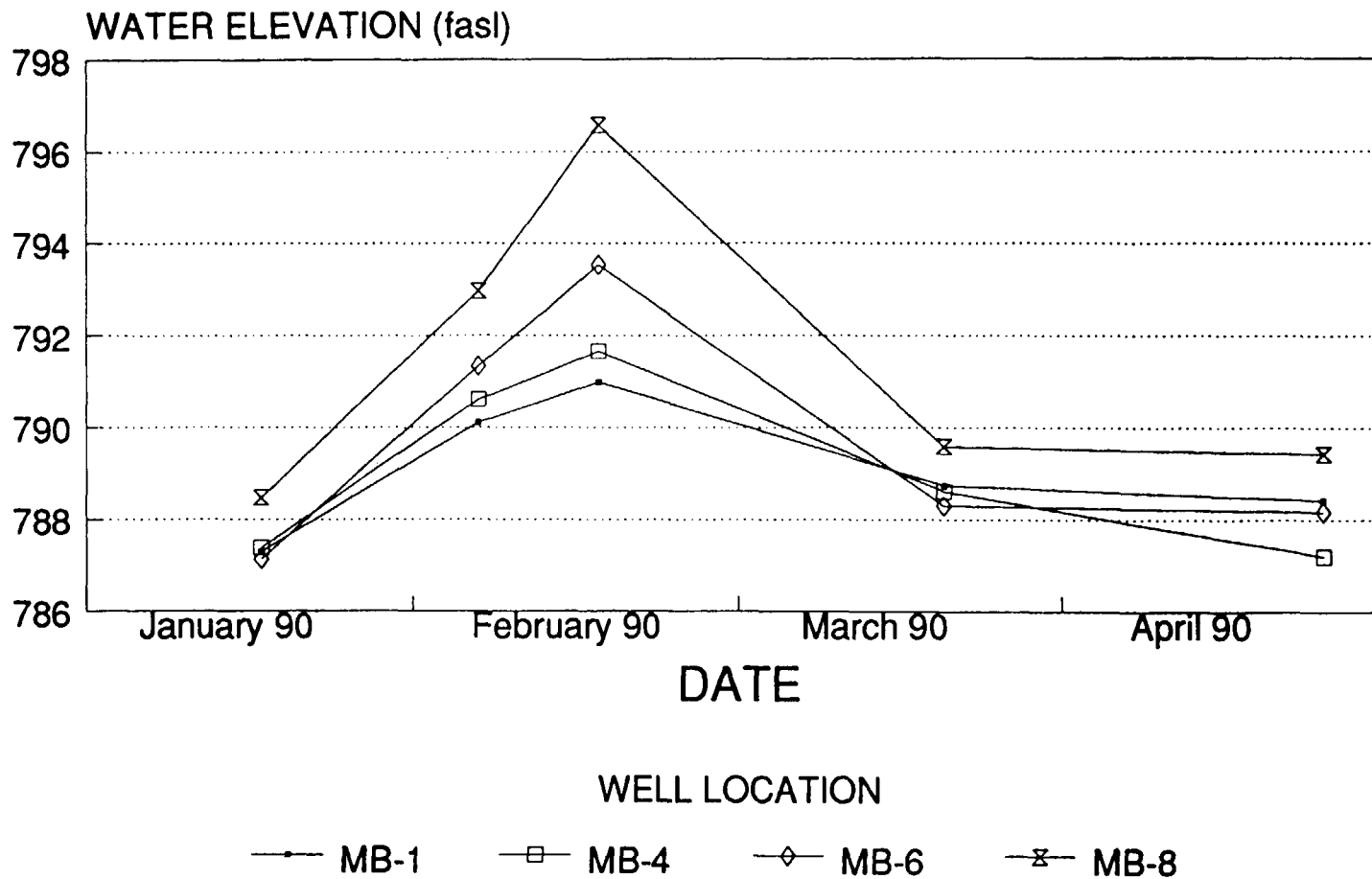
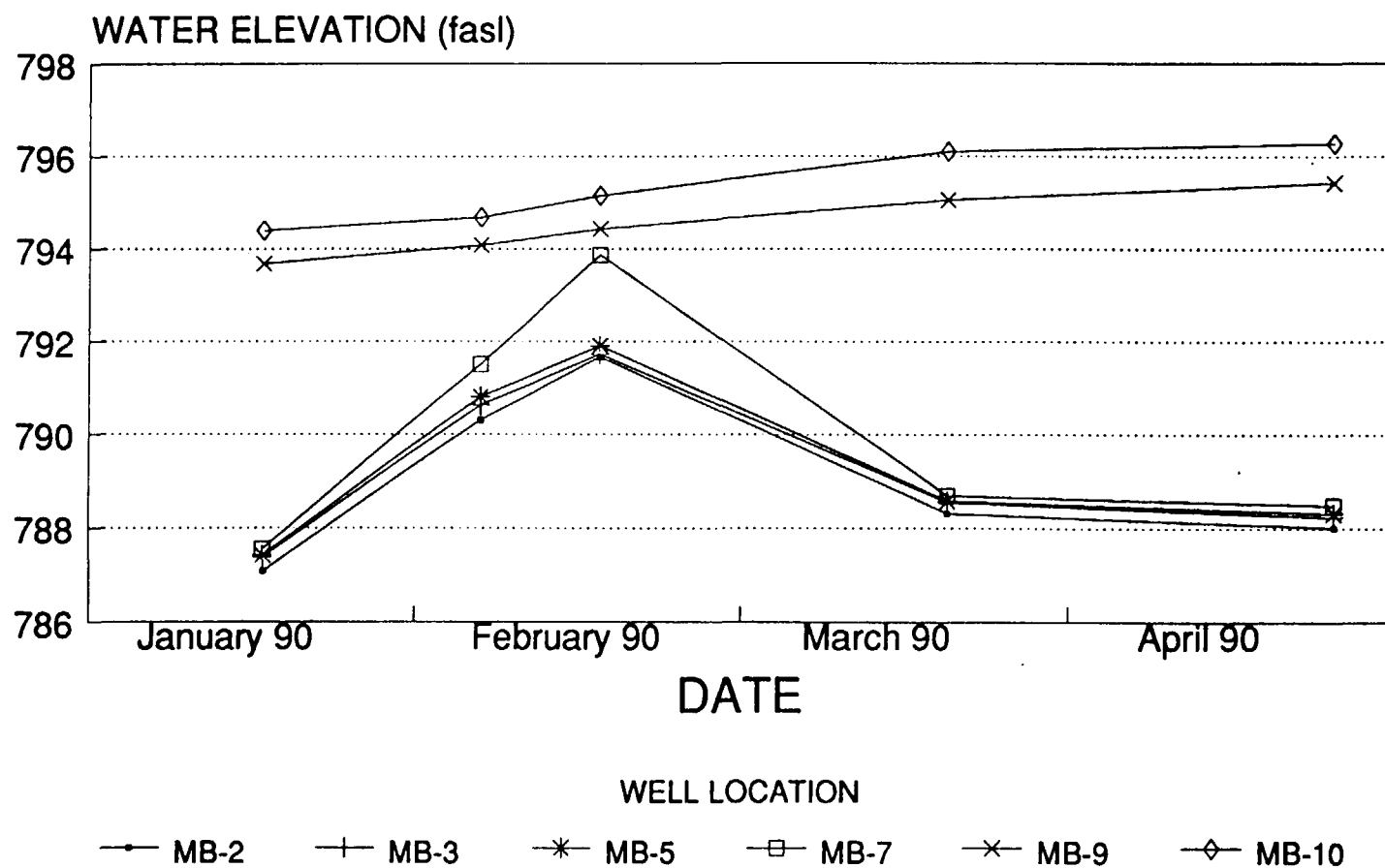


Figure A3.2 Hydrographs for Shallow
Upper Aquifer Monitoring Wells



APPENDIX 4

CHEMICAL DATA

- 1. QA/QC RESULTS**
- 2. ANALYTICAL RESULTS BY PARAMETER**
- 3. SPECIFIC CONDUCTANCE CORRECTION EQUATION**
- 4. MS/MSD REFERENCE NUMBERS**

1. QA/QC RESULTS

Table A4.1 Summary of pH Analyses for TCL Volatiles

Groundwater Samples

Monitoring Well	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	GW14SN	GW15SN	GW22SN	GW29SN	GW46SN	GW54SN	GW74SN	GW82SN	GW38SN	GW01SN
Lab Sample ID	317951	318281	318286	318292	318778	319998	319201	319203	318777	319408
Traffic Report No.	003	005	005	007	010	014	020	019	009	003
Date Collected	6-Feb-90	7-Feb-90	7-Feb-90	7-Feb-90	8-Feb-90	12-Feb-90	12-Feb-90	12-Feb-90	8-Feb-90	6-Feb-90
pH	1.64	1.66	1.54	1.70	1.75	1.92	1.83	1.89	1.57	1.64

Surface Water Samples

River Location	SW-1	SW-2	SW-3	SW-3	SW-4	SW-5	SW-6
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	SW01SN	SW10SN	SW18SN	SW27SN	SW36SN	SW54SN	SW45SN
Lab Sample ID	319408	319409	319741	319744	319748	319998	319997
Traffic Report No.	022	022	026	026	029	032	031
Date Collected	13-Feb-90	13-Feb-90	14-Feb-90	14-Feb-90	14-Feb-90	15-Feb-90	15-Feb-90
pH	1.62	1.62	1.54	1.56	1.69	1.65	1.57

Pond Water Samples

Pond Location	PW-1	PW-2	PW-3	PW-4
Phase	90-1	90-1	90-1	90-1
Field Sample ID	PW07SN	PW16SN	PW24SN	PW33SN
Lab Sample ID	320203	320211	320213	320218
Traffic Report No.	038	041	041	041
Date Collected	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90
pH	1.62	1.62	1.62	1.62

Table A4.2 Summary of TCL Volatile Organic Compound Analyses for Trip Blanks

Sampling Location	GW	GW	GW	GW	GW	GW	GW
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	Lab Pure	GW36TBSN	GW37TBSN	GW45TBSN	GW53TBSN	GW61TBSN	GW80TBSN
Lab Sample ID	317950	318349	318352	318775	318776	319206	319207
SDG No.	01	01	01	01	01	57	57
Traffic Report No.	003	005	007	009	010	014	019
Date Collected	06Feb90	07Feb90	07Feb90	08Feb90	08Feb90	12Feb90	12Feb90
Date Analyzed	07Feb90	14Feb90	14Feb90	14Feb90	14Feb90	14Feb90	14Feb90
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	8 U	5 U	1 UJ	1 UJ	5 U	4 UJ	3 UJ
Acetone	8 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Sampling Location	SW	SW	SW	SW	SW	PW	PW
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	SW09TBSN	SW26TBSN	SW44TBSN	SW53TBSN	SW62TBSN	PW15TBSN	PW32TBSN
Lab Sample ID	319412	319743	319763	319990	319991	320209	320216
SDG No.	57	57	57	128	128	128	128
Traffic Report No.	022	026	029	031	032	038	041
Date Collected	13-Feb-90	14-Feb-90	14-Feb-90	15-Feb-90	15-Feb-90	16-Feb-90	16-Feb-90
Date Analyzed	15-Feb-90	17-Feb-90	17-Feb-90	18-Feb-90	18-Feb-90	20-Feb-90	20-Feb-90
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	1 UJ	2 UJ	2 UJ	5 U	5 U	5 U	5 U
Acetone	10 U	3 J	1 J	10 U	10 U	10 U	10 U

GW - groundwater

SW - surface water

PW - pond water

Data Qualifier Definitions

J - The material was analyzed for, but was not detected. The associated value is the sample quantitation limit

UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

Table A4.3 Summary of Analyses for Field Blanks

Sampling Location	Pond Water	Pond Water	River Water	Pond Water	Pond Water	Pond Water	Pond Water
	Kemmerer	Kemmerer		Kemmerer		Kemmerer	Kemmerer
Equipment	Sampler	Sampler	Filter	Sampler/Filter	Kemmerer	Kemmerer	Kemmerer
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	PW01FBSN	PW02FBSN	SW63FBSN	PW03FBSN	PW04FBSN	PW06FBSN	PW05FBSN
Lab Sample ID	320202	320273	320101	320223	320224	320292	320226
SDG No.	128	128	91498D	149163			
Traffic Report No.	038	038	036	039	038	038	040
Date Collected	16-Feb-90	16-Feb-90	15-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90
Date(s) Analyzed	20-Feb-90	21-Feb-90	21-Feb-90	17-Feb-90	21-Feb-90	21-Feb-90 COD 1-Mar-90 Ammonia	21-Feb-90 TSS 27-Feb-90 Chloride
Units	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
Methylene Chloride	2 UJ						
Acetone	10 U						
Calcium			33.7 J	152 J			
Lead			3.3 J	7.3 J			
Potassium			1820 J	1260 U			
Sodium			1560 J	1490 U			
Vanadium			2.2 J	2 U			
Zinc			6.5 J	12.2 J			
Cyanide					10 U		
COD						50 U	
Ammonia						1 U	
TSS							5 U
Cl							3 U

Tentatively Identified Compounds

Lab artifact	160 NJ
Benzenemethanesulfonamide	130 NJ

Data Qualifier Definitions

U - organics: The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.

- inorganics: The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.

J - The associated value is an estimated quantity.

UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.

NJ - Presumptive evidence of the presence of the material at an estimated quantity.

2. ANALYTICAL RESULTS BY PARAMETER

Table A4.4 Summary of Volatile Organic Compound Analyses

Groundwater Monitoring Well	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-SDP	MB-9	MB-10
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	GW08SN	GW16SN	GW23SN	GW30SN	GW47SN	GW55SN	GW75SN	GW83SN	GW89DPSN	GW39SN	GW02SN
Lab Sample ID	317949	318284	318289	318294	318774	319195	319202	319204	319206	318773	317945
SDG No.	01	01	01	01	01	57	57	57	57	01	01
Traffic Report No.	003	005	005	007	010	014	012	019	019	009	003
Date Collected	06Feb90	07Feb90	07Feb90	07Feb90	08Feb90	12Feb90	12Feb90	12Feb90	12Feb90	08Feb90	06Feb90
Date Analyzed	07Feb90	14Feb90	14Feb90	14Feb90	14Feb90	13Feb90	13Feb90	13Feb90	15Feb90	14Feb90	07Feb90
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Acetone	5 UJ	10 U	10 U	10 U	10 U	5 J	10 U	10 J	9 J	6 UJ	7 UJ
Benzene	5 U	2 J	5 U	5 U	5 U	1 J	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5 U	5 U	5 U	5 U	5 U	2 J	5 U	5 U	5 U	5 U	5 U
1,2-dichloroethene (total)	140	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 J
Methylene Chloride	4 UJ	2 UJ	2 UJ	2 UJ	1 UJ	3 UJ	4 UJ	3 UJ	1 UJ	2 UJ	5 U
Toluene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 J
Trichloroethene	18	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Chloride	22	12	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tentatively Identified Compounds											
Dichlorofluoro-Methane	-	-	-	-	-	-	-	-	9 NJ	-	-

River Water River Location	SW-1	SW-2	SW-3	SW-3	SW-4	SW-5	SW-6
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	SW02SN	SW11SN	SW19SN	SW29DPSN	SW37SN	SW55SN	SW46SN
Lab Sample ID	319410	319411	319742	319745	319751	319985	319989
SDG No.	57	57	57	57	57	128	128
Traffic Report No.	022	022	026	026	029	032	031
Date Collected	13Feb90	13Feb90	14Feb90	14Feb90	14Feb90	15Feb90	15Feb90
Date Analyzed	15Feb90	15Feb90	17Feb90	17Feb90	17Feb90	16Feb90	19Feb90
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	1 UJ	1 UJ	3 UJ	2 UJ	2 UJ	5 U	5 U
Acetone	10 U	10 U	3 J	3 J	3 J	3 J	10 U

Pond Water Pond Location	PW-1	PW-2	PW-3	PW-4
Phase	90-1	90-1	90-1	90-1
Field Sample ID	PW08SN	PW17SN	PW25SN	PW34SN
Lab Sample ID	320207	320212	320214	320220
SDG No.	128	128	128	128
Traffic Report No.	038	038	041	041
Date Collected	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90
Date Analyzed	20-Feb-90	20-Feb-90	20-Feb-90	20-Feb-90
Units	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	1 UJ	5 U	1 UJ	5 U

- Not detected
Data Qualifier Definitions
U - The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
J - The associated value is an estimated quantity.
UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
NJ - Presumptive evidence of the presence of the material at an estimated quantity.

Table A4.5 Summary of Semivolatile Organic Compound Analyses

**Groundwater
Monitoring Well**

	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-8DP	MB-9	MB-10
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	GW06SN	GW17SN	GW24SN	GW31SN	GW48SN	GW56SN	GW76SN	GW84SN	GW90DPN	GW40SN	GW03SN
Lab Sample ID	317944	318296	318323	318334	318772	319206	319214	319216	319216	318771	317940
SDG No.	01	01	01	01	01	57	57	57	57	01	01
Traffic Report No.	004	006	005	007	010	012	018	017	017	006	003
Date Collected	06Feb90	07Feb90	07Feb90	07Feb90	08Feb90	12Feb90	12Feb90	12Feb90	12Feb90	08Feb90	06Feb90
Date Analyzed	10Feb90	10Feb90	10Feb90	10Feb90	13Feb90	14Feb90	15Feb90	14Feb90	20Feb90	13Feb90	06Feb90
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Di-(2-Ethylhexyl) Phthalate	10 U	10 U	3 J	10 U	2 J	2 J	2 J	5 J	10 J	10 U	2 J
Tentatively Identified Compounds											
Benzothiazolone	-	-	-	-	-	60 NJ	-	-	-	-	-
Isobutyroethanophosphate	-	-	-	-	-	18 NJ	-	-	-	-	-
1-Chloro-, Phosphate Ethanol	-	-	-	-	-	-	-	14 NJ	-	-	-
1,2'-Azobis[2-Methyl] Propanenitrile	-	-	-	-	-	30 NJ	-	-	-	-	-
Blank Contaminant	-	-	-	-	-	-	-	-	-	-	14 NUJ
Solvent Contaminant	-	-	-	-	-	14 NUJ	14 NUJ	28 NUJ	-	-	22 NUJ
Tetramethylpentadecane	-	-	-	-	-	-	-	-	40 NJ	-	-
Unknown Alcohol	-	-	-	-	-	60 NJ	-	16 NJ	-	-	-
Unknown Hydrocarbons (Total)	-	-	-	-	-	-	-	-	94 NJ	-	-
Unknowns (Total)	12 NJ	56 NJ	-	-	-	6.0 NJ	-	10 NJ	78 NJ	-	-

Surface Water

River Location	SW-1	SW-2	SW-3	SW-3	SW-4	SW-5	SW-6
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	SW03SN	SW12SN	SW20SN	SW30DPN	SW36SN	SW56SN	SW47SN
Lab Sample ID	319413	319414	319797	319801	319803	319992	319996
SDG No.	57	57	128	128	128	128	128
Traffic Report No.	022	023	026	027	026	032	031
Date Collected	13Feb90	12Feb90	14Feb90	14Feb90	14Feb90	15Feb90	15Feb90
Date Analyzed	19Feb90	23Feb90	18Feb90	18Feb90	21Feb90	19Feb90	19Feb90
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
None detected	-	-	-	-	-	-	-

Tentatively Identified Compounds

Unknown	-	-	6.0 J	-	-	-	-
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Data Qualifier Definitions

- U - organics: The material was analyzed for, but was not detected. The associated value is the sample quantitation limit.
- inorganics: The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.
- J - The associated value is an estimated quantity.
- UU - organics: The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
- inorganics: The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
- NJ - Presumptive evidence of the presence of the material at an estimated quantity.
- NUJ - Presumptive evidence of presence of material. The material was analyzed for but not detected. The sample quantitation limit is an estimated quantity.
- L - The material was analyzed for, but was not detected. The instrument detection limit is greater than the contract required detection limit.

Pond Water

Pond Location	PW-1	PW-2	PW-3	PW-4
Phase	90-1	90-1	90-1	90-1
Field Sample ID	PW06SN	PW16SN	PW26SN	PW35SN
Lab Sample ID	320276	320280	320282	320284
SDG No.	128	128	128	180
Traffic Report No.	039	039	040	040
Date Collected	16Feb90	16Feb90	18Feb90	18Feb90
Date Analyzed	21Feb90	21Feb90	24Feb90	24Feb90
Units	µg/L	µg/L	µg/L	µg/L
Di-(2-Ethylhexyl) Phthalate	10 U	5 J	10 U	10 U

Table A4.6 Summary of Dissolved TAL Metals in Groundwater

Monitoring Well	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-8DP	MB-9	MB-10
Well	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Well Sample ID	GW10SN	GW18SN	GW25SN	GW32SN	GW49SN	GW57SN	GW77SN	GW85SN	GW91DPSN	GW41SN	GW04SN
Sample ID	317958	318299	318324	318335	318805	319223	319258	319270	319279	318800	317962
LOG No.	91498D	91498D	91498D	91498D	91498D	91498D	91498D	91498D	91498D	91498D	91498D
Lab Report No.	004	005	008	008	010	014	019	020	021	009	004
Date Collected	06Feb90	07Feb90	07Feb90	07Feb90	08Feb90	12Feb90	12Feb90	12Feb90	12Feb90	08Feb90	06Feb90
Date Analyzed	21Feb90	21Feb90	21Feb90	21Feb90	21Feb90	21Feb90	21Feb90	21Feb90	21Feb90	21Feb90	21Feb90
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aluminum	16 U	16 U	16 U	16 U	29.4 J	28.5 J	69.8 J	94.4 J	34.8 J	117 J	16 U
Arsenic	11.3	51.7	24.7	8.3 J	3 U	435	3.9 J	108	118	3 U	3 U
Barium	193 J	825	595	359	212	539	461	153 J	156 J	44.3 J	101 J
Calcium	110000 J	153000 J	87000 J	58100 J	99600 J	112000 J	83000 J	59400 J	61300 J	74000 J	127000 J
Cobalt	9.4 J	9.7 J	3 U	3 U	3 U	6.4 J	3 U	3 U	3 U	3 U	3 U
Copper	4 U	4 U	4 U	4 U	16.6 J	4 U	10.9 J	4 U	4 U	5.3 J	4.5 J
Iron	2990	9070	4580	1840	13.4 J	13100	274	4280	4280	80.8 J	26.7 J
Magnesium	32000 J	44600 J	35500 J	32400 J	34300 J	47900 J	52500 J	63000 J	64600 J	18500 J	34800 J
Manganese	671	1190	324	330	313	433	264	162	164	305	13.7 J
Nickel	29 U	30.6 J	29 U	29 U	29 U	29 U	29 U	29 U	29 U	29 U	29 U
Potassium	1260 U	16400	10100	8410	5060	34600	27400	26000	26400	1260 U	4350 J
Sodium	23400	43600	46200	40800	41600	118000	148000	132000	138000	10500	16300
Zinc	7.8 J	2 U	3.2 J	3.2 J	2 U	4.4 J	3.7 J	4.4 J	4.7 J	2.4 J	10.1 J
Lead	11.8 J	13.8 J	2.0 J	7.0 J	12.6 J	7.7 J	8.4 J	1 U	1 U	12.2 J	6.2 J

Qualifier Definitions

- The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.
- The associated value is an estimated quantity.

Table A4.7 Summary of Dissolved TAL Metals in River Water

River Location	SW-1	SW-2	SW-3	SW-3DP	SW-4	SW-5	SW-6
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	SW04SN	SW13SN	SW21SN	SW31DPSN	SW39SN	SW57SN	SW48SN
Lab Sample ID	319420	319423	319766	319780	319787	320006	320009
SDG No.	91498D	91498D	91498D	91498D	91498D	91498D	91498D
Traffic Report No.	022	024	027	028	030	034	033
Date Collected	13-Feb-90	13-Feb-90	14-Feb-90	14-Feb-90	14-Feb-90	15-Feb-90	15-Feb-90
Date Analyzed	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90
Filtered	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aluminum	65.0 J	69.7 J	32.7 J	22.3 J	16 U	149 J	262
Antimony	21 U	88.7	21 U	21 U	21 U	21 U	21 U
Barium	52.2 J	67.6 J	63.2 J	52.6 J	59.6 J	32.1 J	22.1 J
Beryllium	1 U	10.1	1 U	1 U	1 U	1 U	1 U
Cadmium	5 U	11.3	5 U	5 U	5 U	5 U	5 U
Calcium	76200 J	81600 J	91400 J	78100 J	88800 J	46200 J	36300 J
Chromium	5 U	14.7	5 U	5 U	5 U	5 U	5 U
Cobalt	3 U	10.7 J	3 U	3 U	3 U	7.2 J	3 U
Copper	11.3 J	19.6 J	4 U	4 U	6.3 J	4 U	4 U
Iron	10.8 J	20.1 J	4 U	4 U	4 U	163	262
Lead	2 U	2 U	2.1 J	2 U	3.0 J	2.1 J	2 U
Magnesium	24700 J	26700 J	30000 J	25600 J	29100 J	14600 J	9420 J
Manganese	23.9	31.0	20.2	12.2 J	21.2	14.9 J	133
Potassium	1560 J	1260 U	1780 J	3070 J	2490 J	1260 U	2300 J
Silver	4 U	6.3 J	4 U	4 U	4 U	4 U	4 U
Sodium	10600	10400	13200	11600	13900	11600	25400
Vanadium	5.5 J	13.1 J	4.2 J	4.8 J	4.9 J	7.2 J	2.6 J
Zinc	3.4 J	18.8 J	1 U	1 U	2.8 J	2.5 J	9.9 J
Hardness	291.77	313.47	351.5	300.21	340.81	175.36	129.372
Calculated Water Quality Criteria							
Cadmium - acute	13.125	14.231	16.193	13.554	15.638	7.391	5.244
- chronic	2.629	2.782	3.043	2.689	2.971	1.763	1.388
Copper - acute	48.613	52.013	57.938	49.937	56.276	30.090	22.593
- chronic	29.521	31.388	34.614	30.250	33.712	19.107	14.734
Lead - acute	319.100	349.613	404.476	330.897	388.882	166.899	113.319
- chronic	12.435	13.624	15.762	12.895	15.154	6.504	4.416
Silver - acute	25.602	28.964	35.269	26.889	33.444	10.665	6.321
Zinc - acute	289.932	308.102	339.492	297.022	330.723	188.343	145.556
- chronic	262.604	279.061	307.492	269.026	299.550	170.590	131.836

Data Qualifier Definitions

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.

J - The associated value is an estimated quantity.

Table A4.8 Summary of Total TAL Metals in River Water

River Location	SW-1	SW-2	SW-3	SW-3DP	SW-4	SW-5	SW-6
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	SW5SN	SW14SN	SW22SN	SW32DPSN	SW40SN	SW58SN	SW49SN
Lab Sample ID	319426	319429	319769	319784	319788	320001	320005
SDG No.	BOGEY	BOGEY	BOGEY	BOGEY	BOGEY	149163	149163
Traffic Report No.	023	024	026	028	030	035	031
Date Collected	13-Feb-90	13-Feb-90	14-Feb-90	14-Feb-90	14-Feb-90	15-Feb-90	15-Feb-90
Date Analyzed	7-Mar-90	7-Mar-90	7-Mar-90	7-Mar-90	7-Mar-90	7-Mar-90	7-Mar-90
Filtered	No	No	No	No	No	No	No
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aluminum	623	509	462	469	304	1850 J	7940 J
Antimony	21 U	21 U	21 U	21 U	21 U	21 U	21 U
Barium	63.5 J	63.7 J	65.2 J	63.3 J	64.4 J	61.2 J	88.5 J
Beryllium	1 U	1 U	1 U	1 U	1 U	1.2 J	1 U
Cadmium	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Calcium	80600	82300	84000	74900	78800	53200	41900
Chromium	5 U	5 U	5 U	5.0 J	5 U	5 U	5 U
Cobalt	3 U	3 U	3 U	3 U	3 U	3 U	4.3 J
Copper	4 U	4 U	5.0 J	8.3 J	14.1 J	4 U	6.5 J
Iron	827	755	732	627	548	2730 J	12000 J
Lead	2 U	2 U	2 U	2 U	2 U	4.0 J	10.8
Magnesium	26400	26800	27400	25700	26700	18500	13700
Manganese	30.8	30.8	30.8	30.8	30.9	115 J	318 J
Potassium	1260 U	1260 U	2920	1260 U	1260 U	1260 U	1260 U
Silver	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Sodium	9520	9990	12900	5760	7470	9880	21500
Vanadium	2 U	2 U	2 U	2 U	2 U	4.0 J	15.8 J
Zinc	22.0	25.7	26.8	21.6	18.7 J	33.8 J	55.0 J
Hardness	309.74	315.63	322.34	292.62	306.47	208.85	160.92
Calculated Water Quality Criteria							
Cadmium - acute	14.040	14.341	14.686	13.168	13.873	9.001	6.708
- chronic	2.756	2.797	2.843	2.635	2.733	2.022	1.648
Copper - acute	51.429	52.350	53.398	48.747	50.918	35.477	27.750
- chronic	31.068	31.572	32.145	29.595	30.788	22.185	17.754
Lead - acute	344.326	352.683	362.255	320.284	339.705	208.487	149.604
- chronic	13.418	13.744	14.117	12.481	13.238	8.124	5.830
Silver - acute	28.374	29.308	30.388	25.730	27.860	14.405	9.200
Zinc - acute	304.992	309.899	315.473	290.647	302.262	218.405	175.117
- chronic	276.245	280.689	285.737	263.252	273.772	197.819	158.611

Data Qualifier Definitions

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.

J - The associated value is an estimated quantity.

Table A4.9 Summary of Dissolved and Total TAL Metals in Pond Water

	Dissolved				Total			
Pond Location	PW-1	PW-2	PW-3	PW-4	PW-1	PW-2	PW-3	PW-4
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	PW10SN	PW19SN	PW27SN	PW36SN	PW11SN	PW20SN	PW28SN	PW37SN
Lab Sample ID	320230	320246	320257	320266	320232	320250	320258	320268
SDG No.	91498D	49187D	49187D	49187D	149163	149163	149163	149163
Traffic Report No.	044	045	043	043	045	045	043	043
Date Collected	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90
Date Analyzed	21-Feb-90	8-Mar-90	8-Mar-90	8-Mar-90	7-Mar-90	7-Mar-90	7-Mar-90	7-Mar-90
Filtered	Yes	Yes	Yes	Yes	No	No	No	No
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aluminum	16 U	21.4 J	16 U	31.4 J	69.4 J	74.4 J	48.8 J	48.1 J
Barium	159 J	173 J	60.8 J	61.2 J	169 J	164 J	61.3 J	62.0 J
Calcium	49500 J	50200	48800	49800	45600	44100	43200	43700
Cobalt	3 U	3 U	3 U	3 U	3 U	3 U	3.7 J	3 U
Copper	4 U	4 U	4 U	4.2 J	4 U	9.0 J	4 U	4 U
Iron	4 U	18.5 J	10.6 J	7.9 J	198 J	244 J	151 J	163 J
Lead	2.2 J	2 U	2 U	2 U	2 U	5.1 J	2 U	2 U
Magnesium	30500 J	31700	26100	26500	29800	28800	23900	24400
Manganese	8.7 J	16.4	1 U	1 U	22.8 J	24.4 J	16.7 J	16.7 J
Mercury	0.2 U	0.22 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Potassium	10100	4910 UJ	4750 UJ	7990 U	7540	4650 J	1260 U	1260 U
Sodium	32800	31100	10000	11600	31000	29300	9350	9230
Vanadium	4.6 J	2 U	2.6 J	4.9 J	2 U	2 U	2.9 J	2 U
Zinc	1 U	20.6	14.6 J	10 J	1 U	23.2 J	2.1 J	2.5 J
Hardness (mg/L)	248.8	255.47	229.01	233.15	236.18	228.33	205.99	209.29
Calculated Water Quality Criteria								
Copper - acute	41.837	42.893	38.694	39.353	39.835	38.586	35.019	35.547
- chronic	25.764	26.353	24.002	24.373	24.643	23.941	21.925	22.225
Lead - acute	260.524	269.447	234.436	239.845	243.820	233.550	204.860	209.048
- chronic	10.152	10.500	9.136	9.348	9.501	9.101	7.983	8.148
Zinc - acute	253.321	259.063	236.141	239.753	242.391	235.547	215.868	218.795
- chronic	229.444	234.645	213.883	217.155	219.544	213.345	195.521	198.172

Data Qualifier Definitions

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.

J - The associated value is an estimated quantity.

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

Table A4.10 Summary of Cyanide Analyses

Groundwater Monitoring Well	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-8DP	MB-9	MB-10
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	GW11SN	GW19SN	GW26SN	GW33SN	GW50SN	GW58SN	GW78SN	GW86SN	GW92DPSN	GW42SN	GW05SN
Lab Sample ID	317957	318307	318326	318337	318795	319224	319254	319274	319283	318783	317953
Traffic Report No.	002	008	006	007	011	015	019	017	018	011	003
Date Collected	6-Feb-90	7-Feb-90	7-Feb-90	7-Feb-90	8-Feb-90	12-Feb-90	12-Feb-90	12-Feb-90	12-Feb-90	8-Feb-90	6-Feb-90
Date Analyzed	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Cyanide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
River Water River Location	SW-1	SW-2	SW-3	SW-3DP	SW-4	SW-5	SW-6				
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1				
Field Sample ID	SW06SN	SW15SN	SW23SN	SW33DPSN	SW41SN	SW58SN	SW50SN				
Lab Sample ID	319428	319430	319773	319785	319792	319999	320000				
Traffic Report No.	024	024	028	029	030	036	033				
Date Collected	13-Feb-90	13-Feb-90	14-Feb-90	14-Feb-90	14-Feb-90	15-Feb-90	15-Feb-90				
Date Analyzed	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90				
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L				
Cyanide	10U	14	10U	10U	10U	10U	10U				
Pond Water Pond Location	PW-1	PW-2	PW-3	PW-4							
Phase	90-1	90-1	90-1	90-1							
Field Sample ID	PW12SN	PW21SN	PW29SN	PW38SN							
Lab Sample ID	320238	320252	320259	320270							
Traffic Report No.	044	045	042	044							
Date Collected	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90							
Date Analyzed	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90							
Units	µg/L	µg/L	µg/L	µg/L							
Cyanide	10U	10U	10U	10U							

Data Qualifier Definitions

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.

Groundwater											
Monitoring Well	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-8DP	MB-9	MB-10
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	GW12SN	GW20SN	GW27SN	GW34SN	GW51SN	GW59SN	GW81SN	GW87SN	GW93DPSN	GW43SN	GW06SN
Lab Sample ID	317966	318311	318328	318340	318813	319225	319268	319278	319287	318812	317965
Traffic Report No.	002	008	008	008	011	016	019	021	021	011	004
Date Collected	6-Feb-90	7-Feb-90	7-Feb-90	7-Feb-90	8-Feb-90	12-Feb-90	12-Feb-90	12-Feb-90	12-Feb-90	8-Feb-90	6-Feb-90
Date Analyzed - TSS	12-Feb-90	14-Feb-90	14-Feb-90	14-Feb-90	14-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90	14-Feb-90	12-Feb-90
Date Analyzed - Cl	9-Feb-90	12-Feb-90	12-Feb-90	12-Feb-90	13-Feb-90	15-Feb-90	15-Feb-90	15-Feb-90	15-Feb-90	13-Feb-90	9-Feb-90
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Total Suspended Solids	2100	1300	4600	1100	650	1100	1100	3600	3200	6500	660
Chloride	25	40	30	30	30	67	70	36	36	15	40
River Water											
River Location	SW-1	SW-2	SW-3	SW-3DP	SW-4	SW-5	SW-6				
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1				
Field Sample ID	SW07SN	SW16SN	SW24SN	SW34DPSN	SW42SN	SW60SN	SW51SN				
Lab Sample ID	319435	319436	319779	319786	319796	320014	320013				
Traffic Report No.	025	025	028	028	030	032	033				
Date Collected	13-Feb-90	13-Feb-90	14-Feb-90	14-Feb-90	14-Feb-90	15-Feb-90	15-Feb-90				
Date Analyzed - TSS	16-Feb-90	16-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90	22-Feb-90	22-Feb-90				
Date Analyzed - Cl	15-Feb-90	15-Feb-90	19-Feb-90	19-Feb-90	19-Feb-90	19-Feb-90	19-Feb-90				
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L				
Total Suspended Solids	5.2	5 U	20	19	19	170	610				
Chloride	27	27	28	28	29	28	47				
Pond Water											
Pond Location	PW-1	PW-2	PW-3	PW-4							
Phase	90-1	90-1	90-1	90-1							
Field Sample ID	PW13SN	PW22SN	PW30SN	PW39SN							
Lab Sample ID	320242	320254	320264	320272							
Traffic Report No.	040	041	041	044							
Date Collected	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90							
Date Analyzed - TSS	21-Feb-90	21-Feb-90	21-Feb-90	21-Feb-90							
Date Analyzed - Cl	27-Feb-90	27-Feb-90	27-Feb-90	27-Feb-90							
Units	mg/L	mg/L	mg/L	mg/L							
Total Suspended Solids	7.8	48	5 U	5.0	Data Qualifier Definitions U - The material was analyzed for, but was not detected above the level of the associated value.						
Chloride	28	29	16	15							

Table A4.12 Summary of Ammonia-Nitrogen and COD Analyses

Groundwater											
Monitoring Well	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-8DP	MB-9	MB-10
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	GW13SN	GW21SN	GW28SN	GW35SN	GW52SN	GW60SN	GW79SN	GW88SN	GW94DPSN	GW44SN	GW07SN
Lab Sample ID	317964	318318	318330	318348	318811	319217	319220	319221	319222	318810	317963
Lab Report No.	002	005	006	007	009	012	018	020	020	008	003
Date Collected	06Feb90	07Feb90	07Feb90	07Feb90	08Feb90	12Feb90	12Feb90	12Feb90	12Feb90	08Feb90	06Feb90
Date Analyzed - COD	12Feb90	14Feb90	14Feb90	14Feb90	14Feb90	15Feb90	15Feb90	15Feb90	15Feb90	14Feb90	12Feb90
Date Analyzed - NH3-N	28Feb90	28Feb90	28Feb90	28Feb90	28Feb90	28Feb90	28Feb90	28Feb90	28Feb90	28Feb90	28Feb90
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Temperature (°C)	12	11	14	14	14	14	15.5	18	18	13	12
pH	7.14	6.72	6.98	7.36	7.08	6.64	6.97	7.28	7.28	7.66	7.14
Ammonia											
Total	1 L	16	7.1	1 L	3.1	5.6	20	15	4.5	1 L	1 L
Unionized (t=5°C, pH=7.0)	--	0.0197	0.0087	--	0.0038	0.0089	0.0246	0.0184	0.0055	--	--
Chemical Oxygen Demand	56	170	230	160	140	250	160	300	340	300	50 L
River Water						Pond Water					
River Water/ Pond Location	SW-1	SW-2	SW-3	SW-3DP	SW-4	SW-5	SW-6	PW-1	PW-2	PW-3	PW-4
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Field Sample ID	SW08SN	SW17SN	SW25SN	SW35DPSN	SW43SN	SW61SN	SW52SN	PW14SN	PW23SN	PW31SN	PW40SN
Lab Sample ID	319433	319434	319804	319805	319807	320012	320011	320294	320295	320296	320297
Lab Report No.	022	023	026	027	029	034	031	041	041	042	042
Date Collected	13Feb90	13Feb90	14Feb90	14Feb90	14Feb90	15Feb90	15Feb90	16Feb90	16Feb90	16Feb90	16Feb90
Date Analyzed - COD	15Feb90	15Feb90	20Feb90	20Feb90	20Feb90	20Feb90	20Feb90	21Feb90	21Feb90	21Feb90	21Feb90
Date Analyzed - NH3-N	01Mar90	01Mar90	01Mar90	01Mar90	01Mar90	01Mar90	01Mar90	01Mar90	01Mar90	01Mar90	01Mar90
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Temperature (°C)	8	9	5	5	4	3	1	5	5	5	5
pH	8.05	8.15	8.03	8.03	8.15	7.90	7.31	8.17	7.88	8.25	8.28
Ammonia											
Total	1 L	1 L	1 L	1 L	1 L	1 L	1 L	1 L	1.1	1 L	1 L
Unionized	--	--	--	--	--	--	--	--	0.0102	--	--
Chemical Oxygen Demand	50 L	50 L	50 L	50 L	50 L	50 L	50 L	50 L	50 L	50 L	50 L
Calculated Unionized Ammonia Criteria											
Acute	0.0930	0.0995	0.0755	0.0755	0.0706	0.0626	0.0321	0.0756	0.0720	0.0756	0.0756
Chronic	0.0179	0.0192	0.0145	0.0145	0.0136	0.0120	0.0038	0.0145	0.0139	0.0145	0.0145

- Not determined

Data Qualifier Definitions

- The material was analyzed for, but was not detected. The instrument detection limit is greater than the contract required detection limit.

Table A4.13 Summary of Field Indicator Parameter Analyses

Groundwater										
Monitoring Well	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10
Phase	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1	90-1
Date Collected	6-Feb-90	7-Feb-90	7-Feb-90	7-Feb-90	8-Feb-90	12-Feb-90	12-Feb-90	12-Feb-90	8-Feb-90	6-Feb-90
Temperature (°C)	12	11	14	14	14	14	15.5	16	13	12
pH	7.14	6.72	6.98	7.36	7.08	6.64	6.97	7.28	7.66	7.14
Specific Conductance (µmhos/cm) (1)	570	900	700	520	690	1150	1100	1130	380	595
Specific Conductance (µmhos/cm) (2)	1078	1912	1373	1020	1318	2403	2214	2246	745	1087
Dissolved Oxygen (mg/L)	1.7	2.2	2.4	1.3	2.6	1.0	1.8	1.2	6.9	5.5
River Water										
River Location	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6				
Phase	90-1	90-1	90-1	90-1	90-1	90-1				
Date Collected	13-Feb-90	13-Feb-90	14-Feb-90	14-Feb-90	15-Feb-90	15-Feb-90				
Temperature (°C)	8	9	5	4	3	1				
pH	8.05	8.15	8.03	8.15	7.90	7.31				
Specific Conductance (µmhos/cm) (1)	380	400	350	330	250	200				
Specific Conductance (µmhos/cm) (2)	737	753	1021	996	652	561				
Dissolved Oxygen (mg/L)	11.6	11.8	10.2	10.8	11.2	11.6				
Pond Water										
Pond Location	PW-1	PW-2	PW-3	PW-4						
Phase	90-1	90-1	90-1	90-1						
Date Collected	16-Feb-90	16-Feb-90	16-Feb-90	16-Feb-90						
Temperature (°C)	5	5	5	5						
pH	8.17	7.88	8.25	8.28						
Specific Conductance (µmhos/cm) (1)	380	330	250	260						
Specific Conductance (µmhos/cm) (2)	810	704	533	555						
Dissolved Oxygen (mg/L)	11.8	11.4	11.6	12.0						

- 1) Field measurement
2) Value corrected to 25°C

3. SPECIFIC CONDUCTANCE CORRECTION EQUATION

TABLE A4.14: CORRECTION OF FIELD CONDUCTIVITY READING TO 25°C

Step 1: The conductivity probe cell constant was calculated according to the following formula:

$$K = \frac{(1413.0) (1/C)}{1 + 0.02 (T-25)}$$

Where:

K = probe cell constant (unitless)
C = measured conductance value standard*
T = temperature of standard in degrees C.

*if temperature at standard solution is not at 25°C, obtain corrected value from table of conductivity/temperatures corrections for the 1,413 µmhos/cm conductivity standard as supplied by the manufacturer.

Step 2: The calculated cell constant (K) was used to correct the field specific conductance measurements to 25°C with the following formula:

$$S = \frac{(K) (C)}{1 + 0.02 (T-25)}$$

Where:

S = specific conductance at 25°C
K = calculated cell constant.
C = field specific conductance (µmhos/cm)
T = temperature of water sample at which field specific conductance was measured

4. MS/MSD REFERENCE NUMBERS

Table A4.15 Matrix Spike/ Matrix Spike Duplicate Sample Information

Field Sample Number	CompuChem Sample No.	Traffic Report No.	Sample Location	Analysis Performed	Date Sampled	Date Analysed
GW03SNMS	317941	003	MB-10	TCL Semivolatiles	06Feb90	10Feb90
GW03SNMSD	317942	003	MB-10	TCL Semivolatiles	06Feb90	10Feb90
GW08SNMS	317946	003	MB-1	TCL Volatiles	06Feb90	07Feb90
GW08SNMSD	317947	003	MB-1	TCL Volatiles	06Feb90	07Feb90
GW55SNMS	319198	014	MB-6	TCL Volatiles	12Feb90	15Feb90
GW55SNMSD	319197	014	MB-6	TCL Volatiles	12Feb90	15Feb90
GW56SNMS	319209	012	MB-6	TCL Semivolatiles	12Feb90	15Feb90
GW56SNMSD	319210	012	MB-6	TCL Semivolatiles	12Feb90	15Feb90
SW55SNMS	319986	032	SW-5	TCL Volatiles	15Feb90	19Feb90
SW55SNMSD	319987	032	SW-5	TCL Volatiles	15Feb90	19Feb90
SW56SNMS	319993	032	SW-5	TCL Semivolatiles	15Feb90	20Feb90
SW56SNMSD	319994	032	SW-5	TCL Semivolatiles	15Feb90	20Feb90

Note: The matrix spike/ matrix spike duplicate samples were selected by CompuChem Laboratories, Inc.

APPENDIX 5

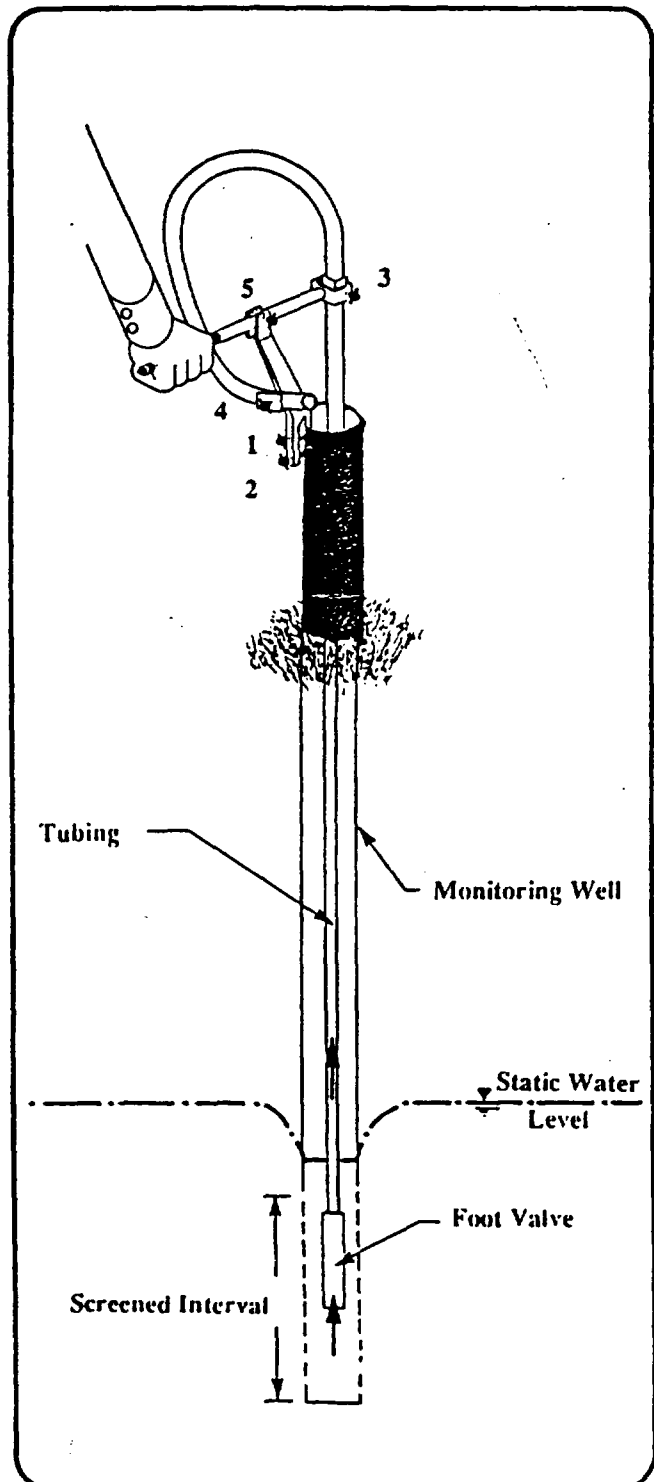
WATERRA PUMPS

Instructions for Installation and Operation of the WaTerra Hand Pump

1. Attach the foot valve to the plastic tubing by threading the foot valve clockwise (right hand thread) on the tubing for a distance of about 1/2 inch. The threads on the foot valve will self-tap into the plastic tubing to provide a strong water tight connection. Test the connection by pulling vigorously on the foot valve.
2. Lower the foot valve and tubing to the desired depth (usually the bottom of the well) and cut the tube with approximately 4 feet extending above the well casing. For dedicated installations, the tubing should be cut flush with the top of the casing to permit capping of the well when not in use.
3. Fasten the WaTerra pump handle on the top edge of the well casing or surface protective casing, as shown in the diagram, by tightening knobs 1 and 2.
4. Attach tubing to the clamp (knob 3) on the end of the handle with about 4 feet of tubing extending above the clamp. Secure the end of the tube in the second clamp (knob 4). This will give you a fixed spout to facilitate the collection of water samples and measurement of flowrates.
5. Adjust position of pivot point (knob 5) so that the tube is centered in the well and hangs clear of the well casing wall.
6. Pump water from the well by operating the handle at a rate of between 90 to 120 strokes per minute. To maximize the pumping rate, rapid and abrupt up/down strokes should be used to impart greater upward momentum to the column of water.

Please Note:

The pump will lift water laden with silt and sand, however, after pumping is completed, the sediment in the column of water within the tube will settle out and may clog the foot valve. To prevent this, we recommend clearing the tube after use. This may be done by air lifting the silty water out of the tube using a small diameter air line and air pump. Alternatively, the tube may be pulled to the surface and drained. If the foot valve or tubing does get plugged, the sediment can be dislodged by removing the foot valve and by striking the outside of the tubing and foot valve.



APPENDIX 6

LABORATORY DATA VALIDATION RESULTS



beak
consultants
limited

595 Woolwich Street (519) 763-BEAK
Guelph, Ontario Fax: (519) 763-2378
Canada N1H 3Y5

25 May 1990

de maximis inc.
9041 Executive Park Drive
Suite 601
Knoxville, TN
U.S.A. 27923

Attention: Mr. Mark Travers

Dear Mr. Travers:

Reference: 7017.1 - Laboratory Data Validation (Marion Bragg Landfill)

BEAK has completed an assessment of the Marion Bragg chemical data, as per CLP (July, 1988) Laboratory Data Validation procedures, and with reference to the Data Quality Objectives outlined in the Quality Assurance Project Plan (May, 1990). Appropriate data qualifying flags have been assigned in the database as follows:

- U = analysed but not detected (can be due to blank problem)
- J = estimated result for trace quantity or due to QC problems (duplicates, spikes, serial dilutions, calibrations)
- N = presumptive compound identification

Only compounds detected or presumed present in at least one sample are included in the database.

The following is an overall summary of data quality for Marion Bragg supported by data quality assessment forms, laboratory case narratives, and selected QC documentation relating to identified problems.

Chloride and TSS measurements appear to conform to the QAPP. Ammonia and COD measurements did not meet the specified quantitation limits of 0.1 mg/L and 20 mg/L respectively. Limits of 1 mg/L and 50 mg/L were achieved. Non-detects for these parameters have been entered into the database as limit values with "L" flags.

The inorganic QC data show consistent matrix spike recovery problems with furnace AA analysis, with spiking both before and after digestion. On the data summary forms we considered all post-digestion spikes under item 8; the laboratory qualified AA data based on post-digestion spike recovery, but did not include these recoveries in QC documentation.

Head Office
14 Abacus Road
Brampton, Ontario
Canada L5T 5B7

beak
consultants
limited

Mr. Mark Travers
de maximis inc.

- 2 -

Reference: 7017.1
25 May 1990

There are also some matrix spike and duplicate agreement problems with ICP, and some duplicate problems with Hg by cold vapour. Blanks very often exceed the laboratory IDL for metals analysis; however, these IDL's are well below the specified CRDL's, and appear to be over-optimistic. We identified blank problems (and assigned "U" flags to associated sample results) only when the CRDL was exceeded in a blank, which occurred for K (SDG #49187D). Calibration checks were sometimes outside CLP prescribed limits, although this was not noted in case narratives.

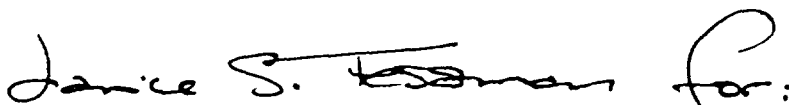
The metals data are heavily "J" flagged as estimates, primarily due to detection below the CRDL, but also due to the above-mentioned problems affecting some metals in some SDG's. We consider these results to be useable as estimates. We noticed no problems at all with the cyanide analysis.

The organic QC data show consistent blank detection of methylene chloride, and sometimes acetone (SDG #19149 01), resulting in "U" flags on associated sample results for these volatile parameters. Calibration checks were frequently outside CLP prescribed limits for some parameters, although this was generally not noted in case narratives. We identified calibration problems only when parameters detected at Marion Bragg were involved. Surrogates and matrix spikes sometimes indicate over-recovery of semi-volatile compounds (SDG #19149 57 and 180), however these problems do not affect compounds detected in the case, and we have not assigned any associated data quality flags.

Most of the organics data are "J" flagged as estimates, primarily due to trace detection below the IDL (=CRDL) but also due to the above-mentioned problems affecting some parameters in some SDG's. We consider these results to be useable as estimates. Only 1,2-dichloroethene, trichloroethene and vinyl chloride are detected without qualification.

Yours truly,

BEAK CONSULTANTS LIMITED

Janice S. [unclear] for:

Donald R. Hart, Ph.D.
Associate

DRH/cm

INORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 5/SW
 SDG # Bogey REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION FYI COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	ICP	AA	Hg	CYANIDE
1. HOLDING TIMES	<u>O</u>	<u>O</u>	<u>O</u>	
2. CALIBRATIONS	<u>O</u>	<u>O</u>	<u>O</u>	
3. BLANKS	<u>O</u>	<u>O</u>	<u>O</u>	
4. ICS	<u>O</u>			
5. LCS	<u>O</u>	<u>O</u>		
6. DUPLICATE ANALYSIS	<u>O</u>	<u>O</u>	<u>O</u>	
7. MATRIX SPIKE	<u>O</u>	<u>M</u>	<u>O</u>	
8. MSA		<u>M</u>		
9. SERIAL DILUTION	<u>O</u>			
10. SAMPLE VERIFICATION	<u>O</u>	<u>O</u>	<u>O</u>	
11. OTHER QC	<u>O</u>	<u>O</u>	<u>O</u>	
12. OVERALL ASSESSMENT	<u>O</u>	<u>M</u>	<u>O</u>	

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: Matrix spike recovery outside limit for Pb, Tl, Se. Post-digestion spikes also outside limits. Blanks often above IDL but all below CRDL.

NOTABLE PERFORMANCE: _____



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill/Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

Case Narrative
De Maximis
Case No. 30360 SDG No. BOGEY
Contract No. 788

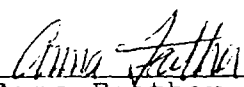
Client Sample No.: SW-14SN, SW-5SN, SW22SN, SW32DPSN, SW40SN

This case consisted of five water samples analyzed for Target Analyte List (TAL) metals. The samples were received intact February 14 and 15, 1990 with the Chain-of-Custody (COC) Records. The enclosed cover page reflects De Maximis and CompuChem sample identifiers.

The associated quality control sample spike, SW-5SNS, was outside the control limits for lead, selenium, and thallium, therefore the concentrations were flagged with an 'N'. The duplicate, SW-5SND, was within the control limits for all of the analytes analyzed.

A serial dilution was done on sample SW32DPSNL. The adjusted sample concentrations were within 10% of the original concentrations for all of the analytes tested.

In one or more of the samples, the concentrations of analytes fell between, below, and above the Instrument Detection Limits (IDLs) and the Contract Required Detection Limits (CRDLs).


Anna Feather
Technical Reviewer
March 13, 1990

Note: This report is paginated for reference and accountability in numerical sequence.

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

CLIENT SAMPLE NO.

SW-5SNS

Lab Name: COMPUCHEM LABORATORIESContract: 7/88Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: BOGEYMatrix: WATERLevel (low/med): LOW% Solids for Sample: 0.0Concentration Units: UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Aluminum	75-125	2274.7000	623.4100	2000.00	82.6		P
Antimony	75-125	474.2400	21.0000	500.00	94.8		P
Arsenic	75-125	36.3800	3.0000	40.00	91.0		F
Barium	75-125	2008.7000	63.4600	2000.00	97.3		P
Beryllium	75-125	48.6400	1.0000	50.00	97.3		P
Cadmium	75-125	47.5800	5.0000	50.00	95.2		P
Calcium							NR
Chromium	75-125	197.1400	5.0000	200.00	98.6		P
Cobalt	75-125	496.4700	3.0000	500.00	99.3		P
Copper	75-125	252.1200	4.0000	250.00	100.8		P
Iron	75-125	1688.7999	827.2600	1000.00	86.2		P
Lead	75-125	13.6200	2.0000	20.00	68.1	N	F
Magnesium							NR
Manganese	75-125	520.4700	30.8500	500.00	97.9		P
Mercury	75-125	0.8080	0.2000	1.00	80.8		CV
Nickel	75-125	506.1700	29.0000	500.00	101.2		P
Potassium							NR
Selenium	75-125	2.7000	10.0000	10.00	27.0	N	F
Silver	75-125	43.8200	4.0000	50.00	87.6		P
Sodium							NR
Thallium	75-125	37.3100	2.0000	50.00	74.6	N	F
Vanadium	75-125	471.5600	2.0000	500.00	94.3		P
Zinc	75-125	505.2600	21.9700	500.00	96.7		P
Cyanide							NR

Comments:

FORM 5A -PAGE 1 (SR)Lab ID:319426

ICP Metals (SSR)Lab ID:317959

AA Metals (SSR)Lab ID:317959

Mercury (SSR)Lab ID:317959

Cyanide (SSR)Lab ID:

U.S. EPA - CLP

5B
POST DIGEST SPIKE SAMPLE RECOVERY

CLIENT SAMPLE NO.

SW-5SNA

Lab Name: COMPUCHEM LABORATORIESContract: 7/88Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: BOGEYMatrix: WATERLevel (low/med): LOW

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							
Cyanide							

Comments:

FORM 5B - PAGE 1 NO POST DIGEST SPIKES WERE REQUIRED FOR FLAME AA
ICP, MERCURY, AND CYANIDE ANALYSES.

INORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 3/PW
 SDG # 49187D REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION _____ FYI _____ COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	ICP	AA	Hg	CYANIDE
1. HOLDING TIMES	<u>O</u>	<u>O</u>	<u>O</u>	
2. CALIBRATIONS	<u>M</u>	<u>O</u>	<u>O</u>	
3. BLANKS	<u>M</u>	<u>O</u>	<u>O</u>	
4. ICS	<u>O</u>			
5. LCS	<u>O</u>	<u>O</u>		
6. DUPLICATE ANALYSIS	<u>O</u>	<u>O</u>	<u>M</u>	
7. MATRIX SPIKE	<u>M</u>	<u>M</u>	<u>O</u>	
8. MSA		<u>M</u>		
9. SERIAL DILUTION	<u>O</u>			
10. SAMPLE VERIFICATION	<u>O</u>	<u>O</u>	<u>O</u>	
11. OTHER QC	<u>O</u>	<u>O</u>	<u>O</u>	
12. OVERALL ASSESSMENT	<u>M</u>	<u>M</u>	<u>M</u>	

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: CCV outside limits for K. Blank above CRDL for K. Duplicates outside limits for Hg.Matrix spikes out for Cd, Se. Post-digest spikes out for Pb, As, Tl, Se. CRDL cal. std. out for Be, Cd, Cr, Mn, Va.

NOTABLE PERFORMANCE: _____



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill/Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

Case Narrative

De Maximis

Case No. 30360 SDG No. 49187D

Contract 788

Client Sample No.: PW19SN, PW27SN, PW36SN

This case consisted of three water samples analyzed for Target Analyte List metals. The samples were received intact on February 17, 1990 with the Traffic Reports and Chain-of-Custody (COC) Records. The enclosed cover page reflects De Maximis and CompuChem sample identifiers.

The associated quality control sample spike, PW19SNS, fell outside the control limits for cadmium and selenium. These analytes received the 'N' flag for all samples, and a post digestion spike was performed for cadmium. The duplicate, PW19SND, fell outside the control limits for mercury, therefore the concentration was flagged with an '*' for all samples.

A serial dilution was done on sample PW27SNL. The adjusted sample concentrations were within 10% of the original concentrations for all of the analytes tested whose initial sample result was greater than fifty times the Instrument Detection Limit (IDL).

In one or more of the samples, the concentrations of analytes fell between, below, and above the Instrument Detection Limits (IDLs) and the Contract Required Detection Limits (CRDLs).

Anna Feather
Technical Reviewer
March 20, 1990

Note: This report is paginated for reference and accountability in numerical sequence.

3
BLANKS

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 49187DPreparation Blank Matrix (soil/water): WATERPreparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L) C	Continuing Calibration Blank (ug/L)						Prepa- ration Blank C	M
		1 C	2 C	3 C					
Aluminum		16.0 U	16.0 U	22.0 B					P
Antimony		-29.2 B	21.0 U	21.0 U					P
Arsenic		3.0 U							F
Barium		-3.6 B	1.0 U	1.0 U					P
Beryllium		-4.4 B	1.2 B	1.0 U					P
Cadmium		5.0 U	5.0 U	5.0 U					P
Calcium		-43.6 B	17.0 U	22.5 B					P
Chromium		5.0 U	5.0 U	5.0 U					P
Cobalt		7.7 B	-5.3 B	-8.1 B					P
Copper		4.0 U	4.0 U	4.0 U					P
Iron		-6.3 B	4.0 U	7.1 B					P
Lead									F
Magnesium		444.5 B	-129.5 B	-207.1 B					P
Manganese		-4.1 B	-1.7 B	-3.9 B					P
Mercury		0.2 U	0.2 U	0.2 U					CV
Nickel		29.0 U	29.0 U	29.0 U					P
Potassium		10022.0	-2423.7 B	-3394.1 B					P
Selenium		2.0 U							F
Silver		4.0 U	4.0 U	4.0 U					P
Sodium		4932.1 B	1490.0 U	-2447.0 B					P
Thallium									F
Vanadium		6.8 B	-5.7 B	-7.0 B					P
Zinc		-4.1 B	1.0 U	1.0 U					P
Cyanide									

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

CLIENT SAMPLE NO.

PW19SNS

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 49187DMatrix: WATERLevel (low/med): LOW% Solids for Sample: 0.0Concentration Units: UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Aluminum	75-125	1912.1000	21.3900 B	2000.00	94.5		P
Antimony	75-125	474.0000	21.0000 U	500.00	94.8		P
Arsenic	75-125	38.4200	3.0000 U	40.00	96.0		F
Barium	75-125	2104.1001	172.8500 B	2000.00	96.6		P
Beryllium	75-125	45.9600	1.0000 U	50.00	91.9		P
Cadmium	75-125	35.6400	5.0000 U	50.00	71.3	N	P
Calcium							NR
Chromium	75-125	183.8800	5.0000 U	200.00	91.9		P
Cobalt	75-125	448.2800	3.0000 U	500.00	89.7		P
Copper	75-125	243.5400	4.0000 U	250.00	97.4		P
Iron	75-125	933.6200	18.4600 B	1000.00	91.5		P
Lead	75-125	17.9000	2.0000 U	20.00	89.5		F
Magnesium							NR
Manganese	75-125	474.5500	16.4300	500.00	91.6		P
Mercury	75-125	1.1730	0.2240	1.00	94.9		CV
Nickel	75-125	464.3400	29.0000 U	500.00	92.9		P
Potassium							NR
Selenium	75-125	6.9100	2.0000 U	10.00	69.1	N	F
Silver	75-125	47.5400	4.0000 U	50.00	95.1		P
Sodium							NR
Thallium	75-125	39.5500	2.0000 U	50.00	79.1		F
Vanadium	75-125	443.8600	2.0000 U	500.00	88.8		P
Zinc	75-125	476.6800	20.6400	500.00	91.2		P
Cyanide							NR

Comments:

FORM 5A -PAGE 1 (SR)Lab ID:320246

ICP Metals (SSR)Lab ID:320247

AA Metals (SSR)Lab ID:320247

Mercury (SSR)Lab ID:320247

Cyanide (SSR)Lab ID:

U.S. EPA - CLP

5B
POST DIGEST SPIKE SAMPLE RECOVERY

CLIENT SAMPLE NO.

PW19SNA

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 49187DMatrix: WATERLevel (low/med): LOW

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium		9.47		5.00	U	10.0	94.7		P
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

FORM 5B - PAGE 1 Lab Sample ID:320246

U.S. EPA - CLP

6
DUPLICATES

CLIENT SAMPLE NO.

PW19SND

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 49187DMatrix (soil/water): WATERLevel (low/med): LOW% Solids for Sample: 0.0% Solids for Duplicate: 0.0Concentration Units: UG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		21.3900	B	16.0000	U	200.0		P
Antimony		21.0000	U	21.0000	U			P
Arsenic		3.0000	U	3.0000	U			F
Barium		172.8500	B	171.6800	B	0.7		P
Beryllium		1.0000	U	1.0000	U			P
Cadmium		5.0000	U	5.0000	U			P
Calcium		50196.0000		51294.0000		2.2		P
Chromium		5.0000	U	5.0000	U			P
Cobalt		3.0000	U	3.0000	U			P
Copper		4.0000	U	4.0000	U			P
Iron		18.4600	B	17.4800	B	5.5		P
Lead		2.0000	U	2.0000	U			F
Magnesium		31705.0000		32297.0000		1.8		P
Manganese	15.0	16.4300		16.5400		0.7		P
Mercury	0.2	0.2240		0.2000	U	200.0	*	CV
Nickel		29.0000	U	29.0000	U			P
Potassium	5000.0	4905.8999	B	8776.1006		56.6		P
Selenium		2.0000	U	2.0000	U			F
Silver		4.0000	U	4.0000	U			P
Sodium		31111.0000		32820.0000		5.3		P
Thallium		2.0000	U	2.0000	U			F
Vanadium		2.0000	U	2.0000	U			P
Zinc	20.0	20.6400		5.2700	B	118.6		P
Cyanide								NR

Comments:

FORM 6 - PAGE 1 (S) Lab ID:320246

ICP Metals Dup. Lab ID:320248

AA Metals Dup. Lab ID:320248

Mercury Dup. Lab ID:320248

Cyanide Dup. Lab ID:

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 49187DInitial Calibration Source: EPA-LVContinuing Calibration Source: SPEX

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				5000.0	4835.50	96.7	4905.70	98.1	P
Antimony				5000.0	5059.20	101.2	4888.10	97.8	P
Arsenic				25.0	25.29	101.2			F
Barium				5000.0	4721.80	94.4	4908.60	98.2	P
Beryllium				5000.0	5037.30	100.7	4740.70	94.8	P
Cadmium				5000.0	5139.80	102.8	4991.90	99.8	P
Calcium				50000.0	51419.00	102.8	48586.00	97.2	P
Chromium				5000.0	5065.80	101.3	4868.40	97.4	P
Cobalt				5000.0	5115.10	102.3	4881.40	97.6	P
Copper				5000.0	4812.30	96.2	4873.50	97.5	P
Iron				5000.0	5060.40	101.2	4874.60	97.5	P
Lead									
Magnesium				50000.0	49706.00	99.4	49331.00	98.7	P
Manganese				5000.0	5065.30	101.3	4877.90	97.6	P
Mercury				3.0	2.82	94.0	3.29	109.7	CV
Nickel				5000.0	5165.50	103.3	4836.30	96.7	P
Potassium				50000.0	59462.00	118.9	50227.00	100.5	P
Selenium				20.0	18.84	94.2			F
Silver				500.0	492.61	98.5	495.54	99.1	P
Sodium				50000.0	53527.00	107.1	48794.00	97.6	P
Thallium									
Vanadium				5000.0	4920.80	98.4	4823.90	96.5	P
Zinc				5000.0	5164.80	103.3	4895.80	97.9	P
Cyanide									

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 49187DInitial Calibration Source: EPA-LVContinuing Calibration Source: SPEX

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				5000.0	5002.20	100.0	4947.90	99.0	P
Antimony				5000.0	5184.40	103.7	4993.10	99.9	P
Arsenic				25.0	25.36	101.4	26.21	104.8	F
Barium				5000.0	5050.60	101.0	4923.90	98.5	P
Beryllium				5000.0	5324.80	106.5	4851.60	97.0	P
Cadmium				5000.0	5167.80	103.4	5084.10	101.7	P
Calcium				50000.0	53047.00	106.1	49522.00	99.0	P
Chromium				5000.0	5272.50	105.4	4965.60	99.3	P
Cobalt				5000.0	5299.00	106.0	4989.40	99.8	P
Copper				5000.0	5027.40	100.5	4920.10	98.4	P
Iron				5000.0	5261.50	105.2	4964.20	99.3	P
Lead				25.0	23.91	95.6	22.76	91.0	F
Magnesium				50000.0	51163.00	102.3	49911.00	99.8	P
Manganese				5000.0	5247.80	105.0	4974.50	99.5	P
Mercury				3.0	3.17	105.7	3.11	103.7	CV
Nickel				5000.0	5337.60	106.8	4936.90	98.7	P
Potassium				50000.0	52091.00	104.2	55129.00	110.3	P
Selenium				20.0	20.68	103.4	19.41	97.0	F
Silver				500.0	503.42	100.7	497.61	99.5	P
Sodium				50000.0	52270.00	104.5	51233.00	102.5	P
Thallium				20.0	19.44	97.2	18.38	91.9	F
Vanadium				5000.0	5164.70	103.3	4886.00	97.7	P
Zinc				5000.0	5238.20	104.8	5022.80	100.5	P
Cyanide									

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 49187DInitial Calibration Source: EPA-LVContinuing Calibration Source: SPEX

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Aluminum				5000.0	4770.50	95.4	4728.80	94.6	P
Antimony				5000.0	4675.70	93.5	4708.30	94.2	P
Arsenic				25.0	25.94	103.8	25.93	103.7	F
Barium				5000.0	4676.80	93.5	4689.20	93.8	P
Beryllium				5000.0	4476.60	89.5	4604.00	92.1	P
Cadmium				5000.0	4778.30	95.6	4742.50	94.8	P
Calcium				50000.0	44739.00	89.5	45147.00	90.3	P
Chromium				5000.0	4553.10	91.1	4589.80	91.8	P
Cobalt				5000.0	4558.60	91.2	4614.50	92.3	P
Copper				5000.0	4722.20	94.4	4699.40	94.0	P
Iron				5000.0	4586.90	91.7	4644.20	92.9	P
Lead				25.0	25.17	100.7	24.47	97.9	F
Magnesium				50000.0	47269.00	94.5	46650.00	93.3	P
Manganese				5000.0	4583.90	91.7	4621.80	92.4	P
Mercury				3.0	3.10	103.3	3.10	103.3	CV
Nickel				5000.0	4579.40	91.6	4643.60	92.9	P
Potassium				50000.0	55060.00	110.1	53374.00	106.7	P
Selenium				20.0	21.20	106.0	21.51	107.6	F
Silver				500.0	478.17	95.6	472.83	94.6	P
Sodium				50000.0	47111.00	94.2	47701.00	95.4	P
Thallium				20.0	20.89	104.4	19.68	98.4	F
Vanadium				5000.0	4489.20	89.8	4516.60	90.3	P
Zinc				5000.0	4661.20	93.2	4677.80	93.6	P
Cyanide									

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2B

CRDL STANDARD FOR AA AND ICP

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 49187DAA CRDL Standard Source: SPEXICP CRDL Standard Source: SPEX

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony				120.0	117.63	98.0	98.18	81.8
Arsenic	10.0	10.28	102.8					
Barium								
Beryllium				10.0	10.03	100.3	7.75	77.5
Cadmium				10.0	10.10	101.0	6.51	65.1
Calcium								
Chromium				20.0	21.65	108.2	17.19	86.0
Cobalt				100.0	103.64	103.6	90.69	90.7
Copper				50.0	55.95	111.9	53.53	107.1
Iron								
Lead	3.0	2.75	91.7					
Magnesium								
Manganese				30.0	32.78	109.3	24.82	82.7
Mercury								
Nickel				80.0	83.36	104.2	78.16	97.7
Potassium								
Selenium	5.0	5.50	110.0					
Silver				20.0	19.60	98.0	19.53	97.6
Sodium								
Thallium	10.0	10.62	106.2					
Vanadium				100.0	99.21	99.2	87.79	87.8
Zinc				40.0	44.35	110.9	40.34	100.8

Comments:

FORM2B.00 - PAGE 1

INORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 2/SW 5/PW
 SDG # 149163 REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION _____ FYI _____ COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	ICP	AA	Hg	CYANIDE
1. HOLDING TIMES	<u>O</u>	<u>O</u>	<u>O</u>	
2. CALIBRATIONS	<u>M</u>	<u>O</u>	<u>O</u>	
3. BLANKS	<u>O</u>	<u>O</u>	<u>O</u>	
4. ICS	<u>O</u>			
5. LCS	<u>O</u>	<u>O</u>		
6. DUPLICATE ANALYSIS	<u>M</u>	<u>O</u>	<u>O</u>	
7. MATRIX SPIKE	<u>M</u>	<u>M</u>	<u>O</u>	
8. MSA		<u>M</u>		
9. SERIAL DILUTION	<u>O</u>			
10. SAMPLE VERIFICATION	<u>O</u>	<u>O</u>	<u>O</u>	
11. OTHER QC	<u>O</u>	<u>O</u>	<u>O</u>	
12. OVERALL ASSESSMENT	<u>M</u>	<u>M</u>	<u>O</u>	

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: CRDL cal. std. outside limits for Au, Be, Cd, Cr, Cu, Ag. Duplicates outside limits for Al, Fe, Mn, Zn. Matrix spikes out for Al, Cd, Fe, Se. Post-digest spikes out for Se, Pb, As, Tl.

NOTABLE PERFORMANCE: _____



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill/Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

Case Narrative
De Maximis

Case No. 30360 SDG No. 149163
Contract 788

Client Sample No.: PW03FBSN, PW11SN, PW20SN, PW28SN, PW37SN,
SW49SN, SW58SN

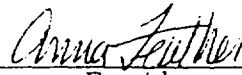
This case consisted of seven water samples analyzed for Target Analyte List metals. The samples were received intact on February 16 and 17, 1990 with the Traffic Reports and Chain-of-Custody (COC) Records. The enclosed cover page reflects De Maximis and CompuChem sample identifiers.

The associated quality control sample spike, SW58SNS, was outside the control limits for aluminum, cadmium, iron, and selenium, therefore the concentrations were flagged with an 'N'. The duplicate, SW58SND, was outside the control limits aluminum, iron, manganese, and zinc, therefore the concentrations were flagged with an '*'.

Method of Standard Addition (MSA) was done for lead in sample SW49SN and the concentration was flagged with an 'S'.

A serial dilution was done on sample SW49SNL. The adjusted sample concentrations were within 10% of the original concentrations for all of the analytes tested.

In one or more of the samples, the concentrations of analytes fell between, below, and above the Instrument Detection Limits (IDLs) and the Contract Required Detection Limits (CRDLs).



Anna Feather
Technical Reviewer
March 13, 1990

Note: This report is paginated for reference and accountability in numerical sequence.

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2B

CRDL STANDARD FOR AA AND ICP

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 149163AA CRDL Standard Source: SPEXICP CRDL Standard Source: SPEX

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony				120.0	106.60	88.8	94.83	79.0
Arsenic	10.0	9.74	97.4					
Barium								
Beryllium				10.0	7.86	78.6	8.68	86.8
Cadmium				10.0	9.27	92.7	6.00	60.0
Calcium								
Chromium				20.0	13.37	66.8	14.18	70.9
Cobalt				100.0	104.04	104.0	93.36	93.4
Copper				50.0	40.20	80.4	34.15	68.3
Iron								
Lead	3.0	2.99	99.7					
Magnesium								
Manganese				30.0	29.27	97.6	25.36	84.5
Mercury								
Nickel				80.0	82.56	103.2	75.73	94.7
Potassium								
Selenium	5.0	4.61	92.2					
Silver				20.0	16.70	83.5	12.12	60.6
Sodium								
Thallium	10.0	10.70	107.0					
Vanadium				100.0	99.78	99.8	94.04	94.0
Zinc				40.0	44.29	110.7	35.03	87.6

Comments:

FORM2B.00 - PAGE 1

U.S. EPA - CLP

6
DUPLICATES

CLIENT SAMPLE NO.

SW58SND

Lab Name: COMPUCHEM LABORATORIES Contract: 788Lab Code: COMPU Case No.: 30360 SAS No.: _____ SDG No.: 149163Matrix (soil/water): WATER Level (low/med): LOW% Solids for Sample: 0.0 % Solids for Duplicate: 0.0Concentration Units: UG/L

Analyte	Control Limit	Sample (S) C	Duplicate (D) C	RPD	Q	M
Aluminum		1848.1000	8144.0000	126.0	*	P
Antimony		21.0000 U	21.0000 U			P
Arsenic		3.0000 U	3.0000 U			F
Barium		61.1700 B	86.2000 B	34.0		P
Beryllium		1.1600 B	1.0000 U	200.0		P
Cadmium		5.0000 U	5.0000 U			P
Calcium		53234.0000	54439.0000	2.2		P
Chromium		5.0000 U	5.9300 B	200.0		P
Cobalt		3.0000 U	4.5900 B	200.0		P
Copper		4.0000 U	7.4900 B	200.0		P
Iron		2727.9001	10256.0000	116.0	*	P
Lead	3.0	4.0500	4.2600	5.1		F
Magnesium	5000.0	18548.0000	19791.0000	6.5		P
Manganese		114.6200	145.5300	23.8	*	P
Mercury		0.2000 U	0.2000 U			CV
Nickel		29.0000 U	29.0000 U			P
Potassium		1260.0000 U	1971.6001 B	200.0		P
Selenium		10.0000 U	10.0000 U			F
Silver		4.0000 U	4.0000 U			P
Sodium	5000.0	9878.5000	11040.0000	11.1		P
Thallium		2.0000 U	2.0000 U			F
Vanadium		4.0100 B	17.0600 B	123.9		P
Zinc	20.0	33.8500	58.1100	52.8	*	P
Cyanide						NR

Comments:

FORM 6 - PAGE 1 (S) Lab ID:320001

ICP Metals Dup. Lab ID:320003

AA Metals Dup. Lab ID:320003

Mercury Dup. Lab ID:320003

Cyanide Dup. Lab ID:

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

CLIENT SAMPLE NO.

SW58SNS

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 149163Matrix: WATERLevel (low/med): LOW% Solids for Sample: 0.0Concentration Units: UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Aluminum	75-125	4436.6001	1848.1000	2000.00	129.4	N	P
Antimony	75-125	438.5000	21.0000 U	500.00	87.7		P
Arsenic	75-125	33.2200	3.0000 U	40.00	83.0		F
Barium	75-125	1951.8000	61.1700 B	2000.00	94.5		P
Beryllium	75-125	50.0600	1.1600 B	50.00	97.8		P
Cadmium	75-125	29.6400	5.0000 U	50.00	59.3	N	P
Calcium							NR
Chromium	75-125	181.7000	5.0000 U	200.00	90.8		P
Cobalt	75-125	462.9500	3.0000 U	500.00	92.6		P
Copper	75-125	229.9700	4.0000 U	250.00	92.0		P
Iron	75-125	4813.5000	2727.9001	1000.00	208.6	N	P
Lead	75-125	20.9100	4.0500	20.00	84.3		F
Magnesium							NR
Manganese	75-125	582.6000	114.6200	500.00	93.6		P
Mercury	75-125	0.7580	0.2000 U	1.00	75.8		CV
Nickel	75-125	473.2200	29.0000 U	500.00	94.6		P
Potassium							NR
Selenium	75-125	2.0000 U	10.0000 U	10.00	0.0	N	F
Silver	75-125	41.5400	4.0000 U	50.00	83.1		P
Sodium							NR
Thallium	75-125	46.5400	2.0000 U	50.00	93.1		F
Vanadium	75-125	456.6200	4.0100 B	500.00	90.5		P
Zinc	75-125	482.4300	33.8500	500.00	89.7		P
Cyanide							NR

Comments:

FORM 5A -PAGE 1 (SR)Lab ID:320001

ICP Metals (SSR)Lab ID:320002

AA Metals (SSR)Lab ID:320002

Mercury (SSR)Lab ID:320002

Cyanide (SSR)Lab ID:

U.S. EPA - CLP

5B

CLIENT SAMPLE NO.

POST DIGEST SPIKE SAMPLE RECOVERY

SW58SNA

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 149163Matrix: WATERLevel (low/med): LOW

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Aluminum		5163.50	1848.10	3700.0	89.6		P
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium		17.72	5.00	10.0	127.2		P
Calcium							
Chromium							
Cobalt							
Copper							
Iron		6942.90	2727.90	5400.0	78.1		P
Lead							
Magnesium							
Manganese							
Mercury							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							
Cyanide							

Comments:

FORM 5B - PAGE 1 Lab Sample ID:320001

DATA ASSESSMENT SUMMARY

NOTABLE PERFORMANCE:



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill/Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

Case Narrative
De Maximis
Case No. 30360 SDG No. 91498D
Contract No. 788

Client Sample No.: GW-04SN, GW-4SN, GW10SN, GW18SN, GW25SN,
GW32SN, GW41SN, GW49SN, GW57SN, GW77SN,
GW85SN, GW91DPSN, PW10SN, SW-13SN, SW21SN,
SW31DPSN, SW39SN, SW48SN, SW57SN, SW63EBSN

This case consisted of twenty water samples analyzed for the Inorganic Target Analyte List (TAL) metals. The samples were received intact on February 7, 8, 9, 13, 15, 16, 17, 1990 with the Chain-of-Custody (COC) Records. The enclosed cover page reflects De Maximis and CompuChem sample identifiers.

The associated quality control sample spike, SW57SNS, was outside the control limits for selenium, therefore the concentration was flagged with an 'N'. The duplicate, SW57SND, was within the control limits for all of the analytes tested.

The third continuing calibration verification fell outside of the control limits for potassium. The instrument was re-calibrated and all associated samples were re-analyzed.

A serial dilution was done on sample SW39SN. The adjusted sample concentrations of calcium and magnesium were not within 10% of the original concentrations, therefore all of the data were flagged with an 'E'.

In one or more of the samples, the concentrations of analytes fell between, below, and above the Instrument Detection Limits (IDLs) and the Contract Required Detection Limits (CRDLs).


Anna Feather
Technical Reviewer
March 2, 1990

Note: This report is paginated for reference and accountability in numerical sequence.

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2B

CRDL STANDARD FOR AA AND ICP

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 91498DAA CRDL Standard Source: SPEX/CCICP CRDL Standard Source: SPEX/CC

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony				120.0	112.54	93.8	111.31	92.8
Arsenic	10.0	10.25	102.5	70.0	78.02	111.5	59.93	85.6
Barium								
Beryllium				10.0	9.85	98.5	9.92	99.2
Cadmium				10.0	11.25	112.5	8.54	85.4
Calcium								
Chromium				20.0	20.70	103.5	20.50	102.5
Cobalt				100.0	114.57	114.6	95.19	95.2
Copper				50.0	53.91	107.8	46.91	93.8
Iron								
Lead	3.0	3.20	106.7					
Magnesium								
Manganese				30.0	33.02	110.1	24.11	80.4
Mercury								
Nickel				80.0	73.69	92.1	73.99	92.5
Potassium								
Selenium	5.0	4.70	94.0					
Silver				20.0	20.91	104.6	20.13	100.6
Sodium								
Thallium	10.0	10.77	107.7					
Vanadium				100.0	104.24	104.2	94.40	94.4
Zinc				40.0	42.79	107.0	40.54	101.4

Comments:

FORM2B.00 - PAGE 1

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

CLIENT SAMPLE NO.

SW57SNS

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 91498DMatrix: WATERLevel (low/med): LOW% Solids for Sample: 0.0Concentration Units: UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum	75-125	2325.7000		149.1700	B	2000.00	108.8		P
Antimony	75-125	557.3500		21.0000	U	500.00	111.5		P
Arsenic	75-125	2336.0000		34.0000	U	2000.00	116.8		P
Barium	75-125	2276.0999		32.1100	B	2000.00	112.2		P
Beryllium	75-125	59.8900		1.0000	U	50.00	119.8		P
Cadmium	75-125	39.7000		5.0000	U	50.00	79.4		P
Calcium									NR
Chromium	75-125	233.1300		5.0000	U	200.00	116.6		P
Cobalt	75-125	606.3600		7.2200	B	500.00	119.8		P
Copper	75-125	275.8900		4.0000	U	250.00	110.4		P
Iron	75-125	1311.0000		162.7300		1000.00	114.8		P
Lead	75-125	18.8600		2.1200	B	20.00	83.7		F
Magnesium									NR
Manganese	75-125	592.5400		14.8600	B	500.00	115.5		P
Mercury	75-125	1.0370		0.2000	U	1.00	103.7		CV
Nickel	75-125	584.1700		29.0000	U	500.00	116.8		P
Potassium									NR
Selenium	75-125	3.9500	B	2.0000	U	10.00	39.5	N	F
Silver	75-125	53.2100		4.0000	U	50.00	106.4		P
Sodium									NR
Thallium	75-125	48.5500		2.0000	U	50.00	97.1		F
Vanadium	75-125	557.2200		7.1700	B	500.00	110.0		P
Zinc	75-125	592.3400		2.5000	B	500.00	118.0		P
Cyanide									NR

Comments:

FORM 5A -PAGE 1 (SR)Lab ID:320006

ICP Metals (SSR)Lab ID:318320

AA Metals (SSR)Lab ID:318320

Mercury (SSR)Lab ID:318320

Cyanide (SSR)Lab ID:

U.S. EPA - CLP

5B
POST DIGEST SPIKE SAMPLE RECOVERY

CLIENT SAMPLE NO.

SW57SNA

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 91498DMatrix: WATERLevel (low/med): LOW

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR) C	Sample Result (SR) C	Spike Added (SA)	%R	Q	M
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							
Cyanide							

Comments:

FORM 5B - PAGE 1 NO POST DIGEST SPIKES WERE REQUIRED FOR FLAME AA
ICP, MERCURY, AND CYANIDE ANALYSES.

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

GW-4SN

Lab Name: COMPUCHEM LABORATORIESContract: 788Lab Code: COMPUCase No.: 30360

SAS No.: _____

SDG No.: 91498DMatrix (soil/water): WATERLab Sample ID: 319420Level (low/med): LOWDate Received: 02/14/90% Solids: 0.0Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	65.0	B		P
7440-36-0	Antimony	21.0	U		P
7440-38-2	Arsenic	3.0	U		F
7440-39-3	Barium	52.2	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	76200		E	P
7440-47-3	Chromium	5.0	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	11.3	B		P
7439-89-6	Iron	10.8	B		P
7439-92-1	Lead	2.0	U		F
7439-95-4	Magnesium	24700		E	P
7439-96-5	Manganese	23.9			P
7439-97-6	Mercury	.20	U		CV
7440-02-0	Nickel	29.0	U		P
7440-09-7	Potassium	1560	B		P
7782-49-2	Selenium	4.0	U	WN	F
7440-22-4	Silver	4.0	U		P
7440-23-5	Sodium	10600			P
7440-28-0	Thallium	2.0	U		F
7440-62-2	Vanadium	5.5	B		P
7440-66-6	Zinc	3.4	B		P
	Cyanide				NR

Color Before: COLORLESSClarity Before: CLEAR

Texture: _____

Color After: COLORLESSClarity After: CLEAR

Artifacts: _____

Comments:

FORM 1 - PAGE 2

INORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 3/SW 5/PW
 SDG # 149136 REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION _____ FYI _____ COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	ICP	AA	Hg	CYANIDE
1. HOLDING TIMES				O
2. CALIBRATIONS				O
3. BLANKS				O
4. ICS				
5. LCS				
6. DUPLICATE ANALYSIS				O
7. MATRIX SPIKE				O
8. MSA				
9. SERIAL DILUTION				
10. SAMPLE VERIFICATION				O
11. OTHER QC				O
12. OVERALL ASSESSMENT				O

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: _____

NOTABLE PERFORMANCE: No problems

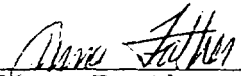
Case Narrative
De Maximis
Case No. 30360 SDG No. 149136
Contract 788

Client Sample No.: PW12SN, PW21SN, PW29SN, PW38SN, PW04FBSN,
SW41SN, SW50SN, SW59SN

This case consisted of eight water samples analyzed for cyanide. The samples were received intact on February 15, 16, and 17, 1990 with the Traffic Reports and Chain-of-Custody (COC) Records. The enclosed cover page reflects De Maximis and CompuChem sample identifiers.

The associated quality control sample spike, SW59SNS, and duplicate, SW59SND, were within the control limits for cyanide.

The concentration of cyanide fell below the Instrument Detection Limit in all of the samples.


Anna Feather
Technical Reviewer
March 12, 1990

Note: This report is paginated for reference and accountability in numerical sequence.

INORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 4/SW 11/GW
 SDG # 191498 REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION _____ FYI _____ COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	ICP	AA	Hg	CYANIDE
1. HOLDING TIMES	_____	_____	_____	<u>O</u>
2. CALIBRATIONS	_____	_____	_____	<u>O</u>
3. BLANKS	_____	_____	_____	<u>O</u>
4. ICS	_____	_____	_____	
5. LCS	_____	_____	_____	
6. DUPLICATE ANALYSIS	_____	_____	_____	<u>O</u>
7. MATRIX SPIKE	_____	_____	_____	<u>O</u>
8. MSA	_____	_____	_____	
9. SERIAL DILUTION	_____	_____	_____	
10. SAMPLE VERIFICATION	_____	_____	_____	<u>O</u>
11. OTHER QC	_____	_____	_____	<u>O</u>
12. OVERALL ASSESSMENT	_____	_____	_____	<u>O</u>

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: _____

NOTABLE PERFORMANCE: No problems



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill/Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

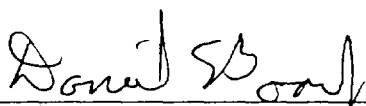
CASE NARRATIVE --De Maximis
CASE # 30360 SDG# 191498
CONTRACT # 788

Sample Numbers: GW-05SN, GW11SN, GW19SN, GW26SN, GW33SN,
GW42SN, GW50SN, GW58SN, GW78SN, GW86SN, GW92DPSN, SW-15SN,
SW-6SN, SW23SN, SW33DPSN

This Case consisted of fifteen water samples to be analyzed for Cyanide. The samples were received intact on February 7, 8, 9, and 13, 1990 with Chain of Custody (COC) Records in order. The enclosed cover page reflects De Maximis and CompuChem sample identifiers.

The associated quality control sample spike, GW58SNS, was within the control limits for Cyanide. The associated duplicate, GW58SND, was within the control limits for Cyanide.

In one of the samples the concentration of Cyanide was above and the Contract Required Detection Limit (CRDL). While the concentration of Cyanide in the remaining samples was below the CRQL.


Daniel E. Boone, Jr. 03/02/90
Technical Reviewer

ORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 18/GW
 SDG # 19149 01 REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION FYI COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	VOA	BNA	PEST	OTHER
1. HOLDING TIMES	<u>O</u>	<u>O</u>		
2. GC/MS TUNE/INSTR. PERFORM.	<u>O</u>	<u>O</u>		
3. CALIBRATIONS	<u>M</u>	<u>M</u>		
4. BLANKS	<u>M</u>	<u>O</u>		
5. SURROGATES	<u>O</u>	<u>O</u>		
6. MATRIX SPIKE/DUP	<u>O</u>	<u>O</u>		
7. OTHER QC	<u>O</u>	<u>O</u>		
8. INTERNAL STANDARDS	<u>O</u>	<u>O</u>		
9. COMPOUND IDENTIFICATION	<u>O</u>	<u>O</u>		
10. SYSTEM PERFORMANCE	<u>O</u>	<u>O</u>		
11. OVERALL ASSESSMENT	<u>M</u>	<u>M</u>		

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: CCV outside limits for methylene chloride, acetone, bis(2EH)phthalate. Blanks contain methylene chloride, acetone.

NOTABLE PERFORMANCE: _____



COMPUCHEM LABORATORIES

CASE NARRATIVE CASE #19149
SDG #01 CONTRACT #(2-88)REVS
COMPUCHEM LABORATORIES, INC.

SAMPLE NUMBERS: GW-02-SN GW-16-SN GW-23-SN GW-30-SN
GW-36-TB GW-37-TB GW-39-SN GW-45-TB-SN
GW-47-SN GW-8-SN LABPURE GW-53-TB-SN

ALL OF THE SAMPLES LISTED ABOVE WERE RECEIVED INTACT ON 2-7-90, 2-8-90, AND 2-9-90 WITH THE CHAIN-OF-CUSTODY DOCUMENTS IN ORDER AND THE SHIPPING CONTAINERS PROPERLY SEALED. THIS NARRATIVE SUMMARIZES THE ANALYSIS OF TWELVE OF THESE LIQUID SAMPLES FOR VOLATILES AND SEVEN FOR SEMIVOLATILES.

VOLATILES:

ALL SAMPLE AND QC FRACTIONS WERE ANALYZED WITHIN HOLDING TIMES. MOST SAMPLES CONTAINED METHYLENE CHLORIDE AND/OR ACETONE WHILE 1,2-DICHLOROETHENE (REPORTED AS TOTAL ISOMESR), VINYL CHLORIDE, AND TRICHLOROETHENE WERE ALSO DETECTED. NO SAMPLES CONTAINED ANY TENTATIVELY IDENTIFIED COMPOUNDS (TICS). ALL SAMPLE AND QC FRACTIONS MET THE SURROGATE RECOVERY CRITERIA. THE MATRIX SPIKE DUPLICATES MET ALL ACCURACY AND PRECISION CRITERIA.

SEMIVOLATILES:

ALL SAMPLE AND QC FRACTIONS WERE EXTRACTED WITHIN HOLDING TIMES. MOST SAMPLES CONTAINED NO TARGET LIST COMPOUNDS (TICS) ALTHOUGH BIS(2-ETHYLHEXYL)PHTHALATE WAS DETECTED AT LOW CONCENTRATIONS IN SOME SAMPLES. SAMPLE GW-03-SN, GW-17-SN, AND GW-9-SN CONTAINED TWO, THREE, AND ONE TIC, RESPECTIVELY. ALL SAMPLE AND QC FRACTIONS MET THE SURROGATE RECOVERY CRITERIA. THE MATRIX SPIKE DUPLICATES MET ALL ACCURACY AND PRECISION CRITERIA.

NOTE: THIS DATA PACKAGE WAS PAGINATED FOR REFERENCE AND ACCOUNTABILITY IN DECREASING NUMERICAL SEQUENCE.



COMPUCHEM
LABORATORIES

Elisabeth R Nowell

ELISABETH ROBINS NOWELL
TECHNICAL REVIEWER
2-22-90

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKHS

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS

Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 01

Matrix: (soil/water) WATER Lab Sample ID: VBLKHS

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CB900207A03

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. _____ Date Analyzed: 02/07/90

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	
67-64-1	Acetone	9	J
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Total Xylenes	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VLKXC

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 01
 Matrix: (soil/water) WATER Lab Sample ID: VLKXC
 Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CB900213B03
 Level: (low/med) LOW Date Received: _____
 % Moisture: not dec. _____ Date Analyzed: 02/13/90
 Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3-----	Chloromethane	10	U
74-83-9-----	Bromomethane	10	U
75-01-4-----	Vinyl Chloride	10	U
75-00-3-----	Chloroethane	10	U
75-09-2-----	Methylene Chloride	2	J
67-64-1-----	Acetone	10	U
75-15-0-----	Carbon Disulfide	5	U
75-35-4-----	1,1-Dichloroethene	5	U
75-34-3-----	1,1-Dichloroethane	5	U
540-59-0-----	1,2-Dichloroethene (total)	5	U
67-66-3-----	Chloroform	5	U
107-06-2-----	1,2-Dichloroethane	5	U
78-93-3-----	2-Butanone	10	U
71-55-6-----	1,1,1-Trichloroethane	5	U
56-23-5-----	Carbon Tetrachloride	5	U
108-05-4-----	Vinyl Acetate	10	U
75-27-4-----	Bromodichloromethane	5	U
78-87-5-----	1,2-Dichloropropane	5	U
10061-01-5-----	cis-1,3-Dichloropropene	5	U
79-01-6-----	Trichloroethene	5	U
124-48-1-----	Dibromochloromethane	5	U
79-00-5-----	1,1,2-Trichloroethane	5	U
71-43-2-----	Benzene	5	U
10061-02-6-----	Trans-1,3-Dichloropropene	5	U
75-25-2-----	Bromoform	5	U
108-10-1-----	4-Methyl-2-Pentanone	10	U
591-78-6-----	2-Hexanone	10	U
127-18-4-----	Tetrachloroethene	5	U
79-34-5-----	1,1,2,2-Tetrachloroethane	5	U
108-88-3-----	Toluene	5	U
108-90-7-----	Chlorobenzene	5	U
100-41-4-----	Ethylbenzene	5	U
100-42-5-----	Styrene	5	U
1330-20-7-----	Total Xylenes	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBKHHV

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 01
 Matrix: (soil/water) WATER Lab Sample ID: VBKHHV
 Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CB900214A03
 Level: (low/med) LOW Date Received: _____
 % Moisture: not dec. _____ Date Analyzed: 02/14/90
 Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3-----	Chloromethane	1	J
74-83-9-----	Bromomethane	1	J
75-01-4-----	Vinyl Chloride	10	U
75-00-3-----	Chloroethane	10	U
75-09-2-----	Methylene Chloride	3	J
67-64-1-----	Acetone	5	J
75-15-0-----	Carbon Disulfide	5	U
75-35-4-----	1,1-Dichloroethene	5	U
75-34-3-----	1,1-Dichloroethane	5	U
540-59-0-----	1,2-Dichloroethene (total)	5	U
67-66-3-----	Chloroform	5	U
107-06-2-----	1,2-Dichloroethane	5	U
78-93-3-----	2-Butanone	10	U
71-55-6-----	1,1,1-Trichloroethane	5	U
56-23-5-----	Carbon Tetrachloride	5	U
108-05-4-----	Vinyl Acetate	10	U
75-27-4-----	Bromodichloromethane	5	U
78-87-5-----	1,2-Dichloropropane	5	U
10061-01-5-----	cis-1,3-Dichloropropene	5	U
79-01-6-----	Trichloroethene	5	U
124-48-1-----	Dibromochloromethane	5	U
79-00-5-----	1,1,2-Trichloroethane	5	U
71-43-2-----	Benzene	5	U
10061-02-6-----	Trans-1,3-Dichloropropene	5	U
75-25-2-----	Bromoform	5	U
108-10-1-----	4-Methyl-2-Pentanone	10	U
591-78-6-----	2-Hexanone	10	U
127-18-4-----	Tetrachloroethene	5	U
79-34-5-----	1,1,2,2-Tetrachloroethane	5	U
108-88-3-----	Toluene	5	U
108-90-7-----	Chlorobenzene	5	U
100-41-4-----	Ethylbenzene	5	U
100-42-5-----	Styrene	5	U
1330-20-7-----	Total Xylenes	5	U

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 01
 Instrument ID: 03 Calibration date: 02/07/90 Time: 1359
 Lab File ID: CS900207A03 Init. Calib. Date(s): 01/31/90 01/31/90
 Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) CAP
 Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Chloromethane	0.697	0.508	27.1
Bromomethane	1.140	0.894	21.6
Vinyl Chloride	1.267	1.138	10.2
Chloroethane	0.746	0.518	30.6
Methylene Chloride	1.530	1.938	-26.7
Acetone	0.465	0.291	37.4
Carbon Disulfide	4.034	3.691	8.5
1,1-Dichloroethene	1.301	1.350	-3.8
1,1-Dichloroethane	3.141	2.928	6.8
1,2-Dichloroethene (total)	2.979	3.162	-6.1
Chloroform	3.402	2.656	21.9
1,2-Dichloroethane	3.271	1.568	52.1
2-Butanone	0.105	0.128	-21.9
1,1,1-Trichloroethane	0.864	0.481	44.3
Carbon Tetrachloride	0.844	0.419	50.4
Vinyl Acetate	0.931	0.830	10.9
Bromodichloromethane	0.836	0.538	35.7
1,2-Dichloropropane	0.447	0.395	11.6
cis-1,3-Dichloropropene	0.797	0.615	22.8
Trichloroethene	0.466	0.428	8.2
Dibromochloromethane	0.666	0.520	21.9
1,1,2-Trichloroethane	0.356	0.447	-25.6
Benzene	0.970	0.932	3.9
Trans-1,3-Dichloropropene	0.466	0.299	35.8
Bromoform	0.533	0.363	31.9
4-Methyl-2-Pentanone	0.404	0.315	22.0
2-Hexanone	0.301	0.317	-5.3
Tetrachloroethene	0.578	0.505	12.6
1,1,2,2-Tetrachloroethane	0.606	0.745	-22.9
Toluene	0.655	0.545	16.8
Chlorobenzene	0.962	0.986	-2.5
Ethylbenzene	0.464	0.452	2.6
Styrene	1.080	1.112	-3.0
Total Xylenes	1.308	1.284	1.8
Toluene-d8	0.997	0.770	22.8
BFB	0.952	0.852	10.5
1,2-Dichloroethane-d4	2.876	1.380	52.0

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 01
 Instrument ID: 03 Calibration date: 02/13/90 Time: 1921
 Lab File ID: CV900213B03 Init. Calib. Date(s): 01/31/90 01/31/90
 Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) CAP
 Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Chloromethane	0.697	0.990	-42.0
Bromomethane	1.140	0.934	18.1
Vinyl Chloride	1.267	1.178	7.0
Chloroethane	0.746	0.474	36.5
Methylene Chloride	1.530	1.539	-0.6
Acetone	0.465	0.168	63.9
Carbon Disulfide	4.034	2.945	27.0
1,1-Dichloroethene	1.301	1.291	0.8
1,1-Dichloroethane	3.141	2.407	23.4
1,2-Dichloroethene (total)	2.979	3.158	-6.0
Chloroform	3.402	2.559	24.8
1,2-Dichloroethane	3.271	1.390	57.5
2-Butanone	0.105	0.090	14.3
1,1,1-Trichloroethane	0.864	0.549	36.5
Carbon Tetrachloride	0.844	0.527	37.6
Vinyl Acetate	0.931	0.530	43.1
Bromodichloromethane	0.836	0.590	29.4
1,2-Dichloropropane	0.447	0.342	23.5
cis-1,3-Dichloropropene	0.797	0.652	18.2
Trichloroethene	0.466	0.502	-7.7
Dibromochloromethane	0.666	0.679	-2.0
1,1,2-Trichloroethane	0.356	0.372	-4.5
Benzene	0.970	0.998	-2.9
Trans-1,3-Dichloropropene	0.466	0.320	31.3
Bromoform	0.533	0.485	9.0
4-Methyl-2-Pentanone	0.404	0.199	50.7
2-Hexanone	0.301	0.165	45.2
Tetrachloroethene	0.578	0.646	-11.8
1,1,2,2-Tetrachloroethane	0.606	0.753	-24.3
Toluene	0.655	0.596	9.0
Chlorobenzene	0.962	1.123	-16.7
Ethylbenzene	0.464	0.544	-17.2
Styrene	1.080	1.136	-5.2
Total Xylenes	1.308	1.398	-6.9
Toluene-d8	0.997	0.783	21.5
BFB	0.952	0.912	4.2
1,2-Dichloroethane-d4	2.876	1.162	59.6

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 01
 Instrument ID: 03 Calibration date: 02/14/90 Time: 0716
 Lab File ID: CT900214C03 Init. Calib. Date(s): 01/31/90 01/31/90
 Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP
 Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Chloromethane	0.697	0.946	-35.7
Bromomethane	1.140	0.961	15.7
Vinyl Chloride	1.267	1.150	9.2
Chloroethane	0.746	0.465	37.7
Methylene Chloride	1.530	1.555	-1.6
Acetone	0.465	0.219	52.9
Carbon Disulfide	4.034	3.128	22.5
1,1-Dichloroethene	1.301	1.322	-1.6
1,1-Dichloroethane	3.141	2.559	18.5
1,2-Dichloroethene (total)	2.979	3.051	-2.4
Chloroform	3.402	2.725	19.9
1,2-Dichloroethane	3.271	1.668	49.0
2-Butanone	0.105	0.100	4.8
1,1,1-Trichloroethane	0.864	0.591	31.6
Carbon Tetrachloride	0.844	0.614	27.3
Vinyl Acetate	0.931	0.548	41.1
Bromodichloromethane	0.836	0.599	28.4
1,2-Dichloropropane	0.447	0.354	20.8
cis-1,3-Dichloropropene	0.797	0.667	16.3
Trichloroethene	0.466	0.503	-7.9
Dibromochloromethane	0.666	0.698	-4.8
1,1,2-Trichloroethane	0.356	0.455	-27.8
Benzene	0.970	1.043	-7.5
Trans-1,3-Dichloropropene	0.466	0.332	28.8
Bromoform	0.533	0.524	1.7
4-Methyl-2-Pentanone	0.404	0.186	54.0
2-Hexanone	0.301	0.160	46.8
Tetrachloroethene	0.578	0.641	-10.9
1,1,2,2-Tetrachloroethane	0.606	0.634	-4.6
Toluene	0.655	0.564	13.9
Chlorobenzene	0.962	1.058	-10.0
Ethylbenzene	0.464	0.503	-8.4
Styrene	1.080	1.082	-0.2
Total Xylenes	1.308	1.358	-3.8
Toluene-d8	0.997	0.763	23.5
BFB	0.952	0.849	10.8
1,2-Dichloroethane-d4	2.876	1.433	50.2

7C
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 01
 Instrument ID: 20 Calibration date: 02/10/90 Time: 1152
 Lab File ID: HH900210A20 Init. Calib. Date(s): 12/21/89 12/21/89
 Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Dibenzofuran	1.723	1.601	7.1
2,4-Dinitrotoluene	0.388	0.307	20.9
Diethylphthalate	1.626	1.363	16.2
4-Chlorophenyl-phenylether	0.745	0.517	30.6
Fluorene	1.580	1.429	9.6
4-Nitroaniline	0.229	0.199	13.1
4,6-Dinitro-2-Methylphenol	0.126	0.093	26.2
N-Nitrosodiphenylamine (1)	* 0.697	0.551	21.0 *
4-Bromophenyl-phenylether	0.257	0.249	3.1
Hexachlorobenzene	0.317	0.304	4.1
Pentachlorophenol	* 0.134	0.123	8.2 *
Phenanthrene	1.355	1.239	8.6
Anthracene	1.328	1.196	9.9
Di-n-Butylphthalate	1.867	1.475	21.0
Fluoranthene	* 1.014	0.996	1.8 *
Pyrene	1.637	1.579	3.5
Butylbenzylphthalate	0.919	0.726	21.0
3,3'-Dichlorobenzidine	0.189	0.112	40.7
Benzo(a)Anthracene	1.112	1.043	6.2
Chrysene	1.274	0.968	24.0
bis(2-Ethylhexyl)Phthalate	1.819	1.070	41.2
Di-n-Octyl Phthalate	* 2.739	2.216	19.1 *
Benzo(b)Fluoranthene	1.541	1.281	16.9
Benzo(k)Fluoranthene	1.154	0.893	22.6
Benzo(a)Pyrene	* 1.135	1.028	9.4 *
Indeno(1,2,3-cd)Pyrene	1.278	1.259	1.5
Dibenzo(a,h)Anthracene	1.122	1.059	5.6
Benzo(g,h,i)Perylene	1.019	0.979	3.9
Nitrobenzene-d5	0.595	0.488	18.0
2-Fluorobiphenyl	1.583	1.475	6.8
Terphenyl-d14	1.152	1.140	1.0
Phenol-d5	1.450	1.573	-8.5
2-Fluorophenol	1.413	1.314	7.0
2,4,6-Tribromophenol	0.140	0.130	7.1

(1) Cannot be separated from Diphenylamine

7C
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 01
 Instrument ID: 22 Calibration date: 02/08/90 Time: 0325
 Lab File ID: HH900208C22 Init. Calib. Date(s): 01/02/90 01/02/90
 Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Dibenzofuran	1.706	1.596	6.4
2,4-Dinitrotoluene	0.439	0.432	1.6
Diethylphthalate	1.614	1.850	-14.6
4-Chlorophenyl-phenylether	0.524	0.493	5.9
Fluorene	1.310	1.324	-1.1
4-Nitroaniline	0.205	0.203	1.0
4,6-Dinitro-2-Methylphenol	0.140	0.123	12.1
N-Nitrosodiphenylamine (1)	0.623	0.514	17.5 *
4-Bromophenyl-phenylether	0.226	0.197	12.8
Hexachlorobenzene	0.269	0.249	7.4
Pentachlorophenol	0.132	0.105	20.5 *
Phenanthrene	1.273	1.147	9.9
Anthracene	1.214	1.066	12.2
Di-n-Butylphthalate	1.819	1.969	-8.2
Fluoranthene	1.141	1.105	3.2 *
Pyrene	1.599	1.485	7.1
Butylbenzylphthalate	0.975	1.171	-20.1
3,3'-Dichlorobenzidine	0.107	0.111	-3.7
Benzo(a)Anthracene	1.136	1.138	-0.2
Chrysene	1.040	0.979	5.9
bis(2-Ethylhexyl) Phthalate	1.406	1.797	-27.8
Di-n-Octyl Phthalate	3.204	3.343	-4.3 *
Benzo(b) Fluoranthene	1.463	1.303	10.9
Benzo(k) Fluoranthene	0.962	1.116	-16.0
Benzo(a) Pyrene	1.072	1.018	5.0 *
Indeno(1,2,3-cd) Pyrene	1.106	1.279	-15.6
Dibenzo(a,h) Anthracene	0.848	1.021	-20.4
Benzo(g,h,i) Perylene	0.902	1.001	-11.0
Nitrobenzene-d5	0.686	0.591	13.9
2-Fluorobiphenyl	1.338	1.323	1.1
Terphenyl-d14	1.110	1.019	8.2
Phenol-d5	2.158	1.425	34.0
2-Fluorophenol	1.726	1.109	35.8
2,4,6-Tribromophenol	0.125	0.182	-45.6

(1) Cannot be separated from Diphenylamine

ORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 1/PW
 SDG # 19149 180 REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION FYI COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	VOA	BNA	PEST	OTHER
1. HOLDING TIMES		O		
2. GC/MS TUNE/INSTR. PERFORM.		O		
3. CALIBRATIONS		O		
4. BLANKS		O		
5. SURROGATES		X		
6. MATRIX SPIKE/DUP		X		
7. OTHER QC		O		
8. INTERNAL STANDARDS		O		
9. COMPOUND IDENTIFICATION		O		
10. SYSTEM PERFORMANCE		O		
11. OVERALL ASSESSMENT		X		

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: Surrogate recovery over limit for 246-tribromophenol. Matrix spike over-recovered for 24-dinitrotoluene, PCP. Some CCVs out but not for compounds detected in case.

NOTABLE PERFORMANCE: _____



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill / Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

CASE NARRATIVE CASE #19149
SDG #180 CONTRACT #(2-88)REVS
COMPUCHEM LABORATORIES, INC.

SAMPLE NUMBER: PW35SN

THE SAMPLE LISTED ABOVE WAS RECEIVED INTACT ON 2-17-90 WITH THE CHAIN-OF-CUSTODY DOCUMENT IN ORDER AND THE SHIPPING CONTAINER PROPERLY SEALED. THIS NARRATIVE SUMMARIZES THE ANALYSIS OF THIS LIQUID SAMPLE FOR SEMIVOLATILES.

SEMIVOLATILES:

ALL SAMPLE AND QC FRACTIONS WERE EXTRACTED WITHIN HOLDING TIMES. THE SAMPLE CONTAINED NO TARGET LIST COMPOUNDS (TCLs) OR TENTATIVELY IDENTIFIED COMPOUNDS (TICs). ALL SAMPLE AND QC FRACTIONS MET THE SURROGATE RECOVERY CRITERIA; HOWEVER, TRIBROMOPHENOL HAD A HIGH RECOVERY IN THE MATRIX SPIKE DUPLICATE. THE MATRIX SPIKE DUPLICATES MET OVERALL ACCURACY AND PRECISION CRITERIA, BUT IN THE MATRIX SPIKE 2,4-DINITROTOLUENE HAD A PERCENT RECOVERY OF 100 VERSUS AN UPPER LIMIT OF 96, AND IN THE MATRIX SPIKE DUPLICATE PENTACHLOROPHENOL HAD A PERCENT RECOVERY OF 104 VERSUS AN UPPER LIMIT OF 103. A LARGE PEAK WHICH HAD A BEST MATCH IN THE NBS LIBRARY FOR ALPHA, ALPHA-DIMETHYLBENZENEMETHANOL WAS DETECTED AS A TIC IN BLANK 320670 (SBLK76). THIS COMPOUND WAS NOT DETECTED AS A TIC IN ANY OF THE ASSOCIATED SAMPLES. CARRYOVER WAS NOT A FACTOR AS THE SAMPLE ANALYZED JUST PRIOR TO BLANK 320670 WAS ANOTHER BLANK WHICH DID NOT CONTAIN THE TIC.

NOTE: THIS DATA PACKAGE WAS PAGINATED FOR REFERENCE AND ACCOUNTABILITY IN DECREASING NUMERICAL SEQUENCE.

ELISABETH ROBINS NOWELL
TECHNICAL REVIEWER
3-1-90

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 180

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01	PW35SN	64	97	110	38	63	93		0
02	PW35SNMS	75	82	107	70	82	117		0
03	PW35SNMSD	70	77	107	62	81	128 *		1
04	SBLK69	61	72	97	43	70	113		0
05	SBLK76	71	83	97	41	61	88		0

QC LIMITS

S1 (NBZ) = Nitrobenzene-d5 (35-114)
 S2 (FBP) = 2-Fluorobiphenyl (43-116)
 S3 (TPH) = Terphenyl (33-141)
 S4 (PHL) = Phenol-d5 (10-94)
 S5 (2FP) = 2-Fluorophenol (21-100)
 S6 (TBP) = 2,4,6-Tribromophenol (10-123)

Column to be used to flag recovery values
 * Values outside of contract required QC limits
 D Surrogates diluted out

3C

WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: COMPUCHEM LABSContract: (2-88)-REVSLab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 180Matrix Spike - EPA Sample No.: PW35SN

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
Phenol	200	0	167	84	12- 86
2-Chlorophenol	200	0	210	105	27-123
1,4-Dichlorobenzene	100	0	78.8	79	36 97
N-Nitroso-di-n-prop. (1)	100	0	66.4	66	41 116
1,2,4-Trichlorobenzene	100	0	78.8	79	39 98
4-Chloro-3-methylphenol	200	0	177	89	23 97
Acenaphthene	100	0	92.2	92	46-118
4-Nitrophenol	200	0	123	62	10- 80
2,4-Dinitrotoluene	100	0	100	100 *	24- 96
Pentachlorophenol	200	0	204	102	9-103
Pyrene	100	0	110	110	26-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS	
					RPD	REC.
Phenol	200	170	85	-1	42	12- 86
2-Chlorophenol	200	200	100	5	40	27-123
1,4-Dichlorobenzene	100	67.6	68	15	28	36 97
N-Nitroso-di-n-prop. (1)	100	55.2	55	18	38	41 116
1,2,4-Trichlorobenzene	100	68.8	69	14	28	39 98
4-Chloro-3-methylphenol	200	169	85	5	42	23 97
Acenaphthene	100	83.8	84	9	31	46-118
4-Nitrophenol	200	128	64	-3	50	10- 80
2,4-Dinitrotoluene	100	92.8	93	7	38	24- 96
Pentachlorophenol	200	208	104 *	-2	50	9-103
Pyrene	100	104	104	6	31	26-127

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 11 outside limitsSpike Recovery: 2 out of 22 outside limitsCOMMENTS: CLP ,1914,9180, ,LOW,WATER,320284,BNA, ,
TUNE: 0004 022490 0839

ORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 10/SW 10/GW
 SDG # 19149 57 REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION FYI COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	VOA	BNA	PEST	OTHER
1. HOLDING TIMES	<u>O</u>	<u>O</u>	<u></u>	<u></u>
2. GC/MS TUNE/INSTR. PERFORM.	<u>O</u>	<u>O</u>	<u></u>	<u></u>
3. CALIBRATIONS	<u>M</u>	<u>M</u>	<u></u>	<u></u>
4. BLANKS	<u>M</u>	<u>O</u>	<u></u>	<u></u>
5. SURROGATES	<u>O</u>	<u>X</u>	<u></u>	<u></u>
6. MATRIX SPIKE/DUP	<u>O</u>	<u>X</u>	<u></u>	<u></u>
7. OTHER QC	<u>O</u>	<u>O</u>	<u></u>	<u></u>
8. INTERNAL STANDARDS	<u>O</u>	<u>O</u>	<u></u>	<u></u>
9. COMPOUND IDENTIFICATION	<u>O</u>	<u>O</u>	<u></u>	<u></u>
10. SYSTEM PERFORMANCE	<u>O</u>	<u>O</u>	<u></u>	<u></u>
11. OVERALL ASSESSMENT	<u>M</u>	<u>M</u>	<u></u>	<u></u>

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: CCV outside limits for acetone, bis(2EH)phthalate. Blanks contain methylene chloride.
Surrogate recovery over limit for terphenyl. Matrix spike over-recovered for 4-chloro-3-methylphenol, 4-nitrophenol.

NOTABLE PERFORMANCE: _____



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill/Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

CLP CASE NARRATIVE CASE # 19149
CONTRACT # 2-88 (REVS) SDG# 57
COMPUCHEM LABORATORIES INC.

SAMPLES: GW55SN, GW61TBSN, GW75SN, GW80TBSN, GW83SN,
GW89DPSN, SW-02SN, SW-11SN, SW-19SN, SW26TBSN,
SW29DPSN, SW37SN, SW44TBSN, SW9TBSN

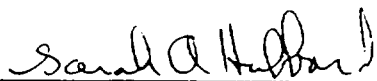
This portion of Case # 19149 consisted of twenty liquid samples for volatile and semivolatile analysis. They were received intact between 2/13/90 and 2/15/90 via Federal Express in properly sealed shipping containers with traffic reports. The above sample listing is of the fourteen volatile samples only. Because of a discrepancy in sample ID's, the ID on the sample container was used for sample SW9TBSN. This portion of the narrative deals only with the volatile fractions of the above case.

VOLATILES:

All volatile fractions were analyzed within holding time requirements. All the samples contained methylene chloride, which was also detected in the associated instrument blanks. In addition, samples GW83SN, GW89DPSN, SW-19SN, SW-26TBSN, SW37SN, and SW44TBSN contained acetone. Sample GW55SN contained acetone, benzene, and chlorobenzene. All surrogates met recovery criteria. The matrix spike/matrix spike duplicate results were acceptable.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Note: This report was paginated for reference and accountability in decreasing numerical sequence.



Sarah A. Hubbard 2/28/90
Technical Reviewer



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill/Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

EPA CASE NARRATIVE--CASE #19149
SDG NO. 57
CONTRACT NO. (2-88)-REVS
COMPUCHEM LABORATORIES, INC.

SAMPLES: GW56SN, GW76SN, GW84SN, GW90DPSN, SW-12SN, SW-3SN

Attached are pertinent analytical data dealing with the analyses of six (6) water samples associated with case #19149 SDG NO. 57. The samples were received intact on 02/13/90 and 02/14/90 in properly sealed shipping containers with the corresponding chains-of-custody. The samples were logged into the CompuChem Laboratory Management system and scheduled for the analyses of volatile and semivolatile fractions. This narrative deals with the semivolatile fractions only.

SEMIVOLATILES

The semivolatile fractions were extracted and analyzed within the prescribed holding time. One semivolatile target compound, bis(2-ethylhexyl)phthalate, was detected in four of the samples identified above. No semivolatile target compounds were detected in the two remaining samples. One to fourteen Tentatively Identified Compounds (TICs) were detected in four of the samples. Included in these were solvent contaminants, which were included on the lists of TICs but are not considered as actual constituents of the samples. No TICs were detected in the remaining two samples. The surrogate recovery data met QC acceptance criteria in the semivolatile fractions. D14-terphenyl was outside of the QC limit in sample GW76SN.

QC SUMMARY

The matrix spike (GW56SN MS) and matrix spike duplicate (GW56SN MSD) met QC criteria. The percent recovery (% REC) for 4-chloro-3-methylphenol was outside of the QC limits in the MS and MSD. Also, the % REC for 4-nitrophenol was outside of the QC limits in the MSD. Two target compounds, benzoic acid and bis(2-ethylhexyl)phthalate, were detected in the MS and MSD. The associated blanks, standards, initial calibrations and continuing calibrations also met QC criteria.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above.



COMPUCHEM
LABORATORIES

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature:

Patricia B. Hopkins

Patricia B. Hopkins

Technical Reviewer

28 February, 1990

Note: This report is paginated for reference and accountability in decreasing numerical sequence.

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: COMPUCHEM LABS

Contract: (2-88)-REVS

Lab Code: COMPU

Case No.: 19149

SAS No.: _____

SDG No.: 57

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01	GW56SN	73	75	92	47	52	61		0
02	GW76SN	114	83	143 *	66	76	98		1
03	GW84SN	89	88	110	73	81	92		0
04	GW90DPSN	96	91	111	47	57	71		0
05	SW-12SN	75	64	101	32	49	48		0
06	SW-3SN	65	69	82	36	57	100		0
07	GW56SNMS	97	88	107	65	70	107		0
08	GW56SNMSD	98	77	97	80	86	120		0
09	SBLK43	93	87	111	64	77	74		0
10	SBLK48	55	64	81	35	57	96		0

QC LIMITS

S1 (NBZ) = Nitrobenzene-d5 (35-114)
 S2 (FBP) = 2-Fluorobiphenyl (43-116)
 S3 (TPH) = Terphenyl (33-141)
 S4 (PHL) = Phenol-d5 (10-94)
 S5 (2FP) = 2-Fluorophenol (21-100)
 S6 (TBP) = 2,4,6-Tribromophenol (10-123)

Column to be used to flag recovery values
 * Values outside of contract required QC limits
 D Surrogates diluted out

WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: COMPUCHEM LABSContract: (2-88)-REVSLab Code: COMPUCase No.: 19149

SAS No.: _____

SDG No.: 57Matrix Spike - EPA Sample No.: GW56SN

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
Phenol	200	0	131	66	12- 86
2-Chlorophenol	200	0	170	85	27-123
1,4-Dichlorobenzene	100	0	70.4	70	36 97
N-Nitroso-di-n-prop. (1)	100	0	89.8	90	41 116
1,2,4-Trichlorobenzene	100	0	77.2	77	39 98
4-Chloro-3-methylphenol	200	0	224	112 *	23 97
Acenaphthene	100	0	72.8	73	46-118
4-Nitrophenol	200	0	140	70	10- 80
2,4-Dinitrotoluene	100	0	59.4	59	24- 96
Pentachlorophenol	200	0	189	95	9-103
Pyrene	100	0	106	106	26-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	REC.
Phenol	200	157	79	-18	42	12- 86
2-Chlorophenol	200	195	98	-14	40	27-123
1,4-Dichlorobenzene	100	60.6	61	14	28	36 97
N-Nitroso-di-n-prop. (1)	100	85.6	86	5	38	41 116
1,2,4-Trichlorobenzene	100	66.6	67	14	28	39 98
4-Chloro-3-methylphenol	200	284	142 *	-24	42	23 97
Acenaphthene	100	60.6	61	18	31	46-118
4-Nitrophenol	200	166	83 *	-17	50	10- 80
2,4-Dinitrotoluene	100	55.8	56	5	38	24- 96
Pentachlorophenol	200	143	72	28	50	9-103
Pyrene	100	92.8	93	13	31	26-127

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 11 outside limitsSpike Recovery: 3 out of 22 outside limitsCOMMENTS: CLP ,1914,957, ,LOW,WATER,319208,BNA, ,
TUNE: 0006 021490 0020

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKXC

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 57
 Matrix: (soil/water) WATER Lab Sample ID: VBLKXC
 Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CB900213B03
 Level: (low/med) LOW Date Received: _____
 % Moisture: not dec. _____ Date Analyzed: 02/13/90
 Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3-----	Chloromethane	10	U
74-83-9-----	Bromomethane	10	U
75-01-4-----	Vinyl Chloride	10	U
75-00-3-----	Chloroethane	10	U
75-09-2-----	Methylene Chloride	2	J
67-64-1-----	Acetone	10	U
75-15-0-----	Carbon Disulfide	5	U
75-35-4-----	1,1-Dichloroethene	5	U
75-34-3-----	1,1-Dichloroethane	5	U
540-59-0-----	1,2-Dichloroethene (total)	5	U
67-66-3-----	Chloroform	5	U
107-06-2-----	1,2-Dichloroethane	5	U
78-93-3-----	2-Butanone	10	U
71-55-6-----	1,1,1-Trichloroethane	5	U
56-23-5-----	Carbon Tetrachloride	5	U
108-05-4-----	Vinyl Acetate	10	U
75-27-4-----	Bromodichloromethane	5	U
78-87-5-----	1,2-Dichloropropane	5	U
10061-01-5-----	cis-1,3-Dichloropropene	5	U
79-01-6-----	Trichloroethene	5	U
124-48-1-----	Dibromochloromethane	5	U
79-00-5-----	1,1,2-Trichloroethane	5	U
71-43-2-----	Benzene	5	U
10061-02-6-----	Trans-1,3-Dichloropropene	5	U
75-25-2-----	Bromoform	5	U
108-10-1-----	4-Methyl-2-Pentanone	10	U
591-78-6-----	2-Hexanone	10	U
127-18-4-----	Tetrachloroethene	5	U
79-34-5-----	1,1,2,2-Tetrachloroethane	5	U
108-88-3-----	Toluene	5	U
108-90-7-----	Chlorobenzene	5	U
100-41-4-----	Ethylbenzene	5	U
100-42-5-----	Styrene	5	U
1330-20-7-----	Total Xylenes	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBKXD

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS

Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 57

Matrix: (soil/water) WATER Lab Sample ID: VBKXD

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CB900214B03

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. _____ Date Analyzed: 02/14/90

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3	-----Chloromethane	10	U
74-83-9	-----Bromomethane	10	U
75-01-4	-----Vinyl Chloride	10	U
75-00-3	-----Chloroethane	10	U
75-09-2	-----Methylene Chloride	3	J
67-64-1	-----Acetone	10	U
75-15-0	-----Carbon Disulfide	5	U
75-35-4	-----1,1-Dichloroethene	5	U
75-34-3	-----1,1-Dichloroethane	5	U
540-59-0	-----1,2-Dichloroethene (total)	5	U
67-66-3	-----Chloroform	5	U
107-06-2	-----1,2-Dichloroethane	5	U
78-93-3	-----2-Butanone	10	U
71-55-6	-----1,1,1-Trichloroethane	5	U
56-23-5	-----Carbon Tetrachloride	5	U
108-05-4	-----Vinyl Acetate	10	U
75-27-4	-----Bromodichloromethane	5	U
78-87-5	-----1,2-Dichloropropane	5	U
10061-01-5	-----cis-1,3-Dichloropropene	5	U
79-01-6	-----Trichloroethene	5	U
124-48-1	-----Dibromochloromethane	5	U
79-00-5	-----1,1,2-Trichloroethane	5	U
71-43-2	-----Benzene	5	U
10061-02-6	-----Trans-1,3-Dichloropropene	5	U
75-25-2	-----Bromoform	5	U
108-10-1	-----4-Methyl-2-Pentanone	10	U
591-78-6	-----2-Hexanone	10	U
127-18-4	-----Tetrachloroethene	5	U
79-34-5	-----1,1,2,2-Tetrachloroethane	5	U
108-88-3	-----Toluene	5	U
108-90-7	-----Chlorobenzene	5	U
100-41-4	-----Ethylbenzene	5	U
100-42-5	-----Styrene	5	U
1330-20-7	-----Total Xylenes	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKYA

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS

Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 57

Matrix: (soil/water) WATER Lab Sample ID: VBLKYA

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CC900217A03

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. _____ Date Analyzed: 02/17/90

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS:	
		(ug/L or ug/Kg) <u>UG/L</u>	<u>Q</u>
74-87-3	-----Chloromethane	10	U
74-83-9	-----Bromomethane	10	U
75-01-4	-----Vinyl Chloride	10	U
75-00-3	-----Chloroethane	10	U
75-09-2	-----Methylene Chloride	2	J
67-64-1	-----Acetone	10	U
75-15-0	-----Carbon Disulfide	5	U
75-35-4	-----1,1-Dichloroethene	5	U
75-34-3	-----1,1-Dichloroethane	5	U
540-59-0	-----1,2-Dichloroethene (total)	5	U
67-66-3	-----Chloroform	5	U
107-06-2	-----1,2-Dichloroethane	5	U
78-93-3	-----2-Butanone	10	U
71-55-6	-----1,1,1-Trichloroethane	5	U
56-23-5	-----Carbon Tetrachloride	5	U
108-05-4	-----Vinyl Acetate	10	U
75-27-4	-----Bromodichloromethane	5	U
78-87-5	-----1,2-Dichloropropane	5	U
10061-01-5	-----cis-1,3-Dichloropropene	5	U
79-01-6	-----Trichloroethene	5	U
124-48-1	-----Dibromochloromethane	5	U
79-00-5	-----1,1,2-Trichloroethane	5	U
71-43-2	-----Benzene	5	U
10061-02-6	-----Trans-1,3-Dichloropropene	5	U
75-25-2	-----Bromoform	5	U
108-10-1	-----4-Methyl-2-Pentanone	10	U
591-78-6	-----2-Hexanone	10	U
127-18-4	-----Tetrachloroethene	5	U
79-34-5	-----1,1,2,2-Tetrachloroethane	5	U
108-88-3	-----Toluene	5	U
108-90-7	-----Chlorobenzene	5	U
100-41-4	-----Ethylbenzene	5	U
100-42-5	-----Styrene	5	U
1330-20-7	-----Total Xylenes	5	U

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 57
 Instrument ID: 03 Calibration date: 02/13/90 Time: 1921
 Lab File ID: CV900213B03 Init. Calib. Date(s): 01/31/90 01/31/90
 Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) CAP
 Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Chloromethane	# 0.697	0.990	-42.0 #
Bromomethane	1.140	0.934	18.1
Vinyl Chloride	* 1.267	1.178	7.0 *
Chloroethane	0.746	0.474	36.5
Methylene Chloride	1.530	1.539	-0.6
Acetone	0.465	0.168	63.9
Carbon Disulfide	4.034	2.945	27.0
1,1-Dichloroethene	* 1.301	1.291	0.8 *
1,1-Dichloroethane	# 3.141	2.407	23.4 #
1,2-Dichloroethene (total)	2.979	3.158	-6.0
Chloroform	* 3.402	2.559	24.8 *
1,2-Dichloroethane	3.271	1.390	57.5
2-Butanone	0.105	0.090	14.3
1,1,1-Trichloroethane	0.864	0.549	36.5
Carbon Tetrachloride	0.844	0.527	37.6
Vinyl Acetate	0.931	0.530	43.1
Bromodichloromethane	0.836	0.590	29.4
1,2-Dichloropropane	* 0.447	0.342	23.5 *
cis-1,3-Dichloropropene	0.797	0.652	18.2
Trichloroethene	0.466	0.502	-7.7
Dibromochloromethane	0.666	0.679	-2.0
1,1,2-Trichloroethane	0.356	0.372	-4.5
Benzene	0.970	0.998	-2.9
Trans-1,3-Dichloropropene	0.466	0.320	31.3
Bromoform	# 0.533	0.485	9.0 #
4-Methyl-2-Pentanone	0.404	0.199	50.7
2-Hexanone	0.301	0.165	45.2
Tetrachloroethene	0.578	0.646	-11.8
1,1,2,2-Tetrachloroethane	# 0.606	0.753	-24.3 #
Toluene	* 0.655	0.596	9.0 *
Chlorobenzene	# 0.962	1.123	-16.7 #
Ethylbenzene	* 0.464	0.544	-17.2 *
Styrene	1.080	1.136	-5.2
Total Xylenes	1.308	1.398	-6.9
Toluene-d8	0.997	0.783	21.5
BFB	0.952	0.912	4.2
1,2-Dichloroethane-d4	2.876	1.162	59.6

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 57
 Instrument ID: 03 Calibration date: 02/14/90 Time: 2112
 Lab File ID: CS900214B03 Init. Calib. Date(s): 01/31/90 01/31/90
 Matrix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP
 Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Chloromethane	0.697	0.840	-20.5
Bromomethane	1.140	0.899	21.1
Vinyl Chloride	1.267	0.958	24.4
Chloroethane	0.746	0.434	41.8
Methylene Chloride	1.530	1.405	8.2
Acetone	0.465	0.198	57.4
Carbon Disulfide	4.034	3.203	20.6
1,1-Dichloroethene	1.301	1.218	6.4
1,1-Dichloroethane	3.141	2.314	26.3
1,2-Dichloroethene (total)	2.979	2.981	-0.1
Chloroform	3.402	2.593	23.8
1,2-Dichloroethane	3.271	1.619	50.5
2-Butanone	0.105	0.085	19.1
1,1,1-Trichloroethane	0.864	0.614	28.9
Carbon Tetrachloride	0.844	0.564	33.2
Vinyl Acetate	0.931	0.470	49.5
Bromodichloromethane	0.836	0.587	29.8
1,2-Dichloropropane	0.447	0.339	24.2
cis-1,3-Dichloropropene	0.797	0.615	22.8
Trichloroethene	0.466	0.525	-12.7
Dibromochloromethane	0.666	0.685	-2.9
1,1,2-Trichloroethane	0.356	0.423	-18.8
Benzene	0.970	0.914	5.8
Trans-1,3-Dichloropropene	0.466	0.357	23.4
Bromoform	0.533	0.581	-9.0
4-Methyl-2-Pentanone	0.404	0.153	62.1
2-Hexanone	0.301	0.134	55.5
Tetrachloroethene	0.578	0.739	-27.9
1,1,2,2-Tetrachloroethane	0.606	0.604	0.3
Toluene	0.655	0.556	15.1
Chlorobenzene	0.962	1.064	-10.6
Ethylbenzene	0.464	0.501	-8.0
Styrene	1.080	1.078	0.2
Total Xylenes	1.308	1.316	-0.6
Toluene-d8	0.997	0.758	24.0
BFB	0.952	0.865	9.1
1,2-Dichloroethane-d4	2.876	1.337	53.5

7C
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 57
 Instrument ID: 20 Calibration date: 02/22/90 Time: 1914
 Lab File ID: HG900222B20 Init. Calib. Date(s): 12/21/89 12/21/89
 Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Dibenzofuran	1.723	1.772	-2.8
2,4-Dinitrotoluene	0.388	0.375	3.4
Diethylphthalate	1.626	1.580	2.8
4-Chlorophenyl-phenylether	0.745	0.574	23.0
Fluorene	1.580	1.377	12.9
4-Nitroaniline	0.229	0.235	-2.6
4,6-Dinitro-2-Methylphenol	0.126	0.101	19.8
N-Nitrosodiphenylamine (1)	* 0.697	0.573	17.8 *
4-Bromophenyl-phenylether	0.257	0.238	7.4
Hexachlorobenzene	0.317	0.272	14.2
Pentachlorophenol	* 0.134	0.139	-3.7 *
Phenanthrene	1.355	1.263	6.8
Anthracene	1.328	1.070	19.4
Di-n-Butylphthalate	1.867	1.656	11.3
Fluoranthene	* 1.014	1.121	-10.6 *
Pyrene	1.637	1.402	14.4
Butylbenzylphthalate	0.919	0.743	19.2
3,3'-Dichlorobenzidine	0.189	0.164	13.2
Benzo(a)Anthracene	1.112	1.114	-0.2
Chrysene	1.274	0.996	21.8
bis(2-Ethylhexyl)Phthalate	1.819	1.205	33.8
Di-n-Octyl Phthalate	* 2.739	2.095	23.5 *
Benzo(b)Fluoranthene	1.541	1.381	10.4
Benzo(k)Fluoranthene	1.154	0.808	30.0
Benzo(a)Pyrene	* 1.135	1.038	8.5 *
Indeno(1,2,3-cd)Pyrene	1.278	1.314	-2.8
Dibenzo(a,h)Anthracene	1.122	1.050	6.4
Benzo(g,h,i)Perylene	1.019	1.037	-1.8
Nitrobenzene-d5	0.595	0.470	21.0
2-Fluorobiphenyl	1.583	1.496	5.5
Terphenyl-d14	1.152	0.989	14.2
Phenol-d5	1.450	1.229	15.2
2-Fluorophenol	1.413	1.158	18.1
2,4,6-Tribromophenol	0.140	0.127	9.3

(1) Cannot be separated from Diphenylamine

ORGANIC REGIONAL DATA ASSESSMENT

CASE NO. 30360 SITE Marion (Bragg) Landfill
 LABORATORY Compuchem NO. OF SAMPLES/
 MATRIX 9/SW 11/PW
 SDG # 19149 128 REVIEWER (IF NOT ESD) BEAK
 SOW # 7/88 REVIEWER'S NAME Don Hart
 DPO: ACTION FYI COMPLETION DATE 25 May 1990

DATA ASSESSMENT SUMMARY

	VOA	BNA	PEST	OTHER
1. HOLDING TIMES	<u>O</u>	<u>O</u>	<u></u>	<u></u>
2. GC/MS TUNE/INSTR. PERFORM.	<u>O</u>	<u>O</u>	<u></u>	<u></u>
3. CALIBRATIONS	<u>O</u>	<u>M</u>	<u></u>	<u></u>
4. BLANKS	<u>M</u>	<u>O</u>	<u></u>	<u></u>
5. SURROGATES	<u>O</u>	<u>O</u>	<u></u>	<u></u>
6. MATRIX SPIKE/DUP	<u>O</u>	<u>O</u>	<u></u>	<u></u>
7. OTHER QC	<u>O</u>	<u>O</u>	<u></u>	<u></u>
8. INTERNAL STANDARDS	<u>O</u>	<u>O</u>	<u></u>	<u></u>
9. COMPOUND IDENTIFICATION	<u>O</u>	<u>O</u>	<u></u>	<u></u>
10. SYSTEM PERFORMANCE	<u>O</u>	<u>O</u>	<u></u>	<u></u>
11. OVERALL ASSESSMENT	<u>M</u>	<u>M</u>	<u></u>	<u></u>

O = Data had no problems/or qualified due to minor problems

M = Data qualified due to major problems

Z = Data unacceptable

X = Problems, but do not affect data

ACTION ITEMS: _____

AREAS OF CONCERN: CCV outside limits for bis(2EH)phthalate. Blanks contain methylene chloride. Other CCVs out but not for compounds detected in case.

NOTABLE PERFORMANCE: _____



COMPUCHEM
LABORATORIES, INC.

P.O. Box 12652 3308 Chapel Hill/Nelson Highway Research Triangle Park, NC 27709 (919) 549-8263

CLP CASE NARRATIVE CASE # 19149
CONTRACT # 2-88 (REVS) SDG# 128
COMPUCHEM LABORATORIES INC.

SAMPLES: PW01FBSN, PW02FBSN, PW08SN, PW09SN, PW15TBSN,
PW17SN, PW18SN, PW25SN, PW26SN, PW32TBSN, PW34SN,
SW20SN, SW30DPSN, SW38SN, SW46SN, SW47SN, SW53TBSN,
SW55SN, SW56SN, SW62TBSN

This portion of Case # 19149 consisted of twenty samples, of which eleven were for volatile and nine were for semivolatile analysis. They were received intact between 2/15/90 and 2/17/90 via Federal Express in properly sealed shipping containers with traffic reports.

VOLATILES:

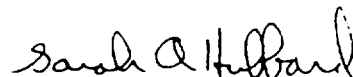
All volatile fractions were analyzed within holding time requirements. Samples PW01FBSN, PW08SN, and PW25SN contained methylene chloride, which was also detected in the associated instrument blank. Sample SW55SN contained a small amount of acetone. The remaining samples were free of target compounds. All surrogates met recovery criteria. The matrix spike/matrix spike duplicate results were acceptable.

SEMIVOLATILES:

All semivolatile fractions were extracted and analyzed within holding time requirements. Sample PW18SN contained a small amount of bis(2-ethylhexyl) phthalate. The remaining samples were free of target compounds. All surrogates met recovery criteria. The matrix spike/matrix spike duplicate results were acceptable.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Note: This report was paginated for reference and accountability in decreasing numerical sequence.


Sarah A. Hubbard 2/28/90
Technical Reviewer

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKHV

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 128
 Matrix: (soil/water) WATER Lab Sample ID: VBLKHV
 Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CD900220A12
 Level: (low/med) LOW Date Received: _____
 ‡ Moisture: not dec. _____ Date Analyzed: 02/20/90
 Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) <u>UG/L</u>	Q
74-87-3-----	Chloromethane	10	U
74-83-9-----	Bromomethane	10	U
75-01-4-----	Vinyl Chloride	10	U
75-00-3-----	Chloroethane	10	U
75-09-2-----	Methylene Chloride	3	J
67-64-1-----	Acetone	10	U
75-15-0-----	Carbon Disulfide	5	U
75-35-4-----	1,1-Dichloroethene	5	U
75-34-3-----	1,1-Dichloroethane	5	U
540-59-0-----	1,2-Dichloroethene (total)	5	U
67-66-3-----	Chloroform	5	U
107-06-2-----	1,2-Dichloroethane	5	U
78-93-3-----	2-Butanone	10	U
71-55-6-----	1,1,1-Trichloroethane	5	U
56-23-5-----	Carbon Tetrachloride	5	U
108-05-4-----	Vinyl Acetate	10	U
75-27-4-----	Bromodichloromethane	5	U
78-87-5-----	1,2-Dichloropropane	5	U
10061-01-5-----	cis-1,3-Dichloropropene	5	U
79-01-6-----	Trichloroethene	5	U
124-48-1-----	Dibromochloromethane	5	U
79-00-5-----	1,1,2-Trichloroethane	5	U
71-43-2-----	Benzene	5	U
10061-02-6-----	Trans-1,3-Dichloropropene	5	U
75-25-2-----	Bromoform	5	U
108-10-1-----	4-Methyl-2-Pentanone	10	U
591-78-6-----	2-Hexanone	10	U
127-18-4-----	Tetrachloroethene	5	U
79-34-5-----	1,1,2,2-Tetrachloroethane	5	U
108-88-3-----	Toluene	5	U
108-90-7-----	Chlorobenzene	5	U
100-41-4-----	Ethylbenzene	5	U
100-42-5-----	Styrene	5	U
1330-20-7-----	Total Xylenes	5	U

7C
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 128
 Instrument ID: 20 Calibration date: 02/18/90 Time: 1049
 Lab File ID: HH900218A20 Init. Calib. Date(s): 12/21/89 12/21/89
 Min RRF50 for SPCC(%) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Dibenzofuran	1.723	1.637	5.0
2,4-Dinitrotoluene	0.388	0.384	1.0
Diethylphthalate	1.626	1.645	-1.2
4-Chlorophenyl-phenylether	0.745	0.542	27.3
Fluorene	1.580	1.351	14.5
4-Nitroaniline	0.229	0.248	-8.3
4,6-Dinitro-2-Methylphenol	0.126	0.111	11.9
N-Nitrosodiphenylamine (1)	* 0.697	0.556	20.2 *
4-Bromophenyl-phenylether	0.257	0.229	10.9
Hexachlorobenzene	0.317	0.282	11.0
Pentachlorophenol	* 0.134	0.131	2.2 *
Phenanthrene	1.355	1.176	13.2
Anthracene	1.328	1.106	16.7
Di-n-Butylphthalate	1.867	1.703	8.8
Fluoranthene	* 1.014	1.105	-9.0 *
Pyrene	1.637	1.209	26.2
Butylbenzylphthalate	0.919	0.737	19.8
3,3'-Dichlorobenzidine	0.189	0.125	33.9
Benzo(a)Anthracene	1.112	1.028	7.6
Chrysene	1.274	0.995	21.9
bis(2-Ethylhexyl)Phthalate	1.819	1.102	39.4
Di-n-Octyl Phthalate	* 2.739	2.290	16.4 *
Benzo(b)Fluoranthene	1.541	1.295	16.0
Benzo(k)Fluoranthene	1.154	0.824	28.6
Benzo(a)Pyrene	* 1.135	1.013	10.8 *
Indeno(1,2,3-cd)Pyrene	1.278	1.222	4.4
Dibenzo(a,h)Anthracene	1.122	1.010	10.0
Benzo(g,h,i)Perylene	1.019	0.986	3.2
Nitrobenzene-d5	0.595	0.562	5.5
2-Fluorobiphenyl	1.583	1.332	15.9
Terphenyl-d14	1.152	0.932	19.1
Phenol-d5	1.450	1.293	10.8
2-Fluorophenol	1.413	1.087	23.1
2,4,6-Tribromophenol	0.140	0.155	-10.7

(1) Cannot be separated from Diphenylamine

7C
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: COMPUCHEM LABS Contract: (2-88)-REVS
 Lab Code: COMPU Case No.: 19149 SAS No.: _____ SDG No.: 128
 Instrument ID: 20 Calibration date: 02/21/90 Time: 0533
 Lab File ID: HG900221C20 Init. Calib. Date(s): 12/21/89 12/21/89
 Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D
Dibenzofuran	1.723	1.565	9.2
2,4-Dinitrotoluene	0.388	0.371	4.4
Diethylphthalate	1.626	1.397	14.1
4-Chlorophenyl-phenylether	0.745	0.528	29.1
Fluorene	1.580	1.257	20.4
4-Nitroaniline	0.229	0.235	-2.6
4,6-Dinitro-2-Methylphenol	0.126	0.085	32.5
N-Nitrosodiphenylamine (1)	* 0.697	0.556	20.2 *
4-Bromophenyl-phenylether	0.257	0.228	11.3
Hexachlorobenzene	0.317	0.270	14.8
Pentachlorophenol	* 0.134	0.128	4.5 *
Phenanthrene	1.355	1.124	17.1
Anthracene	1.328	1.073	19.2
Di-n-Butylphthalate	1.867	1.553	16.8
Fluoranthene	* 1.014	0.975	3.8 *
Pyrene	1.637	1.495	8.7
Butylbenzylphthalate	0.919	0.798	13.2
3,3'-Dichlorobenzidine	0.189	0.114	39.7
Benzo(a)Anthracene	1.112	1.052	5.4
Chrysene	1.274	1.003	21.3
bis(2-Ethylhexyl)Phthalate	1.819	1.100	39.5
Di-n-Octyl Phthalate	* 2.739	2.259	17.5 *
Benzo(b)Fluoranthene	1.541	1.476	4.2
Benzo(k)Fluoranthene	1.154	1.051	8.9
Benzo(a)Pyrene	* 1.135	1.018	10.3 *
Indeno(1,2,3-cd)Pyrene	1.278	1.212	5.2
Dibenzo(a,h)Anthracene	1.122	0.995	11.3
Benzo(g,h,i)Perylene	1.019	0.967	5.1
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Nitrobenzene-d5	0.595	0.445	25.2
2-Fluorobiphenyl	1.583	1.314	17.0
Terphenyl-d14	1.152	1.060	8.0
Phenol-d5	1.450	1.338	7.7
2-Fluorophenol	1.413	1.111	21.4
2,4,6-Tribromophenol	0.140	0.131	6.4

(1) Cannot be separated from Diphenylamine