U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL ENFORCEMENT SUPPORT
AT
HAZARDOUS WASTE SITES

TES X
CONTRACT NO. 68-W9-0007
WORK ASSIGNMENT NO. C05030

MONITORING WELL CONSTRUCTION REPORT
STOUGHTON CITY LANDFILL SITE
STOUGHTON, WISCONSIN

U.S. EPA REGION V
METCALF & EDDY, INC.
PROJECT NO. 250030

WORK PERFORMED BY:

JACOBS ENGINEERING GROUP INC.
111 N. CANAL, SUITE 105
CHICAGO, ILLINOIS 60606
JACOBS PROJECT NO. 13-E018-00

DECEMBER 17, 1993

STOUGHTON
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RPTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:
HSRW-6J

December 21, 1993

Mr. Gary Edelstein
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, Wisconsin 53707-7921

Re: Stoughton City Landfill
Stoughton, Wisconsin

Dear Gary:

Enclosed is a copy of the Monitoring Well Construction report submitted by Jacobs Engineering Group summarizing the work they did at Stoughton this past summer. The groundwater data that are included are from the real-time samples collected for quick turn-around analysis while the bore holes were being drilled. The only inaccuracy the report includes is on page 21 under "Additional Work Planned". The recent change in plans to eliminate sampling City of Stoughton municipal wells in the second round of sampling in January 1994 and to limit the second round analytical parameters to THF and two chlorofluorocarbons was not incorporated into the text. I will have Jacobs make corrections and send out the revised page.

Found in L. Meyer's file.

I looked through the file information in our central record center but could not find the letter from Lyman Wible dated August 12, 1991, regarding WDNR comments on the Proposed Plan. The closest material I found were four letters, all from Robin Schmidt. Two letters, dated January 12, 1990 and November 1, 1990, contained comments on the Alternatives Array Document. The other two, dated March 11, 1991 and May 10, 1991, were regarding early drafts of the Proposed Plan. The March 12th letter contained actual comments. The May 10th letter had annotated and revised portions of the plan attached to it instead of written comments.

I've also enclosed a copy of a recent letter from the City of Stoughton. Give me a call at (312) 886-4785 if you have any questions.

Sincerely,

Mary Tierney

Mary Tierney
Remedial Project Manager

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY-REGION V

ADDENDUM TO MONITORING WELL CONSTRUCTION REPORT
Stoughton City Landfill
Stoughton, Wisconsin

This memorandum serves to clarify information and to document changes in the Monitoring Well Construction report submitted in December 1993 by the Jacobs Engineering Group.

The report summarizes the field work performed by Jacobs at the Stoughton City Landfill site during Summer 1993. Groundwater data that are included in the report are from samples that were collected for quick turn-around analysis during the drilling of boreholes for the monitoring wells.

Information on the second round groundwater sampling, given on page 21 of the report under "Additional Work Planned", is not accurate. The corrections are:

1) The second round of sampling will take place either in February or March 1994 instead of January 1994.

2) Samples from the City of Stoughton municipal wells #3 and #6 will not be collected during the second round of sampling.

3) The analytical parameters for the second round of sampling will be limited to THF and two chlorofluorocarbons (dichlorodifluoromethane and trichlorofluoromethane).

Mary Tierney
1/20/94

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1.0 Project Description

As requested by the U.S. Environmental Protection Agency (EPA) Region V, Jacobs Engineering Group Inc. (Jacobs), as a subcontractor to Metcalf and Eddy Inc. (M & E), from June 16, 1993 through August 25, 1993, performed additional investigative work at the Stoughton City Landfill site in Stoughton, Dane County, Wisconsin. The following work was performed under the EPA Technical Enforcement Support (TES) X Contract to supplement Remedial Investigation (RI) activities conducted by the PRPs.

1.1 Site Background

The City of Stoughton Landfill is located in the northeastern corner of the City of Stoughton, Dane County, Wisconsin (Figure 1). Stoughton Landfill lies approximately 60 miles west of Milwaukee and 20 miles south of Madison, in a predominantly rural area of about 15 acres (Figure 2). The Yahara river flows immediately to the west of the landfill, coming within abut 400 feet of the landfill at its closest point.

The landfill accepted municipal and commercial waste between 1952 and 1978, until it was closed by the Wisconsin Department of Natural Resources (WDNR). Detailed records of users, waste types and quantities were not kept during the operation years. It is known that U.S. Rubber (now Uniroyal Plastics Company, Inc.) utilized the site to dispose of liquid and solid waste between the years of 1953 and 1962. EPA and WDNR investigations have revealed the presence of wastes containing solvents and vinyl plastic scraps, specifically, tetrahydrofuran (THF), toluene, ethyl benzene, tetrachloroethylene (PCE), trichloroethylene (TCE), 1,2-dichloroethylene (1,2-DCE), 1,1-dichloroethane (1,1-DCA), and xylene.

1.2 Site History

An Administrative Order on Consent (AOC) was negotiated between the EPA, the Wisconsin Department of Natural Resources (WDNR) and the Respondents on May 2, 1988. The Respondents to the AOC are the City of Stoughton and Uniroyal Plastics Company, Inc.. Environmental Resources Management (ERM) was contracted by the Respondents to conduct a Remedial Investigation/Feasibility Study (RI/FS) and submit all deliverables as outlined in the AOC. However, during the RI the Respondents dismissed ERM as their consultant and contracted with ENSR Consulting and Engineering to complete the activities covered by the AOC.

During the RI, piezometers and additional monitoring wells were installed, and a soil gas survey and ambient air monitoring were conducted. Methane gas and geophysical surveys were also conducted. Round one of groundwater monitoring was conducted in May 1989. In August 1989, Round two of groundwater monitoring and surface water and sediment sampling were conducted. Round three of groundwater sampling was completed in October 1989 and Round four was conducted in January 1990. The Final RI Report was submitted by the Respondents in June 1991 and the Record of Decision (ROD) was signed in the fourth quarter of FY91.

According to the Final Remedial Investigation Report (ENSR, 1991), contaminants found in the groundwater which exceeded the Wisconsin Preventative Action Limits (PALs) included THF, barium, selenium, and chromium. Dichlorodifluoromethane was the compound detected in soils at the highest concentrations at the site.

Prior to issuance of the ROD, EPA in consultation with the WDNR, issued a request for additional field work to the Respondents. Since the Respondents refused to

complete this work, the additional field work was tasked to Jacobs, under subcontract to M&E.

2.0 Project Scope

The objective of the field work was to further delineate the vertical and horizontal extent of groundwater contamination northwest, west and southwest of the site. Exploration Technology Inc. of Madison, Wisconsin was subcontracted for drilling activities during this phase of the supplemental investigation. Drilling and monitoring well installation activities included: one bedrock monitoring well (MW-3B) completed at the pre-existing MW-3 cluster, four exploratory borings (EB-1, EB-2, EB-3 and EB-4) completed to bedrock along the western boundary of the landfill, three of which were converted into bedrock monitoring wells MW-7B (EB-1), MW-8B (EB-3), and MW-9B (EB-4). In addition, well clusters were created at the MW-7 and MW-9 bedrock well locations with the installation of one shallow and one intermediate well at each location (Figure 2).

Due to the high amount of precipitation in the Stoughton area during the months of May and June of 1993, site ground surface conditions at the outset of drilling activities were very wet and muddy. In order to mobilize the drill rig and support equipment to the proposed drill locations it was necessary to construct access roads across the southern end and western boundary of the landfill. Roads were constructed of heavy geotextile fabric (twelve feet wide) overlain by coarse crushed limestone to an approximate depth of twelve to eighteen inches (Figure 2).

3.0 Field Procedures

3.1 Drilling Methodology

Bedrock wells and exploratory borings into the bedrock layer were completed using the dual wall reverse circulation drilling method. The specific rig used at the site for these borings was a Gus Pech GP-1000R dual wall reverse circulation rig. The drilling method utilized air to bring soil cuttings to the surface. However, the drilling method also generated large volumes of groundwater when highly permeable saturated zones were encountered. Air for the reverse circulation drilling was generated by a large truck-mounted compressor at approximately 1,000 cubic feet per second and filtered through two filters prior to entering the airline to the drill rod.

Reverse circulation drilling did not allow for split-spoon soil sampling. However, cuttings generated at the bit were brought to the surface by the circulating air with almost no lag-time. The cuttings were monitored continuously and were sampled and characterized by the field geologist as they came out of the cyclone. See Attachment A for all boring logs and well completion diagrams.

3.2 Groundwater Sampling Procedures

When it appeared that a sufficient permeable zone was encountered during the drilling process the field geologist collected a groundwater sample. Upon reaching the required groundwater sampling depth, drilling was stopped but the air was allowed to keep circulating in order to clear the drill casing of soil cuttings and water. The air was then turned off and the drill rod was allowed to fill with water from the bottom of the rod (sampling depth). The outer casing and inner rods were then unscrewed from the main drill head in order to collect a sample from within the inner drill rod. A decontaminated Teflon bailer with top and bottom check valves and new polypropylene rope was then lowered to the bottom of the drill rod. The bailer was retrieved and four

40 ml volatile organic analysis (VOA) vials were filled with minimal aeration using a bottom-emptying device. Upon collection, sample containers were labeled and placed in an iced cooler at 4°C. Appropriate chain of custody procedures were completed and groundwater samples were hand delivered to the courier for overnight shipment to Aquatec Inc. in Colchester, Vermont for 24-hour turn around analysis.

24-hour turn around analysis was required in order to expedite the decision making process for the conversion of exploratory borings into monitoring wells. Groundwater samples collected were analyzed for dichlorodifluoromethane (DCDF), trichlorofluoromethane (TCF), and tetrahydrofuran (THF) which were targeted as the possible problem contaminants at the site. Close contact was maintained between Jacobs field personnel, the laboratory (Aquatec), and the Jacobs project manager during the drilling and sampling effort. See Attachment B for groundwater analytical data.

3.3 Well Installation Procedures

Shallow and intermediate monitoring wells were constructed with stainless steel (.010-inch) slotted screens. Well screens were ten feet in length with exception of monitoring well MW-7S which was constructed with a five foot screen due to the shallowness of the well. The bedrock well screens were constructed with schedule 40, flush-threaded 304 stainless steel pre-packed screens. Well risers for all monitoring wells installed consisted of two-inch (ID) schedule 40, flush-threaded stainless steel.

Well construction materials (filter pack sand, bentonite slurry, and grout) were introduced into the annular space between the stainless steel and side walls via a tremie pipe to insure that a uniform and complete filling of the annular space was achieved.

As stated in the Scope of Work for hydrogeological drilling and monitoring well installation at the Stoughton Landfill, clays exceeding five feet in thickness encountered during drilling were to be outer cased and grouted five feet into the confining layer so as not to provide a pathway for the migration of any contaminants to lower aquifers. Ten inch diameter outer casing was installed approximately five feet into the encountered clay layer, pressure grouted into place and allowed to set for 24-hours prior to resuming drilling at the above mentioned boring locations. See well completion diagrams in Attachment A for outer casing details.

Wells were completed with concrete pads which were 4' x 4' x .5' except at the MW-7 and MW-9 well clusters where pad size was adjusted according to proximity of wells to one another. Concrete pads at the MW-7 cluster were all modified to 3' x 3' x .5'. Concrete pads at the MW-9 cluster are as follows: 4' x 4' x .5' at MW-9I, 2.5' x 2.5' x .5' at MW-9B, and 3' x 3' x .5' at MW-9S.

Protective steel bollard posts were place around each monitoring well or monitoring well cluster during the well completion process. Eight foot length, three inch diameter hollow 1/4 inch steel posts were placed four feet bls, filled and set with concrete. Three protective bollard posts were placed at the MW-3B and MW-8B well locations. A total of six protective bollard posts were placed at each of the MW-7 and MW-9 well clusters. All steel protective casings covering the actual monitoring well risers were secured with a keyed alike lock upon construction completion.

All monitoring wells constructed during this field work phase were developed in order to restore the natural hydraulic conductivity of the formation and to remove all foreign sediments from well and filter pack material. Wells were allowed to sit a minimum of 24 hours after completion prior to the development phase.

Wells were developed using a Brainard Killman (BK) pump hooked up to a piston operated pumping device. All wells were alternately surged and purged for a minimum of 30 minutes. Development was considered complete if after 30 minutes water produced from the development process was clear and sediment free. If after 30 minutes of the development process and the water produced was still not clear or free of sediments, then development would continue until development criteria were met. Generally, all of the wells were developed within 30 and 60 minutes. Well MW-7S was developed using a 1000 ml decontaminated teflon bailer. This method was used at this location due to its shallow depth and slow recharge rate. The bailer was used at the MW-7S location to alternately surge and purge the well until development was completed.

3.4 Decontamination Procedures

A temporary decontamination pad was built in the southeast corner of the site for use in the decontamination of the drill rigs and all well construction materials (Figure 2). The decon pad consisted of a bermed area approximately 30'x40' which was covered by 1/4" sheets of plywood and then was overlain by several thick sheets of visqueen. The decon area was constructed to gently slope in one direction in order to pump accumulated decon water into the Baker tank. The drill rig, drilling equipment and well materials were deconned using a high pressure steam cleaner. Decontamination of drilling equipment occurred between each individual drilling location or as required. Water utilized for the decontamination process was obtained from the City of Stoughton water system via a metered water spigot located in the southeast corner of the site.

3.5 Investigative Derived Wastes

During reverse circulation drilling, soils and groundwater were discharged into a 300-gallon settling basin via a cyclone. Soil cuttings were monitored continuously using an HNu photoionization detector (PID) as they were discharged from the cyclone into the settling basin. No PID readings above background were detected during the drilling process. Soil cuttings were containerized in 55 gallon drums which were then labeled, dated, and staged in the southeast corner of the site (Figure 2).

Water was pumped from the basin into a 6,000 gallon tanker truck and then transported to a 20,000 gallon Baker tank staged on the southeast corner of the site. Decontamination water was also pumped to the Baker tank. The collected groundwater and decon water was sampled and analyzed for volatiles and metals as required by the City of Stoughton for discharge to the Stoughton POTW. The Stoughton POTW acceptance criteria are given in Attachment C.

Prior to acquiring the 20,000 gallon Baker tank, the 6,000 gallon tanker truck was used for the storage of purge as well as decontamination water. During the drilling process at the MW-3Ba location, the truck was filled rapidly with groundwater when the bedrock aquifer was encountered. Samples of the collected water were obtained by directly filling sample containers from a valve located on the underside of the tank. Samples were labeled sample number 1819-001 and were hand delivered to RMT Laboratories in Madison for 24-hour analysis. Analytical data for the collected water indicated concentrations within the Stoughton POTW acceptance criteria (Attachment D). Upon transmittal of the data to the City of Stoughton and their approval, the water was subsequently discharged to a sewer manhole located on Amundson Parkway.

Water stored in the Baker tank was sampled using a decontaminated teflon bailer lowered through a porthole in the top of the tank. The samples were labelled sample number BT1 and were delivered to a courier for overnight delivery to IEA laboratory in Schaumburg, Illinois. Analytical data for the Baker tank water indicated concentrations within Stoughton POTW acceptance criteria and, upon transmittal of the data to the City of Stoughton and their approval, the water was transported to the POTW and discharged. A total of approximately 17,000 gallons of water was transported to the City of Stoughton POTW at the completion of field activities. See Attachment D for complete wastewater analytical data.

4.0 Exploratory Borings and Monitoring Well Installations

The following section discusses each exploratory boring and monitoring well location in detail. A brief description will be given of the geology and hydrogeology encountered at each location, the depths and geology at which groundwater samples were collected, analytical results of groundwater samples, grain size sample locations and analytical, and well construction details. See Attachment A for complete boring logs and well construction diagrams.

Monitoring Well MW3-Ba (abandoned)

Monitoring well MW-3Ba was installed into bedrock at existing monitoring well cluster MW-3. The well was constructed near the MW-3D and MW-3S locations (where past contaminants have been found in groundwater samples) in order to monitor the groundwater from the deeper bedrock unit. Drilling began at this location on June 24, 1993 and a well was constructed at the location on July 7, 1993. Dual wall reverse circulation was the drilling method utilized at the MW-3Ba location. The total depth of the MW-3Ba borehole was 103 feet. The MW-3Ba well was screened in the bedrock unit from 92.5 to 102.5 feet bls.

Geology encountered at the MW-3Ba location consisted of deposits of fine sands and gravels above 73 feet. A small unit of medium plasticity silty clay approximately four feet in thickness was encountered near 73 feet bls. Bedrock was encountered at the MW-3Ba location at approximately 82 feet bls. A small unit of gravely sand with clay, turning into sandy gravels was encountered just above the bedrock unit. Limestone fragments were present in the lower portion of this unit characterizing the weathered bedrock zone. The large clay unit encountered at borings EB-1, EB-2, and EB-3 was not encountered at this drilling location.

Groundwater samples were collected at depths of 13 feet (SL-MW3B-13), 41 feet (SL-MW3B-41), 72 feet (SL-MW3B-72), and 103 feet (SL-MW3B-103). The 13 foot groundwater sample (SL-MW3B-13) was collected from a sandy gravel unit characterized by fine sands and gravels from 1.0 to 2.0 cm. The volume of water encountered in this shallow zone was minimal due to the amount of time taken for the drill rods to fill with enough water to collect the sample. The 41 foot groundwater sample (SL-MW3B-41) was collected just below a gravel unit with medium to fine sands in a fine sand unit with trace gravels. Water encountered in this unit was produced in much greater volume (drill rods filled immediately upon shutdown of rig), was fairly clear, and was considerably cooler than the 13 foot sample. The 72 foot groundwater sample (SL-MW3B-72) was collected from the bottom of a fine sand unit located just above the silty clay layer of medium plasticity found at 73 feet bls. Groundwater encountered at this depth was similar to the groundwater encountered from the 42 foot interval. The 103 foot groundwater sample (SL-MW3B-103) was collected from the bedrock unit at the bottom depth of the MW-3Ba borehole. A large volume of water was produced at this depth (approximately 30 to 40 gpm) and was very clear and cold. Samples were analyzed for DCDF, TCF, and THF. All samples

from the MW-3Ba location were below detection limits. See Table 1 for groundwater sampling results. Attachment B contains laboratory data sheets of groundwater analytical data.

At 82 feet drilling conditions were characterized by drastically decreased rates, tan limestone chips in the drill cuttings and production of significant amounts of very cold and clear groundwater. This zone was interpreted as the top of the limestone bedrock. Drilling into bedrock with both the outer casing and the inner drill rods proved to be very slow so the inner drill rods were advanced without the outer casing thereby increasing the drilling rate.

Monitoring well MW-3Ba was installed into bedrock at a total depth of 102.5 feet. However, upon return to the well for development purposes, approximately a month and a half later, a Brainard Killman (BK) pump was found in the well. Several attempts were made to remove the pump but they were unsuccessful. A decision was made by Jacobs to abandon the well by overdrilling the well to depth, removing all well materials, and grouting with portland/bentonite grout using a tremie pipe. A new well MW-3B was located approximately seven feet southwest of the abandoned location and was redrilled and installed at the expense to Exploration Technology Inc..

Monitoring Well MW-3B

Monitoring well MW-3B was installed into bedrock at existing monitoring well cluster MW-3 to take the place of MW-3Ba which was abandoned due to well riser damage. Drilling began at this location on August 17, 1993 and a well was constructed at the location on August 20, 1993. Dual wall reverse circulation was the drilling method utilized at the MW-3B location. The total depth of the MW-3B borehole was 92.8 feet. It was decided to complete this monitoring well approximately ten feet into bedrock in

order to intersect the weathered bedrock unit with the upper filter pack material. This decision was made due to the high permeability of the weathered bedrock in this zone. Due to its proximity to MW-3Ba, soil samples were not logged and groundwater samples were not collected during drilling of MW-3B.

Exploratory Boring EB-1/Monitoring Well MW-7B

Monitoring well MW-7B, converted from exploratory boring EB-1, was installed into bedrock at the MW-7 three well cluster. Monitoring well MW-7B was constructed at this location in order to monitor the bedrock aquifer along the western boundary of the landfill. Contaminants previously detected at the MW-3 well cluster were expected to migrate in the direction of the MW-7 cluster prior to leaving the site along the western boundary. Drilling began at this location on July 8, 1993 and a well was constructed at the location on July 13, 1993. Dual wall reverse circulation was the drilling method utilized at the MW-7B location. The total depth of the MW-7B (EB-1) borehole was 81.8 feet. The MW-7B well was screened in the bedrock unit from 81.3 to 71.3 feet bls.

Geology encountered at the MW-7B location consisted of units of fine sands, silty clay, and gravels above 13 feet. A 22 foot thick unit of brown to gray clay of high plasticity was encountered from 13 to 35 feet bls. A 10" carbon steel surface casing was pressure grouted from ground surface into the clay to a depth of 20 feet bls. The surface casing was placed into the clay unit in order to insure that any contaminants present in the upper water zones could not enter water units beneath the clay. The casing was allowed to sit for 24-hours before resuming drilling at the location in order to allow the grout to set. Units of fine sands and gravels continued below the clay layer to the top of the bedrock unit. Bedrock was encountered at 72 feet bls at this location.

Groundwater samples were collected at depths of 12 feet (SL-EB1-12), 55 feet (SL-EB1-55), and 72 feet (SL-EB1-72). An attempt was made to collect a sample at 42 feet , however, no sample could be recovered due to lack of groundwater present. The 12 foot groundwater sample (SL-EB1-12) was collected from a fine sand unit just above a thin gray silt layer approximately one foot in thickness. The volume of water encountered in this shallow zone was minimal due to slow recharge of water in the drill rods. An attempt was made to collect a groundwater sample from a gravely sand approximately 42 feet bls. Upon letting the drill rig sit for approximately one hour, however, no groundwater sample was obtained. Groundwater was encountered at approximately 55 feet bls in a unit of fine sand with trace gravels and a sample was collected (SL-EB1-55). Water encountered in this unit was present in much greater volume (drill rods filled immediately upon shutdown of rig), was fairly clear, and was considerably cooler than the 12 foot sample. The 72 foot groundwater sample (SL-EB1-72) was also collected from the weathered bedrock unit. This unit was characterized with gravels, limestone fragments and poorly graded sands. Water encountered at this depth was significant in volume (approximately 30 to 40 gpm) and was very clear and cold. Samples were analyzed for DCDF, TCF, and THF. All samples from the EB-1 location were below detection limits.

No problems were encountered during the drilling or well construction process at this location. However, upon completion of well MW-7B it was noticed that flowing artesian conditions were present at the well head when the stainless steel well cap was removed from the riser. Water immediately began flowing from the well at a rate of approximately 10 to 15 gallons per minute (gpm) when the cap was removed. The stainless steel well cap was replaced with a locking pressure sealing cap to eliminate any continued leakage.

Monitoring Well MW-7I

Monitoring well MW-7I was installed as an intermediate depth well at the MW-7 well cluster. Monitoring well MW-7I was constructed at this location in order to monitor the intermediate aquifer along the western boundary of the landfill. Drilling and well construction occurred at this location on August 3, 1993. Hollow stem augers utilizing eight-inch outer diameter augers was the drilling method utilized at the MW-7I location. The total depth of the MW-7I borehole was 57 feet bls. The MW-7I well was screened in a unit of gravely sand to fine sand with trace gravels from 56.5 to 46.5 feet bls. The screened interval was chosen in order to intersect groundwater encountered during the EB-1 boring. A 10" carbon steel surface casing was pressure-grouted five feet into the clay unit.

A split spoon sample was collected from 56 feet bls (MW7-I-56) the bottom of screened interval MW-7I and was submitted to the laboratory IEA, Inc. for grain size analysis. The sample submitted for analysis consisted of fine grained sand with trace gravels. The lab copy of analytical data for grain size is located in Attachment E.

Monitoring Well MW-7S

Monitoring well MW-7S was installed as a shallow depth well at the MW-7 well cluster. Monitoring well MW-7S was constructed at this location in order to monitor the shallow aquifer along the western boundary of the landfill. Drilling and well construction occurred at this location on August 4, 1993. Hollow stem augers utilizing eight-inch outer diameter augers was the drilling method utilized at the MW-7S location. Due to the shallow depth of well MW-7S, well construction was modified by using a shorter length of screen (five foot instead of ten), and limiting filter pack above the screen to accommodate the well depth. Bentonite chips were used to seal the

borehole annulus above the filter pack and were used as a surface seal to two feet bls instead of portland/bentonite grout. The total depth of the MW-7S borehole was 12.5 feet bls. The MW-7S well was screened in shallow units of gravely sand to fine sand from seven to twelve feet bls. The screened interval at MW-7S was chosen in order to intersect the groundwater encountered during the EB-1 boring.

A split spoon sample was collected from the depth of ten feet bls (MW7-S-10), near the mid-point of the screened interval in MW-7S and was submitted to the laboratory IEA, Inc. for grain size analysis. The sample submitted for grain size analysis consisted of sandy gravels to 2.0 cm in size.

Exploratory Boring EB-2

Exploratory boring EB-2 was drilled to bedrock but was not converted to a monitoring well. Analytical data on groundwater samples collected at the EB-2 location were non-detect and the decision was made not to construct a well based on the low possibility (due to location) of contaminants migrating from the site at this location. Drilling began at this location on July 14, 1993 and was abandoned by back-filling with portland/bentonite grout using a tremie pipe on July 22, 1993. Dual wall reverse circulation was the drilling method utilized at the EB-2 location. The total depth of the EB-2 borehole was 79 feet bls.

Geology encountered at the EB-2 location consisted of fine sands, silts and gravels to a depth of approximately 20 feet bls. A unit of olive gray clay of high plasticity approximately 15 feet in thickness was encountered at 20 feet bls and continued to a depth of approximately 35 feet bls. A 10" carbon steel surface casing was pressure-grouted six feet into the clay to serve as a contaminant transport barrier. Sandy gravel and fine to medium sands continued from 35 feet bls to approximately 45 feet bls

where geology changed to a saturated, very fine silty sand. The upper weathered bedrock unit was encountered near 65 feet bls and was characterized by fine sand and gravels with trace limestone chips in combination with very clear, cold water produced in significant volume (30 to 40 gpm). Bedrock was encountered at 73 feet bls at this location.

Groundwater samples were collected at depths bls of 12 feet (SL-EB2-12), 42 feet (SL-EB2-42), and 79 feet (SL-EB2-79). The 12-foot groundwater sample (SL-EB2-12) was collected from a fine sand unit just above a two foot clayey gray sand layer. The volume of water encountered in this shallow zone was minimal due to the amount of time taken for the drill rods to fill with enough water to collect the sample. The 42 foot sample (SL-EB2-42) was collected in a unit of fine sand. Water encountered in this unit was present in much greater volume (drill rods filled immediately upon shutdown of rig), was fairly clear, and was considerably cooler than the 12 foot sample. The 79 foot groundwater sample (SL-EB2-79) was collected from the bottom of the borehole in the bedrock unit. This unit was characterized by limestone fragments . Water encountered at this depth was of significant volume (approximately 30 to 40 gpm) and was very clear and cold. Samples were analyzed for DCDF, TCF, and THF. All samples from the EB-2 location were below detection limits.

Exploratory Boring EB-3/Monitoring Well MW-8B

Monitoring well MW-8B, converted from exploratory boring EB-3, was installed into bedrock as a single well location. Drilling began at this location on July 20, 1993 and a well was constructed at the location on July 27, 1993. Dual wall reverse circulation was the drilling method utilized at the MW-8B location. The total depth of the MW-8B (EB-3) borehole was 81.7 feet. MW-8B was screened into bedrock from 71 to 81 feet bls.

Geology encountered at the MW-8B location consisted of deposits of fine sands and clayey sands to approximately seven feet bls. A unit of light brown clay of high plasticity approximately eleven feet in thickness was encountered at seven feet and continued to approximately 18 feet bls. A 10" carbon steel surface casing was pressure grouted six feet into the clay to serve as a contaminant transport barrier. Alternating layers of sands, gravels, and silty sands each no greater than five feet in thickness continued to the top of the weathered bedrock unit at approximately 68 feet bls. Bedrock characterized by limestone chips and significant volume of cold clear water was encountered at 75 feet bls.

Groundwater samples were collected at depths of 21 feet (SL-EB3-21), 41 feet (SL-EB3-41), and 71 feet (SL-EB3-71). The 21 foot groundwater sample (SL-EB3-21) was collected from just below the plastic clay unit in a unit of fine clayey sand. The volume of water encountered in this shallow zone was minimal due to the amount of time taken for the drill rods to fill with enough water to collect the sample. The 41 foot sample (SL-EB3-41) was collected in a unit of well graded gravels to 3.0 cm in size. Water encountered in this unit was present in much greater volume (drill rods filled immediately upon shutdown of rig), was fairly clear, and was considerably cooler than the 21 foot sample. The 71 foot groundwater sample (SL-EB3-71) was collected from the weathered bedrock unit characterized by well graded gravels, fine sand, and limestone chips. Water encountered at the 71 foot interval was of significant volume (30 to 40 gpm) and was very clear and cold. All samples from the EB-3 location were below detection limits.

Exploratory Boring EB-4/Monitoring Well MW-9B

Monitoring well MW-9B, converted from exploratory boring EB-4, was installed into bedrock at the MW-9 three well cluster. A well was installed at this location due to the detection of contaminants in the deep groundwater sample (SL-EB4-71) collected at the 71 foot interval. Drilling began at this location on July 21, 1993 and a well was constructed at the location on July 29, 1993. Dual wall reverse circulation was the drilling method utilized at the MW-9B location. The total depth of the MW-9B (EB-4) borehole was 81 feet. Well MW-9B was screened into bedrock from 70.5 feet to 80.5 feet bls.

Geology encountered at the MW-9B location consisted of deposits of clays, fine sands, and gravels in varying depth intervals and thicknesses to bedrock. The unit of clay such as the one encountered at the EB-1, EB-2 and EB-3 locations was encountered at this location from 5.5 to 6.5 feet bls. Bedrock was encountered at 70 feet bls at this location.

Groundwater samples were collected at depths of 26 feet (SL-EB4-26), 42 feet (SL-EB4-42), and 71 feet (SL-EB4-71). An attempt was made to collect a groundwater sample at the 12 foot interval (sand, medium grained-poorly graded), but could not be collected due to insufficient sample volume. Sample SL-EB4-26, collected from a unit of poorly graded fine sand, detected DCDF at 240 ug/L, TCF at 1.1 ug/L, and THF at 31 ug/L. Sample SL-EB4-42, collected from a unit of well graded sandy gravels, detected DCDF at 130 ug/L, TCF at 13 ug/L, and THF at 84 ug/L. Sample SL-EB4-71, collected from the upper portion of the bedrock unit in a significant groundwater zone detected DCDF and TCF at 1 ug/L and 0.7 ug/L respectively. THF was below detection limits in the SL-EB4-71 sample.

Monitoring Well MW-9I

Monitoring well MW-9I was installed as an intermediate depth well at the MW-9 well cluster. A well was installed at this location due to the detection of contaminants in the intermediate groundwater sample (SL-EB4-42) collected from the 42 foot interval in EB-4. Drilling and well construction occurred at this location on August 5, 1993. Hollow stem augers utilizing eight inch outer diameter augers was the drilling method utilized at the MW-9I location. The total depth of the MW-9I borehole was 44.5 feet bls. Well MW-9I was screened in a unit of well graded sandy gravel from 34 to 44 feet bls.

A split spoon sample was not collected from the screened depth interval at this location due to the problem with heaving sands when attempting to pull the inner lead drill bit and rods.

Monitoring Well MW-9S

Monitoring well MW-9S was installed as a shallow depth well at the MW-9 well cluster. A well was installed at this location due to the detection of contaminants in the shallow groundwater sample (SL-EB4-26) collected from the 26 foot interval in EB-4. Drilling and well construction occurred at this location on August 4, 1993. Hollow stem augers utilizing eight inch outer diameter augers was the drilling method utilized at the MW-9S location. The total depth of the MW-9S borehole was 28.5 feet bls. Well MW-9S was screened in units of sandy gravels and poorly graded fine to medium sand at a depth of 18 to 28 feet bls.

A split spoon sample (MW9-S-16) was collected from a depth interval of 16 feet bls (just above the top of the screened interval) and was submitted to the laboratory IEA, Inc. for grain size analysis. The sample submitted for grain size analysis consisted of

coarse grained, poorly graded clayey sands. A spoon was not obtainable from the screened interval at this location due to the problem with heaving sands inside the augers.

5.0 Geology

During the initial RI at the Stoughton Landfill the bedrock units beneath the site were not penetrated by any of the borings or wells completed. The Final Remedial Investigation Report (Revision #4: Dated June 14, 1991, prepared by ENSR Consulting and Engineering), stated that during drilling the lowermost unit at the site (between 60 feet and 80 feet) could not be sampled with the drilling equipment used (hollow stem auger) and was characterized by a drastically decreased drilling rate and the inability to penetrate and bring a sample to the surface. The unit was interpreted by ENSR to be "a boulder-rich till or a boulder lag deposit on a till." The limestone bedrock was interpreted at a depth of approximately 200 feet below land surface (bls).

It was discovered by Jacobs during this last drilling effort that what was thought by ENSR to be a boulder unit encountered between 60 feet and 80 feet was in fact the limestone bedrock unit. The bedrock unit was encountered between 70 feet and 85 feet by Jacobs and was similarly characterized by a drastically decreased drilling rate. Cuttings characterized by the field geologist during this depth interval were tan/light brown limestone chips (not characteristic of a glacial boulder till), and sufficiently higher volume of cold and clear groundwater were encountered at a rate of approximately 30 to 40 gallons per minute indicating that the bedrock unit had been encountered. See Figures 3 and 4 for monitoring well cross sections. Encountering the bedrock unit at this depth (70 to 85 feet) proved to be a significant factor in clarifying

the geology in the vicinity of the site. As a result, bedrock wells planned for installation at the site were constructed at much more shallow depths than planned.

A low permeability clay layer was encountered during drilling operations at exploratory borings EB-1, EB-2, EB-3, and EB-4. The clay encountered at these locations was light brown to olive gray in color and was of high plasticity. The wedge-shaped clay unit was thickest at EB-1 (approximately 22 feet), significantly thinning to the north at EB-4 where it was interbedded with sands and gravels, pinching out completely to the east (See A-A' and B-B' cross sections in Figures 3 and 4).

6.0 Additional Work Planned

Field work completed during this phase will be followed up by two rounds of groundwater sampling scheduled for October 1993 and January of 1994. These scheduled rounds of groundwater sampling will encompass all new wells installed during this phase as well as the twelve monitoring wells at well clusters MW-1 through MW-6 previously installed at the site. City of Stoughton municipal wells #3 and #6 will also be sampled during the scheduled sampling events.

Samples for the monitoring wells and municipal wells will be analyzed for low concentration inorganics, low concentration volatile and semi-volatile organics, and DCDF/TCF/THF to evaluate contaminants migrating offsite at concentrations above Wisconsin PALs.

FIGURES

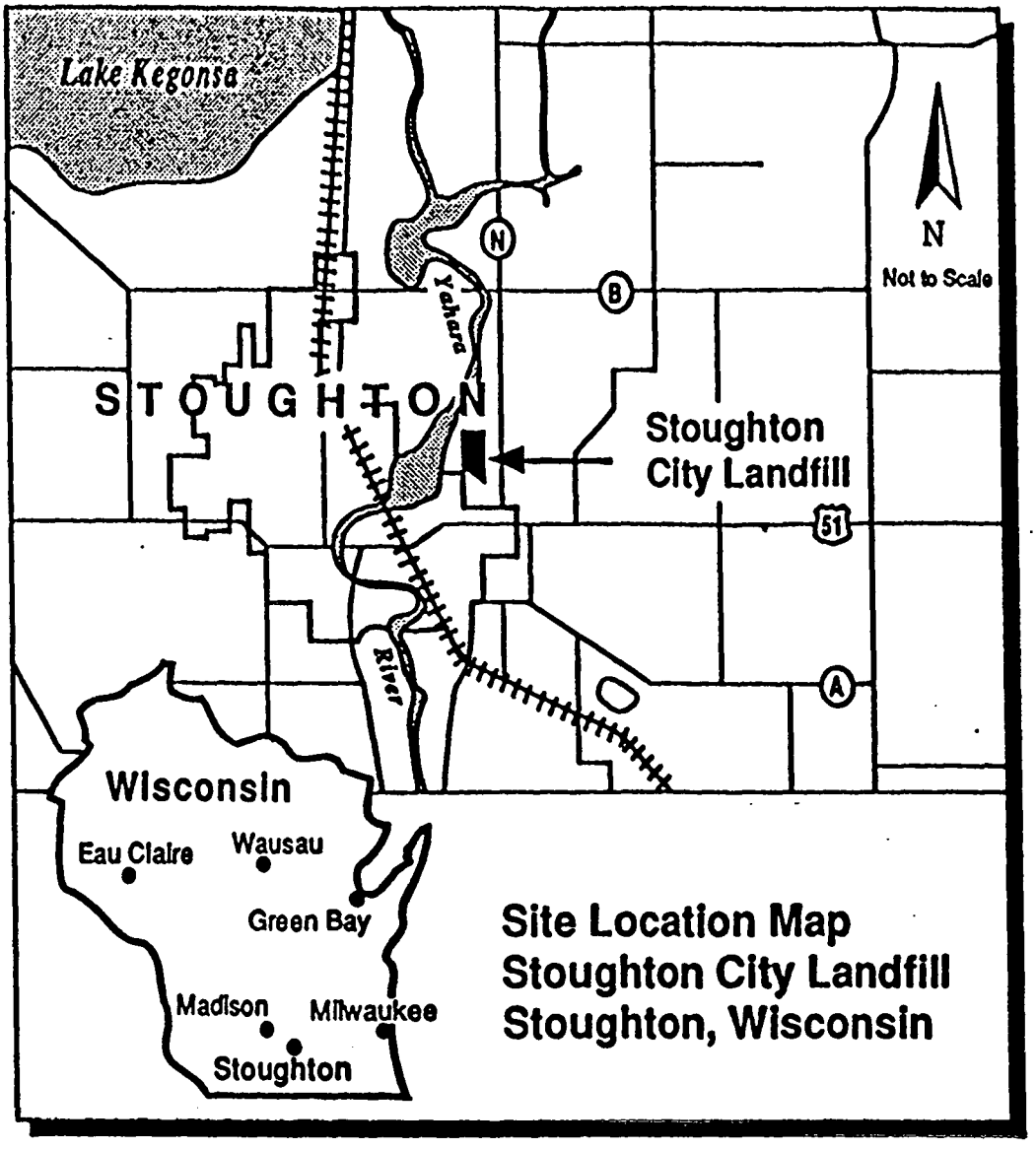


Figure 1 - Site Location Map Stoughton City Landfill, Stoughton, WI

Jacobs Engineering Group Inc. Environmental Systems Division

Drawn By:	KL
Checked By:	LE
Date:	12/15/93

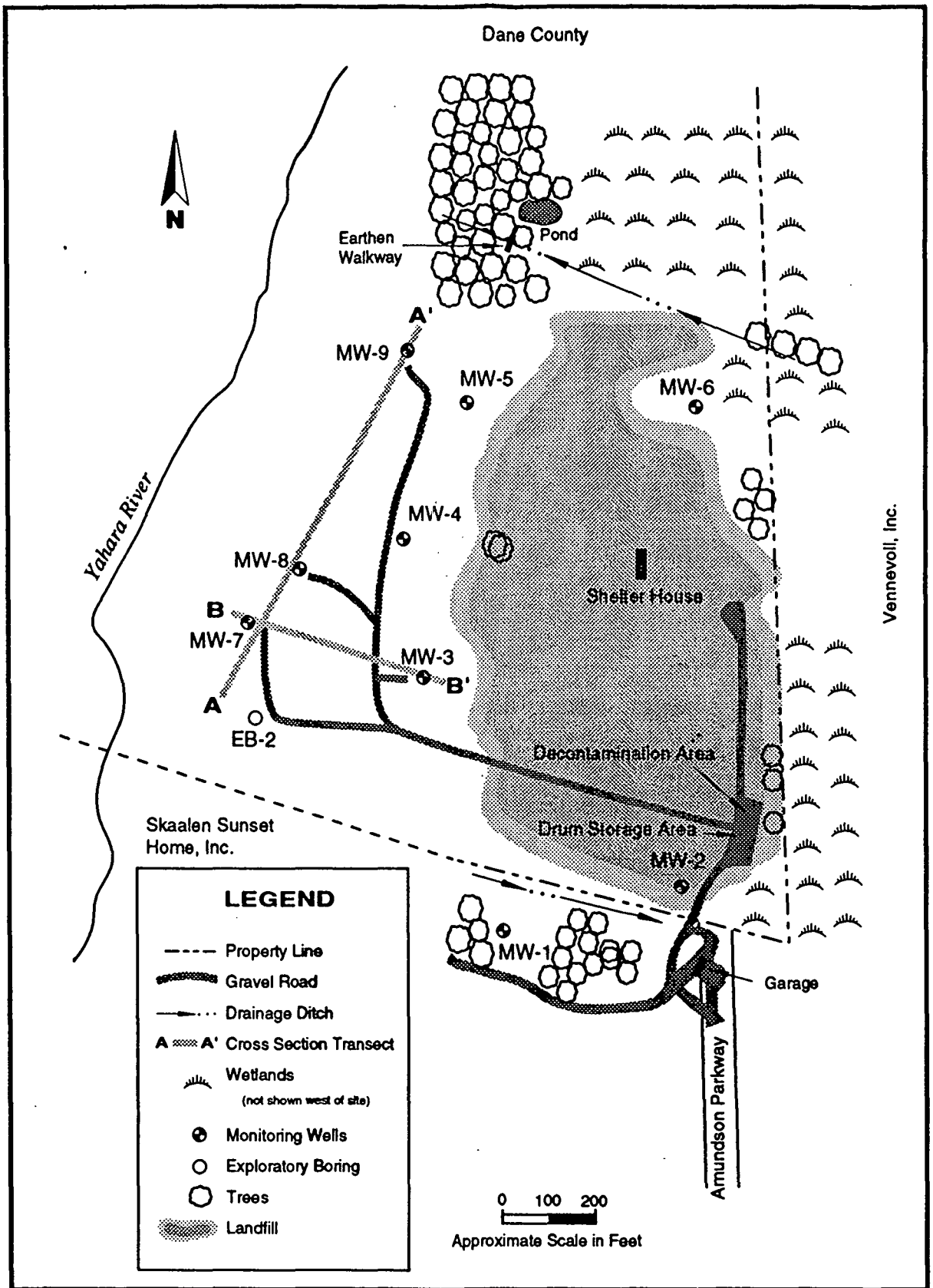
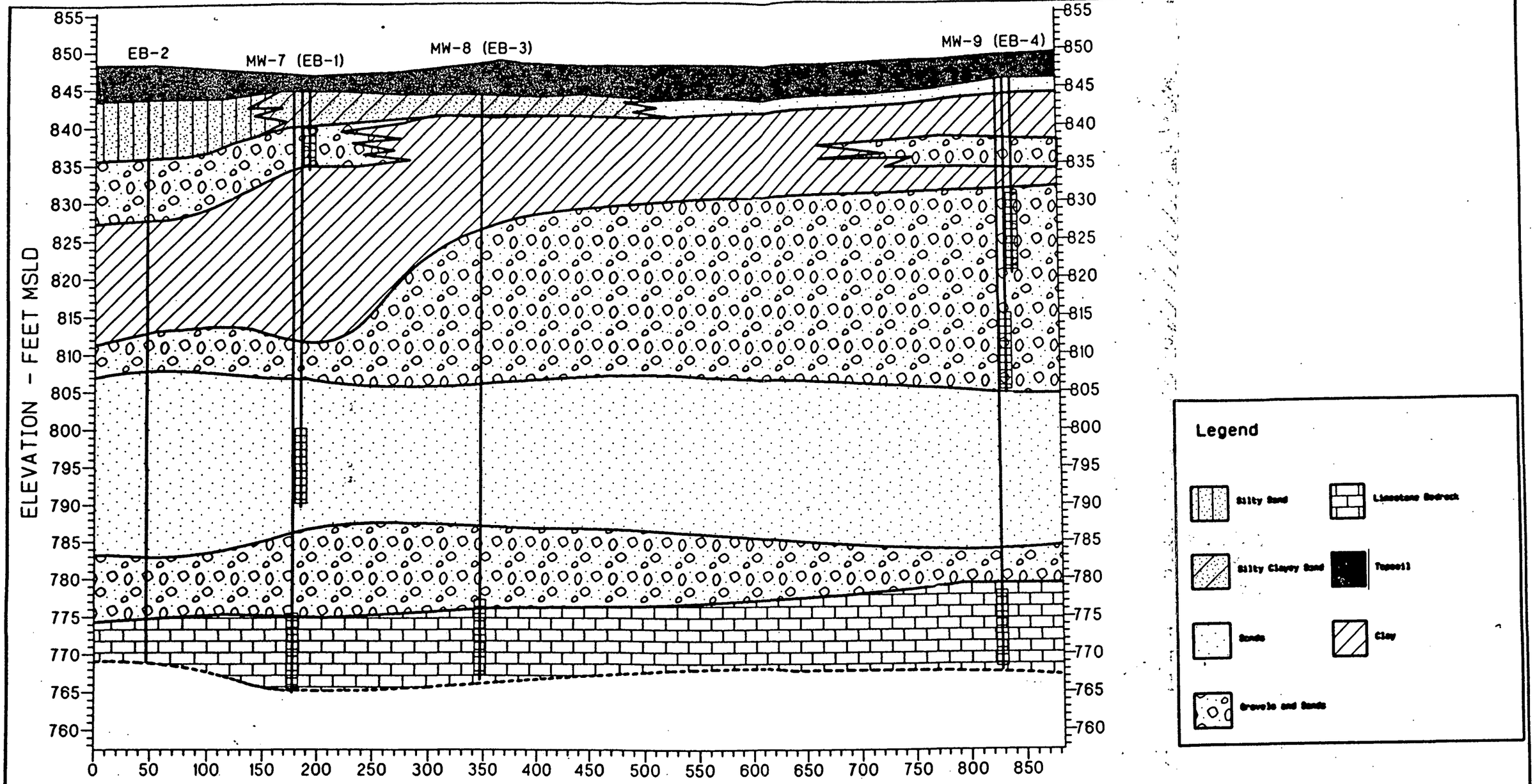


Figure 2 - Site Layout Diagram Stoughton City Landfill, Stoughton, WI

Jacobs Engineering Group Inc. Environmental Systems Division

Drawn By: KL
Checked By: LE
Date: 12/15/93



A-A' TRANSECT - FEET

Figure 3: Monitoring Well Cross Section

JACOBS ENGINEERING GROUP, INC.
CHICAGO ENVIRONMENTAL
Stoughton City Landfill
Stoughton, WI

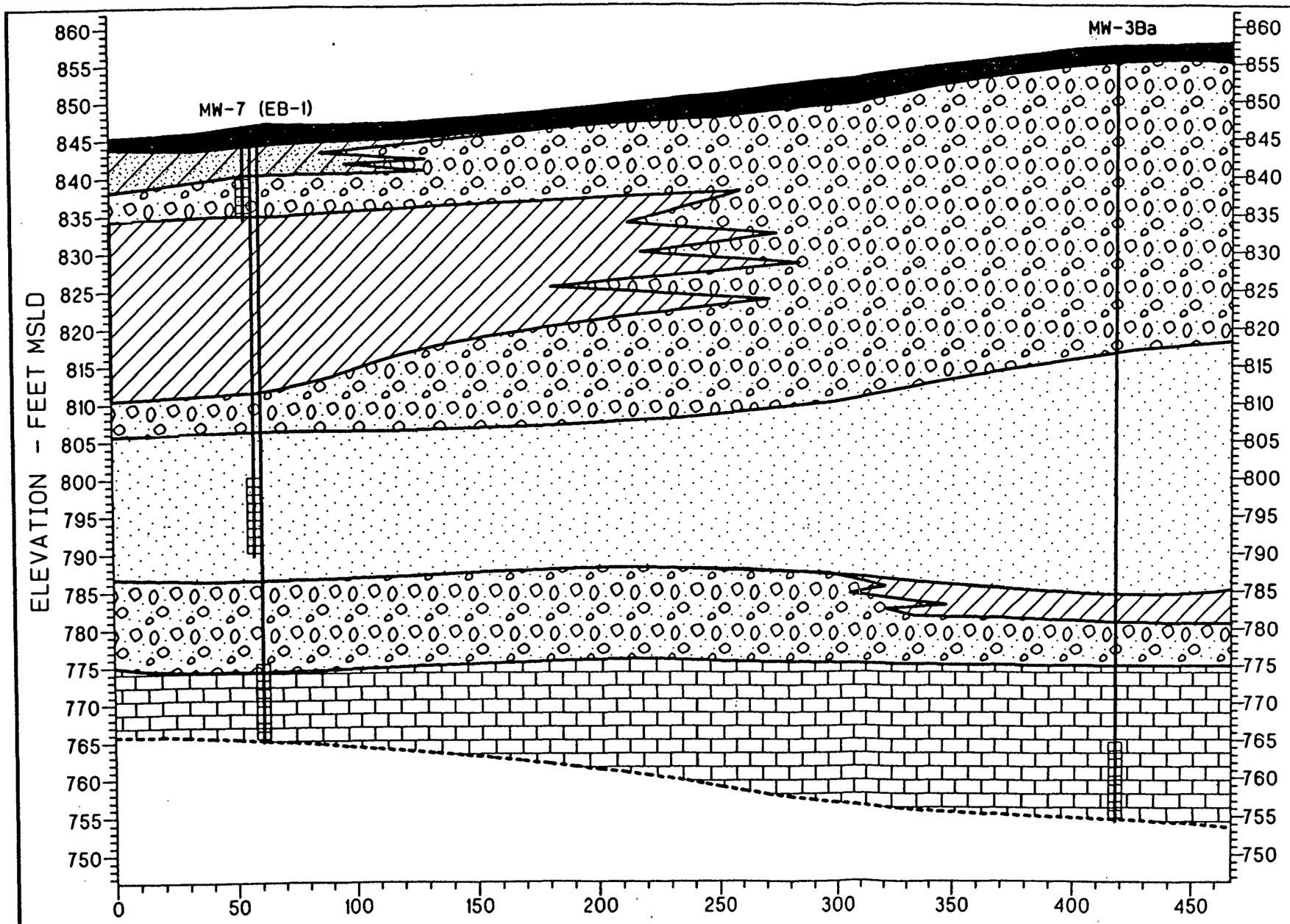
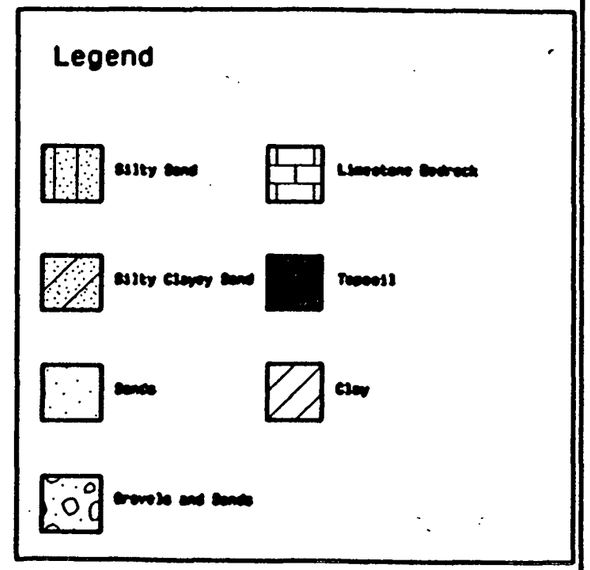


Figure 4: Monitoring Well Cross Section



JACOBS ENGINEERING GROUP, INC.
CHICAGO ENVIRONMENTAL
Stoughton City Landfill
Stoughton, WI

TABLES

Table 1: Groundwater sampling results
ALL RESULTS IN ug/L

LOCATION	SAMPLE #	MATRIX	ANALYTE		
			Dichlorodifluoromethane	Trichlorofluoromethane	Tetrahydrofuran
MW3-B	SL-MW3B-13	water	ND	ND	ND
	SL-MW3B-41	water	ND	ND	ND
	SL-MW3B-72	water	ND	ND	ND
	SL-MW3B-103	water	ND	ND	ND
EB-1	SL-EB1-12	water	ND	ND	ND
(MW7-B)	SL-EB1-55	water	ND	ND	ND
	SL-EB1-72	water	ND	ND	ND
EB-2	SL-EB2-12	water	ND	ND	ND
(abandoned)	SL-EB2-42	water	ND	ND	ND
	SL-EB2-79	water	ND	ND	ND
EB-3	SL-EB3-21	water	ND	ND	ND
(MW8-B)	SL-EB3-41	water	ND	ND	ND
	SL-EB3-71	water	ND	ND	ND
EB-4	SL-EB4-26	water	240D	1.1	31
(MW9-B)	SL-EB4-42	water	130D	13D	84
	SL-EB4-71	water	1.0	0.7	ND

LEGEND: ND = Below detection limits
D = Concentration reported from secondary dilution of sample

DETECTION LIMITS:
Dichlorodifluoromethane = 0.5ug/L
Trichlorofluoromethane = 0.5 ug/L
Tetrahydrofuran = 10ug/L

ATTACHMENT A: Boring Logs and Well Construction Diagrams

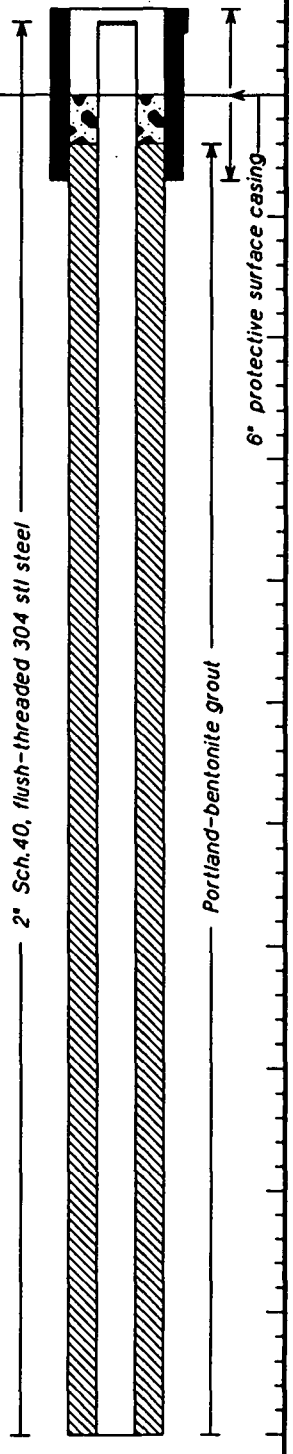
JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-3Ba (abandoned)
DATE DRILLED 6/24/93 through 7/7/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 857.26 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				0 150			Topsoil, dark brown, organic
5						GW	Sandy gravel to 2.0cm with sand, fine
10							
15	SL	MW3B-13				GW	Same as above to 1.0cm
20							
25						SP	Sand, fine
30						GW	Gravel to 1.0cm with sand, medium-fine
35							
40	SL	MW3B-41				SP	Sand, fine with trace gravels
45						GW	Sandy gravel to 1.0cm
50						SP	
55							

WELL DIAGRAM



JOB NUMBER: C05030

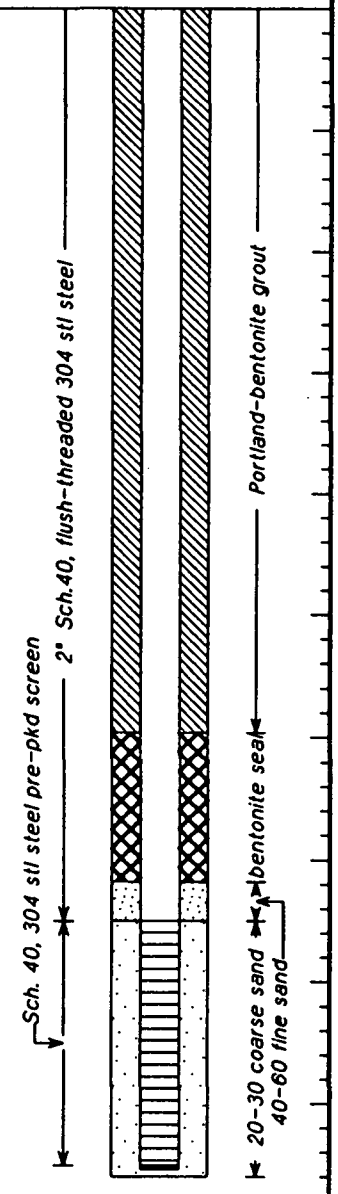
JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-3Ba (abandoned)
DATE DRILLED 6/24/93 through 7/7/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 857.26 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm) 0 150	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
60						SP	Sand, fine
65							
70	☒	SL-MW3B	72				
75						CL	Silty Clay, medium plasticity
						SW	Gravelly sand with clay, gray, plastic
						GW	Sandy gravel to 3.0cm with sand, medium-fine
80						GW	Same as above with trace limestone fragments
						LS	
85							
90							Limestone bedrock, tan, producing significant water
95							
100							
	☒	SL-MW3E	103				
105							*Boring terminated at 103'*
110							

WELL DIAGRAM



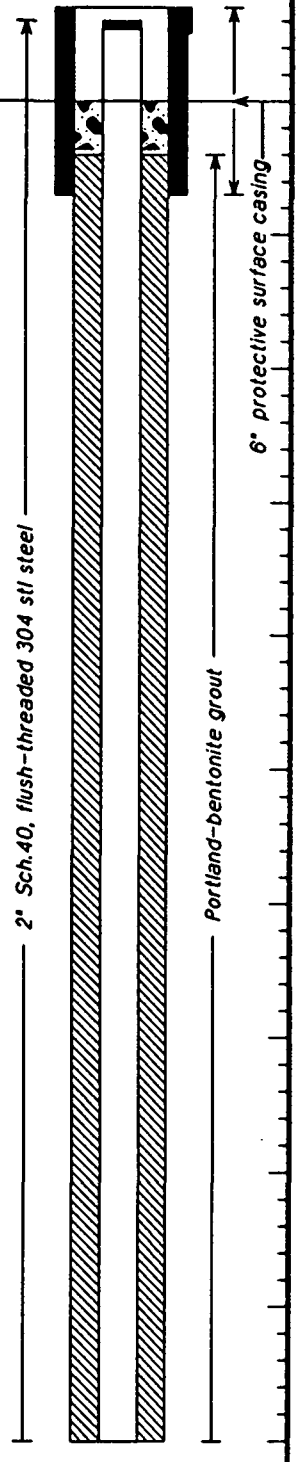
JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-3B
DATE DRILLED 8/17/93 through 8/20/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 857.26 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				0 150			Topsoil, dark brown, organic
5						GW	Sand gravel to 2.0cm some fine sand
10							
15						GW	Same as above to 1.0cm
20							
25						SP	Sand, fine
30							
35						GW	Gravel to 1.0cm with sand, medium-fine
40						SP	Sand, fine with trace gravels
45							
50						GW	Sandy gravel to 1.0cm
						SP	



JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-3B
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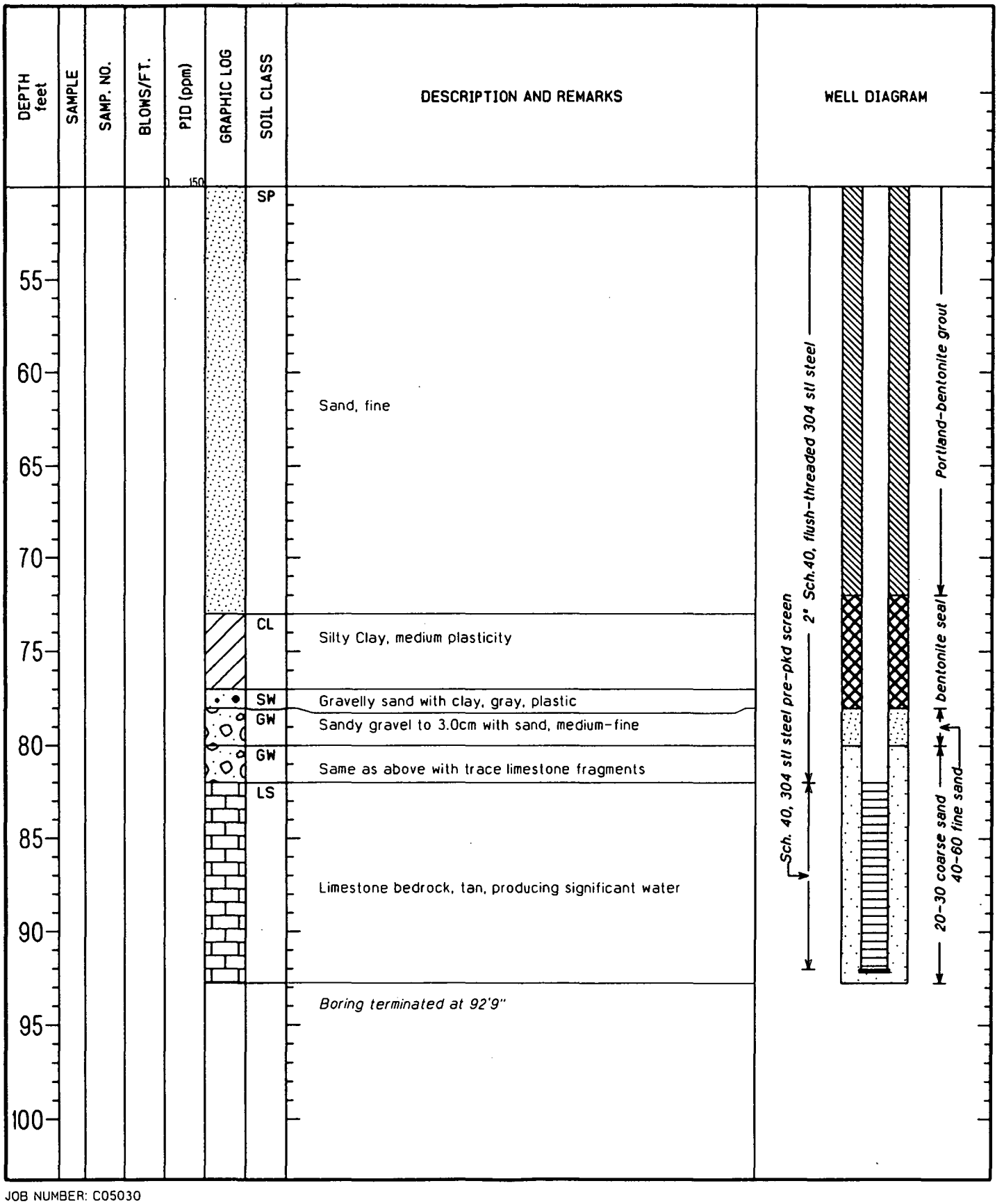
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 857.26 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale



JOB NUMBER: C05030

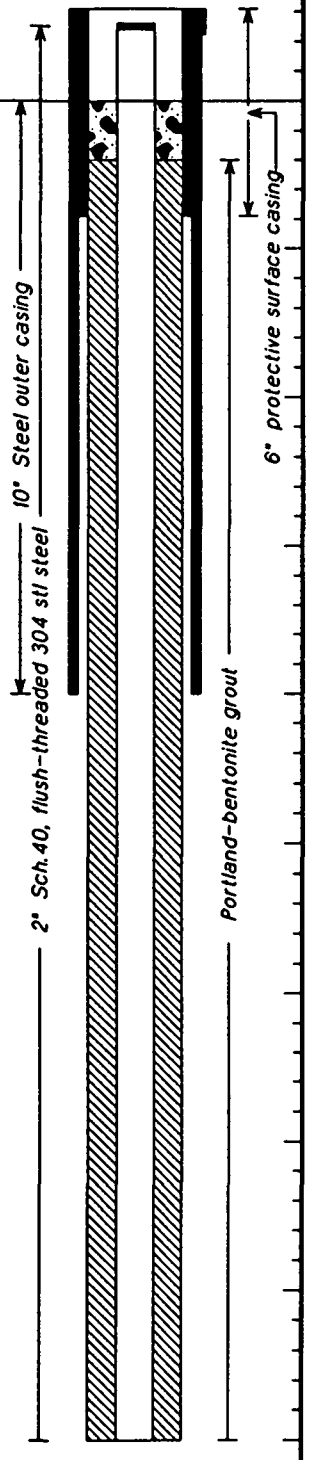
JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-7B (EB-1)
DATE DRILLED 7/8/93 through 7/13/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 846.79 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Lou Ehrhard and Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm) 0 150	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
							Topsoil, dark brown, organic
						SP	Sand, fine, light brown
5						CL	Silty clay, gray
						SP	Sand, medium, light brown
						SW	Gravelly sand
10						GW	
						GW	Sandy gravel
						SP	Gravel to 2cm, angular to subrounded
	X	SL-EB1-12				ML	
						CH	Sand, fine, light brown
15						CH	Silt, gray
							Clay, brown-gray, plastic
							Same as above
20						CH	Same as above
25						CH	Same as above
30						CH	Same as above
35						GW	Sandy gravel to 1.5cm, angular-subrounded
						GW	Same as above
40						SW	*No sample recovery
	X	NO RECOV					Gravelly sand, brown, dry
45						SM	

WELL DIAGRAM



JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-7B (EB-1)
DATE DRILLED 7/8/93 through 7/13/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 846.79 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Lou Ehrhard and Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				0 150		SM	Silty sand, brown
						SW	Gravelly sand to 1.0cm, subrounded
50						SP	Sand, fine with gravel
55	⊠	SL-EB1-55				SP	Same as above
60						GW	
						SP	Sandy gravel to 2cm, angular-subrounded Getting refusal, possible boulder layer
						GW	Sand, fine with trace gravel
65						GW	Gravel to 3cm, limestone chips, some sand - upper weathered bedrock unit.
							Same as above, producing significant water
70						GW	Gravel, limestone with 20% poorly graded sand
	⊠	SL-EB1-72				LS	
						LS	Limestone bedrock, tan
75							Same as above
80						LS	Same as above
							Boring terminated at 81'10"
85							
90							

WELL DIAGRAM

Sch. 40, 304 stl steel pre-pkd screen
2" Sch.40, flush-threaded 304 stl steel
Portland-bentonite grout
bentonite seal
20-30 coarse sand
40-60 fine sand

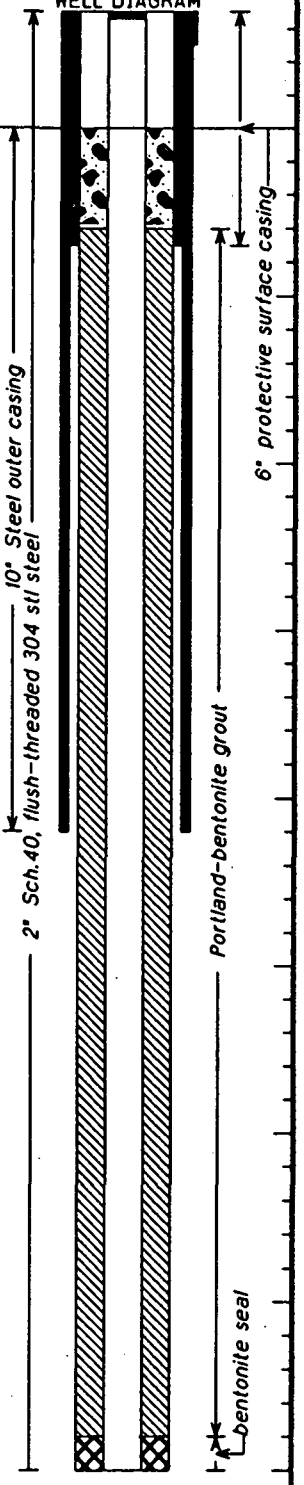
JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-7I
DATE DRILLED 8/3/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD 8" OD Hollow Stem Auger
SURFACE ELEVATION 846.69 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale and Sue Lorenz

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm) 0 150	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
							Topsoil, dark brown, organic
						SP	Sand, fine, light brown
5						CL	Silty clay, gray
						SP	Sand, medium, light brown
						SW	Gravelly sand
10						GW	
						GW	Sandy gravel
						SP	Gravel to 2cm, angular to subrounded
						ML	Sand, fine, light brown
						CH	Silt, gray
15						CH	Clay, brown gray, plastic
							Same as above
20						CH	Same as above
25						CH	Same as above
30						CH	Same as above
35						GW	Sandy gravel to 1.5cm, angular-subrounded
						GW	Same as above
40						SW	



JOB NUMBER: C05030

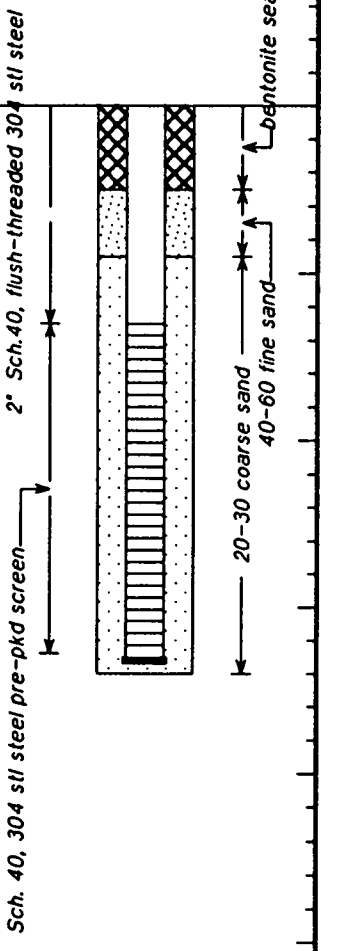
JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-7I
DATE DRILLED 8/3/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD 8" OD Hollow Stem Auger
SURFACE ELEVATION 846.69 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale and Sue Lorenz

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm) 0 150	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
45						SW	*No sample recovery Gravelly sand, brown, dry
						SM	Silty sand, brown
						SW	Gravelly sand to 1.0cm, subrounded
50						SP	
55	☒	MW7-I-56					Sand, fine with gravel
							Boring terminated at 57'
60							
65							
70							
75							
80							

WELL DIAGRAM



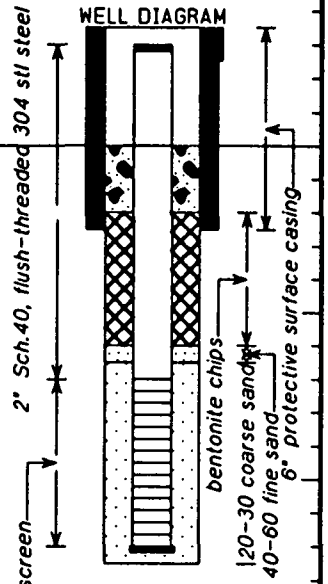
JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-7S
DATE DRILLED 8/4/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD 8" OD Hollow Stem Auger
SURFACE ELEVATION 846.80 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				0 150			
							Topsoil, dark brown, organic
						SP	Sand, fine, light brown
5						CL	Silty clay, gray
						SP	Sand, medium, light brown
						SW	Gravelly sand
10	☒	MW7-S-10				GW	
						GW	Sandy gravel
						SP	Gravel to 2cm, angular to subrounded
						ML	Sand, fine, light brown
15							Silt, gray
							Boring terminated at 12.5'
20							
25							
30							
35							
40							

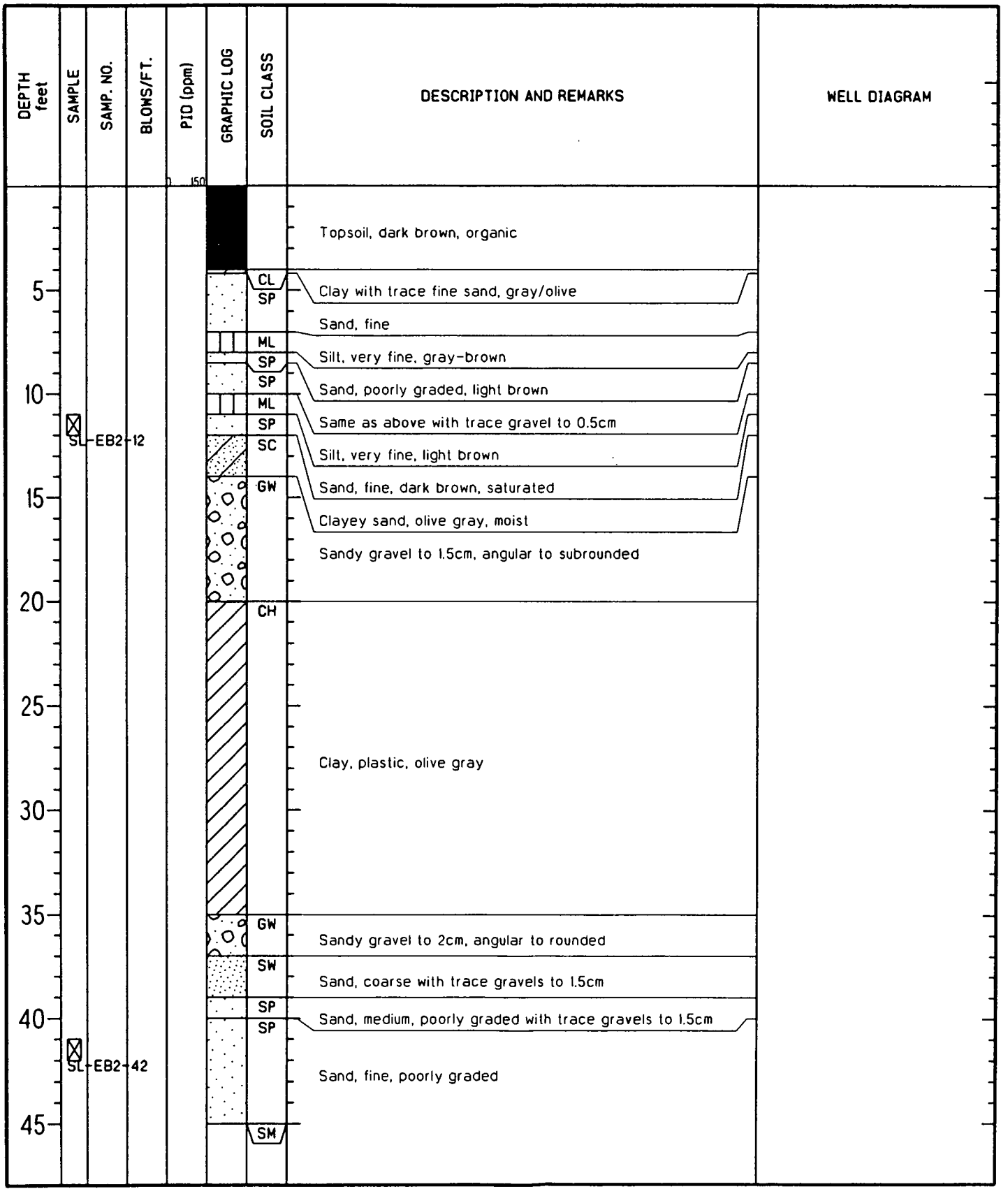


JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER EB-2
DATE DRILLED 7/14/93 through 7/22/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale and Sue Lorenz



JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER EB-2
DATE DRILLED 7/14/93 through 7/22/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale and Sue Lorenz

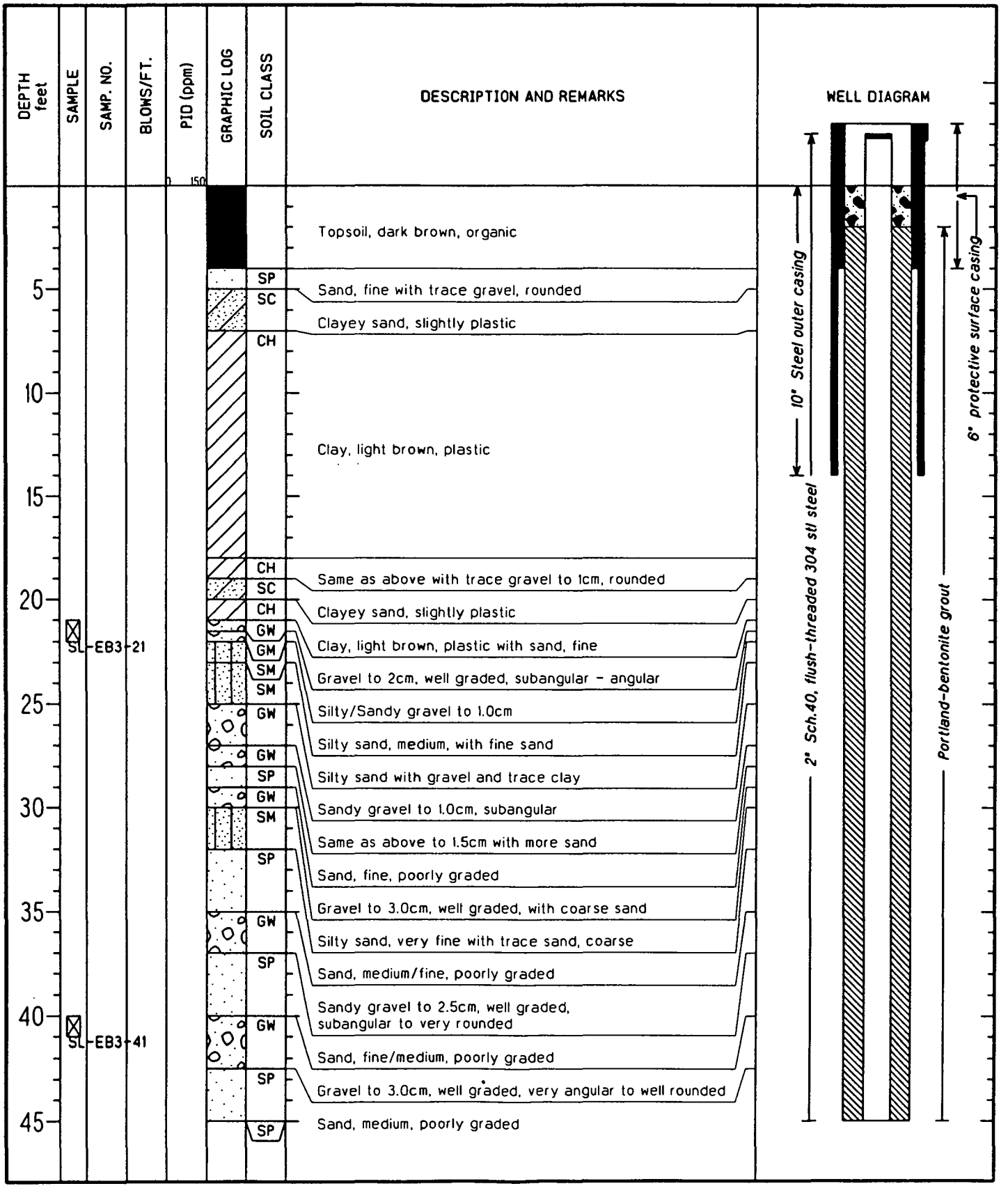
DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm) 0 150	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
50						SM	Silty sand, very fine, saturated	
55								
60								
65						GW	Sand, fine, poorly graded, with gravel to 3.0cm Trace limestone chips, producing significant water Upper weathered bedrock unit	
70						SP	Sand, coarse, poorly graded	
						SP	Sand, fine, poorly graded	
75						LS	Limestone bedrock, tan Producing significant water	
	SL	EB2-79						
80							*Boring terminated at 79' Portland-bentonite grout to surface*	
85								
90								

JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-8B (EB-3)
DATE DRILLED 7/20/93 TO 7/27/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 848.28 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale and Sue Lorenz

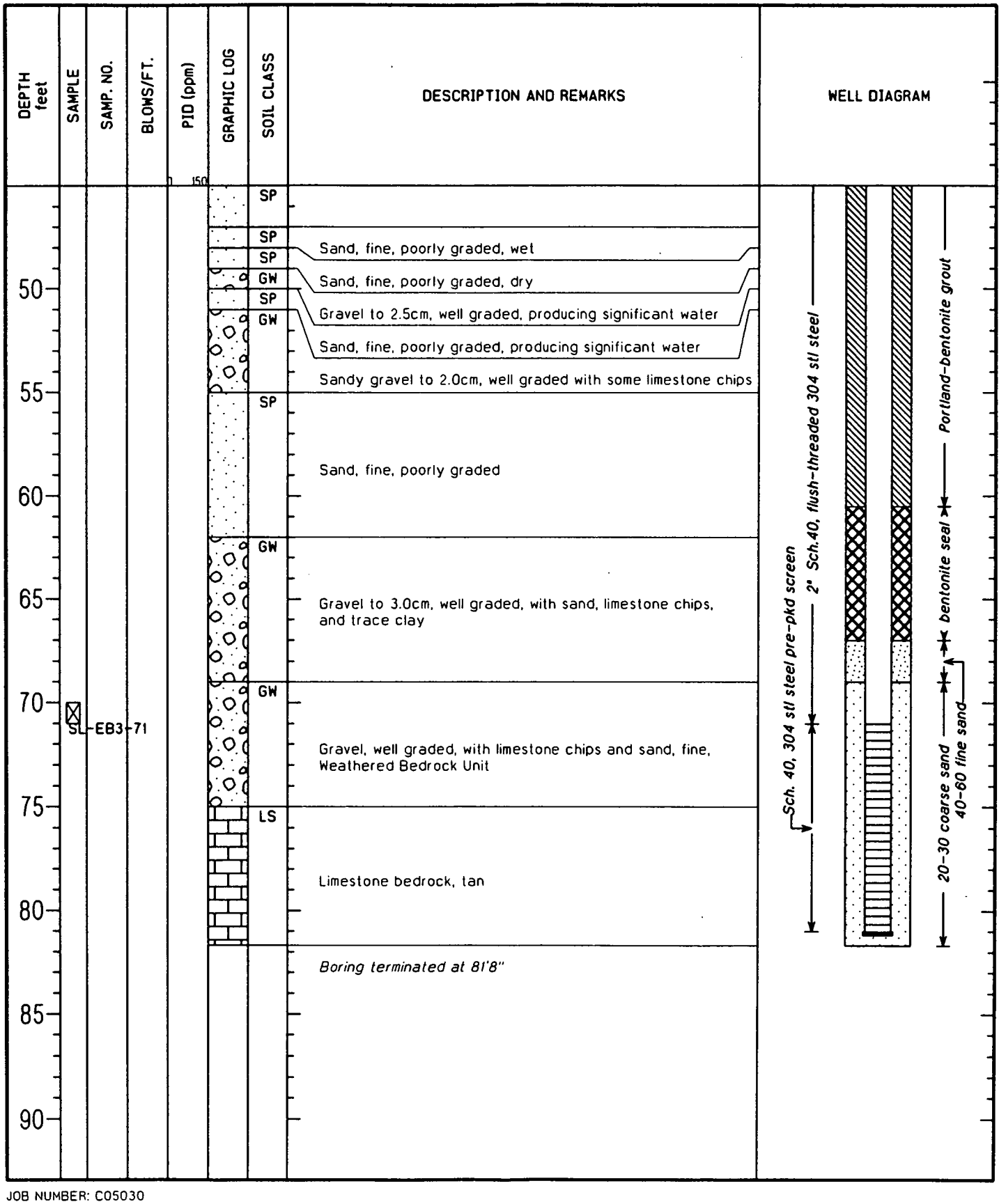


JOB NUMBER: C05030

JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-8B (EB-3)
DATE DRILLED 7/20/93 TO 7/27/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 848.28 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale and Sue Lorenz



JOB NUMBER: C05030

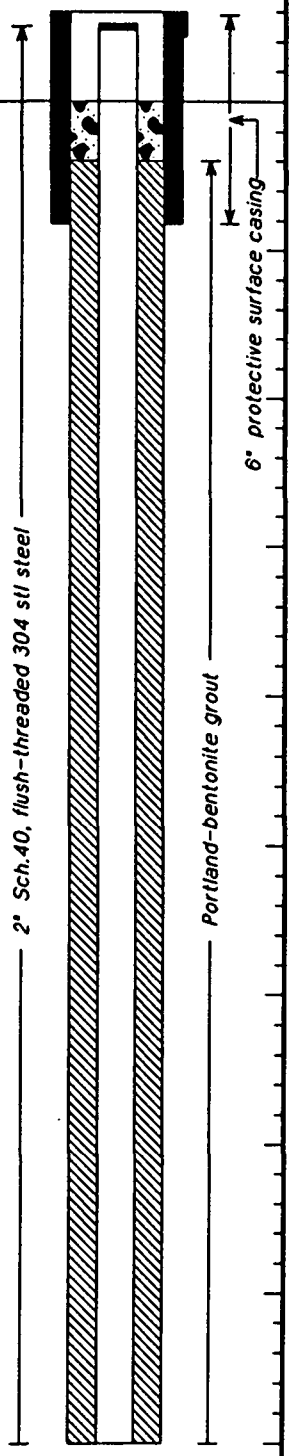
JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-9B (EB-4)
DATE DRILLED 7/21/93 through 7/29/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 848.88 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm) 0–150	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
							Topsoil, dark, organic with clay, low plasticity
						SW	Gravelly sand, well graded
						SP	
5						CL	Sand, medium, poorly graded
						CH	Gravelly/Sandy clay, medium plasticity
						CL	Clay, light brown/gray, plastic
10							Gravelly/Sandy clay, medium plasticity
	⊠	NO RECOV				SP	Sand, medium, poorly graded
						GW	Gravel to 1.5cm, well graded, subangular
15						GC	Clayey gravel to 1.0cm, subangular
						SC	Clayey sand, coarse, poorly graded
						GW	Gravel to 2.5cm, well graded with sand
20						SP	Sand, fine-medium, poorly graded, moist
						SP	Sand, fine, poorly graded
25	⊠	SL-EB4-26				GW	Sandy gravel, well graded, producing water
30						SM	Silty sand, very fine with trace sand, coarse and gravel
						GW	
35							Sandy gravel, well graded, producing significant water
40	⊠	SL-EB4-42					
45						SP	

WELL DIAGRAM



JOB NUMBER: C05030

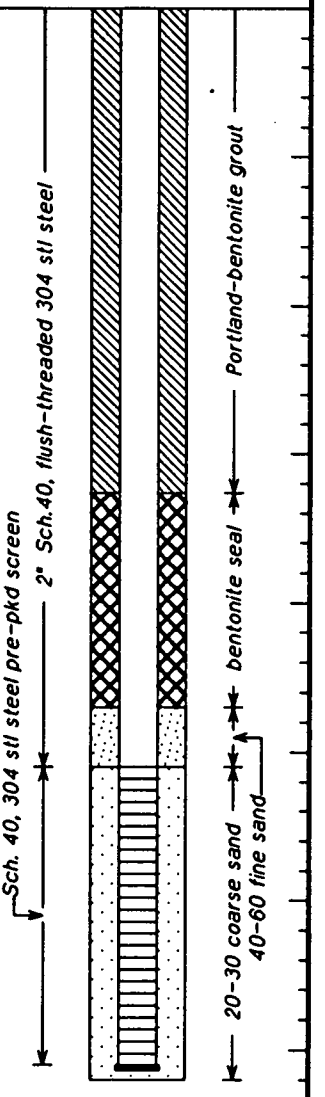
JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-9B (EB-4)
DATE DRILLED 7/21/93 through 7/29/93
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD Dual Wall Reverse Circulation (6" OD)
SURFACE ELEVATION 848.88 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				0 150			
50						SP	Sand, very fine, poorly graded, wet with fines
55						SP	Same as above with trace gravel, well graded
						SP	Same as above
60						SP	Sand, fine, poorly graded, wet
65						GW	Gravel, well graded, with sand, medium-coarse
						GP	Gravel, poorly graded with sand, fine-coarse limestone fragments
70	SL	EB4-71				SP LS	Sand, medium-coarse with small limestone fragments, producing minor water
75							Limestone bedrock, tan, producing steady water
80							
							Boring terminated at 81'
85							
90							

WELL DIAGRAM



JOB NUMBER: C05030

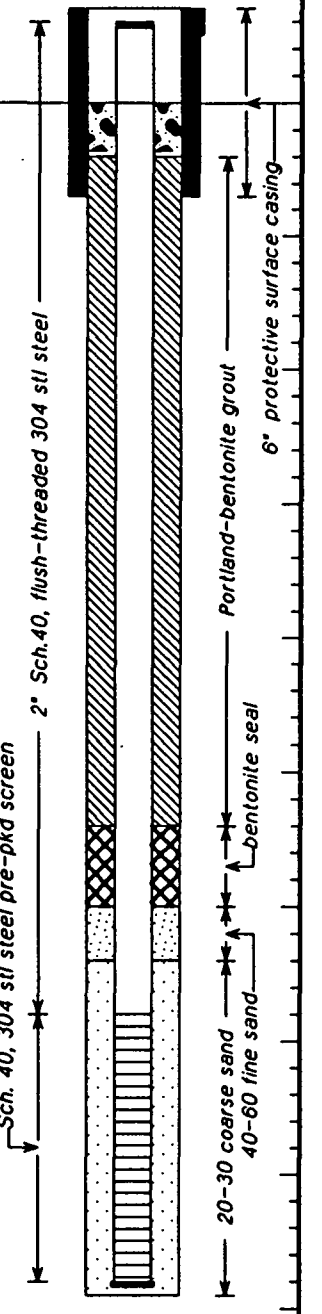
JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-9I
DATE DRILLED 8/5/933
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD 8" OD Hollow Stem Auger
SURFACE ELEVATION 849.18 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm) 0 150	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
							Topsoil, dark, organic with clay, low plasticity
5						SW	Gravelly snad, well graded
						SP	
						CL	Sand, medium, poorly graded
						CH	Gravelly/Sandy clay, medium plasticity
10						CL	Clay, light brown/gray, plastic
						SP	Gravelly/Sandy clay, medium plasticity
							Sand, medium, poorly graded
15						GW	Gravel to 1.5cm, well graded, subangular
						GC	Clayey gravel to 1.0cm, subangular
						SC	Clayey sand, coarse, poorly graded
20						GW	Gravel to 2.5cm, well graded with sand
						SP	Sand, fine-medium, poorly graded, moist
25						SP	Sand, fine, poorly graded
						GW	Sandy gravel, well graded, producing water
30						SM	Silty sand, very fine with trace sand, coarse and gravel
						GW	
35							Sandy gravel, well graded, producing significant water
40							
45						SP	Sand, very fine, poorly graded, wet with fines
							Boring terminated at 44'6"
50							

WELL DIAGRAM



JOB NUMBER: C05030

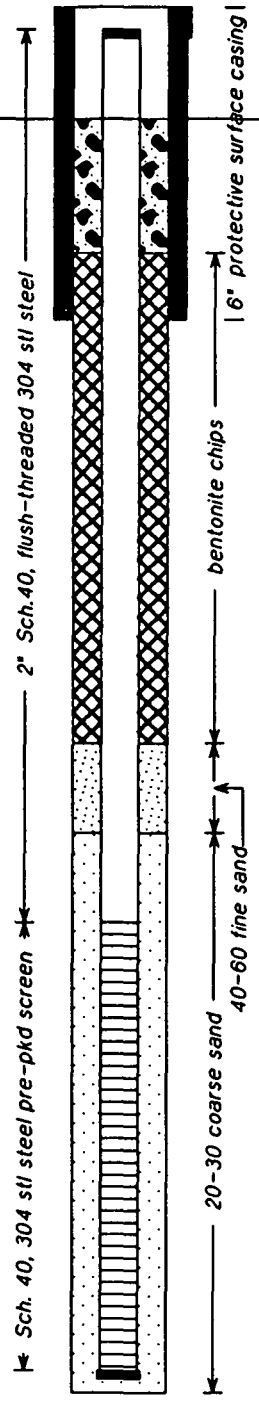
JACOBS ENGINEERING GROUP, INC
CHICAGO ENVIRONMENTAL

BORING NUMBER MW-9S
DATE DRILLED 8/4/933
DRILL COMPANY Exploration Technology Inc.
DRILL METHOD 8" OD Hollow Stem Auger
SURFACE ELEVATION 848.98 Feet MSLD

CLIENT U.S. EPA
PROJECT Stoughton City Landfill
GEOLOGIST Jeff Bale

DEPTH feet	SAMPLE	SAMP. NO.	BLOWS/FT.	PID (ppm) 0 150	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
							Topsoil, dark, organic with clay, low plasticity
						SW	Gravelly snad, well graded
						SP	Sand, medium, poorly graded
5						CL	Gravelly/Sandy clay, medium plasticity
						CH	Clay, light brown/gray, plastic
						CL	Gravelly/Sandy clay, medium plasticity
10						SP	Sand, medium, poorly graded
						GW	Gravel to 1.5cm, well graded, subangular
15		MW9-S-16				GC	Clayey gravel to 1.0cm, subangular
						SC	Clayey sand, coarse, poorly graded
						GW	Gravel to 2.5cm, well graded with sand
20						SP	Sand, fine-medium, poorly graded, moist
						SP	Sand, fine, poorly graded
25						GW	Sandy gravel, well graded, producing water
							Boring terminated at 28'6"
30							

WELL DIAGRAM



JOB NUMBER: C05030

ATTACHMENT B: Groundwater Analytical Data

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLMW3B13

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 187510

Matrix: (soil/water) WATER Lab Sample ID: 187511

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

Level: (low/med) LOW Date Received: 06/25/93

Date Extracted: ____

Date Analyzed: 06/25/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	97%
1-Bromo-3-chloropropane	104%
1,4-Dichlorobutane	100%

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLMW3B41

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 187510

Matrix: (soil/water) WATER Lab Sample ID: 187510

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

Level: (low/med) LOW Date Received: 06/25/93

Date Extracted: _____

Date Analyzed: 06/25/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	103%
1-Bromo-3-chloropropane	104%
1,4-Dichlorobutane	101%

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLMW3B72

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 187510

Matrix: (soil/water) WATER Lab Sample ID: 187512

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

Level: (low/med) LOW Date Received: 06/25/93

Date Extracted: ____

Date Analyzed: 06/25/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	126%
1-Bromo-3-chloropropane	92%
1,4-Dichlorobutane	85%

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLMW3B103

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 187510

Matrix: (soil/water) WATER Lab Sample ID: 188035

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 01JUL931147.4

Level: (low/med) LOW Date Received: 07/01/93

Date Extracted: _____

Date Analyzed: 07/01/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	23%
1-Bromo-3-chloropropane	13%
1,4-Dichlorobutane	21%

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SL-EB-12

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 187510

Matrix: (soil/water) WATER Lab Sample ID: 187531

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

Level: (low/med) LOW Date Received: 07/09/93

Date Extracted: ____

Date Analyzed: 07/09/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	107%
1-Bromo-3-chloropropane	118%
1,4-Dichlorobutane	109%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB155

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. _____ SDG No. 187510

Matrix: (soil/water) WATER Lab Sample ID: 188789

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 13JUL931415.4

Level: (low/med) LOW Date Received: 07/13/93

Date Extracted: _____

Date Analyzed: 07/13/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-0	Tetrahydrofuran	10.0	U

Percent surrogate Recovery

Fluorobenzene	106%
1-Bromo-3-chloropropane	118%
1,4-Dichlorobutane	102%

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB172

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 187510

Matrix: (soil/water) WATER Lab Sample ID: 188974

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 14JUL931429.9

Level: (low/med) LOW Date Received: 07/14/93

Date Extracted: ____

Date Analyzed: 07/15/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	102%
1-Bromo-3-chloropropane	95%
1,4-Dichlorobutane	94%

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB212

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 189099

Matrix: (soil/water) WATER Lab Sample ID: 189099

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 16JUL931126.2

Level: (low/med) LOW Date Received: 07/15/93

Date Extracted: _____

Date Analyzed: 07/16/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	99%
1-Bromo-3-chloropropane	106%
1,4-Dichlorobutane	104%

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SL-EB2-42

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 189099

Matrix: (soil/water) WATER Lab Sample ID: 189448

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 20JUL931250,8

Level: (low/med) LOW Date Received: 07/20/93

Date Extracted: ____

Date Analyzed: 07/20/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	101%
1-Bromo-3-chloropropane	81%
1,4-Dichlorobutane	97%

1D
VOLATILE ORGANIC COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SL-EB2-79

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No. 37550 SAS No. ____ SDG No. 189099

Matrix: (soil/water) WATER Lab Sample ID: 189449

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 20JUL931250,9

Level: (low/med) LOW Date Received: 07/20/93

Date Extracted: ____

Date Analyzed: 07/20/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10.0	U

Percent Surrogate Recovery

Fluorobenzene	106%
1-Bromo-3-chloropropane	83%
1,4-Dichlorobutane	96%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB321

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No.: 37550 SAS No.: _____ SDG No.: 189099

Matrix: (soil/water) WATER Lab Sample ID: 190354

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 27JUL931631.8

Level: (low/med) LOW Date Received: 07/27/93

Date Analyzed: 07/28/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10	U

Percent Surrogate Recovery

Fluorobenzene	104%
1-Bromo-3-chloropropane	106%
1,4-Dichlorobutane	102%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB341

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No.: 37550 SAS No.: _____ SDG No.: 189099

Matrix: (soil/water) WATER Lab Sample ID: 190355

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 27JUL931631.9

Level: (low/med) LOW Date Received: 07/27/93

Date Analyzed: 07/28/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10	U

Percent Surrogate Recovery

Fluorobenzene	102%
1-Bromo-3-chloropropane	103%
1,4-Dichlorobutane	97%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB371

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No.: 37550 SAS No.: _____ SDG No.: 189099

Matrix: (soil/water) WATER Lab Sample ID: 190591

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 28JUL931640.4

Level: (low/med) LOW Date Received: 07/28/93

Date Analyzed: 07/28/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	0.5	U
75-69-4	Trichlorofluoromethane	0.5	U
109-99-9	Tetrahydrofuran	10	U

Percent Surrogate Recovery

Fluorobenzene	102%
1-Bromo-3-chloropropane	118%
1,4-Dichlorobutane	116%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB426

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No.: 37550 SAS No.: _____ SDG No.: 189099

Matrix: (soil/water) WATER Lab Sample ID: 190761

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 29JUL931455.4

Level: (low/med) LOW Date Received: 07/29/93

Date Analyzed: 07/29/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	310	X
75-69-4	Trichlorofluoromethane	1.1	
109-99-9	Tetrahydrofuran	31	

Percent Surrogate Recovery

Fluorobenzene	97%
1-Bromo-3-chloropropane	97%
1,4-Dichlorobutane	95%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB426DL

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No.: 37550 SAS No.: _____ SDG No.: 189099

Matrix: (soil/water) WATER Lab Sample ID: 190761D1

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 29JUL932223.2

Level: (low/med) LOW Date Received: 07/29/93

Date Analyzed: 07/30/93

Dilution Factor: 20.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	240	D
75-69-4	Trichlorofluoromethane	10	U
109-99-9	Tetrahydrofuran	200	U

Percent Surrogate Recovery

Fluorobenzene	99%
1-Bromo-3-chloropropane	112%
1,4-Dichlorobutane	109%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB442

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No.: 37550 SAS No.: _____ SDG No.: 189099

Matrix: (soil/water) WATER Lab Sample ID: 190762

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 29JUL931455.5

Level: (low/med) LOW Date Received: 07/29/93

Date Analyzed: 07/29/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	180	X
75-69-4	Trichlorofluoromethane	20	X
109-99-9	Tetrahydrofuran	84	

Percent Surrogate Recovery

Fluorobenzene	101%
1-Bromo-3-chloropropane	104%
1,4-Dichlorobutane	100%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB442DL

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No.: 37550 SAS No.: _____ SDG No.: 189099

Matrix: (soil/water) WATER Lab Sample ID: 190762D1

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 29JUL932223.3

Level: (low/med) LOW Date Received: 07/29/93

Date Analyzed: 07/30/93

Dilution Factor: 10.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	130	D
75-69-4	Trichlorofluoromethane	13	D
109-99-9	Tetrahydrofuran	100	U

Percent Surrogate Recovery

Fluorobenzene	101%
1-Bromo-3-chloropropane	96%
1,4-Dichlorobutane	97%

1D
VOLATILE ORGANICS COMPOUNDS
Modified EPA Method 601

EPA SAMPLE NO.

SLEB471

Lab Name: Aquatec, Inc. Contract: 93000

Lab Code: AQUAI Case No.: 37550 SAS No.: _____ SDG No.: 189099

Matrix: (soil/water) WATER Lab Sample ID: 190763

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 29JUL931455.6

Level: (low/med) LOW Date Received: 07/29/93

Date Analyzed: 07/29/93

Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-71-8	Dichlorodifluoromethane	1.0	
75-69-4	Trichlorofluoromethane	0.7	
109-99-9	Tetrahydrofuran	10	U

Percent Surrogate Recovery

Fluorobenzene	100%
1-Bromo-3-chloropropane	102%
1,4-Dichlorobutane	97%

ATTACHMENT C: Stoughton POTW Acceptance Criteria

FOUNDED 1888 CITY OF STOUGHTON UTILITIES

ELECTRIC • WATER • WASTEWATER

211 WATER STREET • BOX 383 • STOUGHTON, WISCONSIN 53589-0383 • 608/873-
ROBERT P. KARDASZ, P.E. — Director of Public Works / Superintendent of Utilities

BY FACSIMILIE

June 9, 1993

Mr. Jeffrey Bale
Jacobs Engineering
111 N. Canal St., Suite 105
Chicago, Il 60606

Dear Mr. Bale:

Pursuant to your June 9, 1993 request, I am providing the minimum criteria required for the acceptance of liquids by the City of Stoughton Wastewater Treatment Facility. Your acceptance of these criteria would permit further negotiations to occur.

If you have any questions on this matter, please contact me.

Sincerely,

CITY OF STOUGHTON

Robert P. Kardasz, P.E.
Superfund Program Director

cc: Mayor Helen J. Johnson

Michael D. Doran
Strand Assocs., Inc.

Rodney J. Scheel
Planning Director

encl.

RPK/kg

B. HANDLING OF LIQUIDS

Liquids generated during decontamination, drilling and purging or development of exploratory borings and monitoring wells will be placed in temporary storage on-site, and hauled off-site for suitable disposal at the City of Stoughton POTW.

1) Exploratory Boring Liquids

An estimate of the average daily quantity of liquid during the exploratory boring work is as follows:

a. Water Produced During Drilling Exploratory Borings

Based on a drilling rate of 1 ft/min, and a water production rate of 50 gpm (estimates), about 75,000 gal of liquid would be produced from six exploratory

borings (1,500 ft total) during drilling advance. Based on 20 field days, about 4,000 gal/day of water would be produced.

b. Exploratory Boring Purging Water

Based on an average of 500 gal/purging, 75 purgings, and 20 field days, purging water volume is estimated to be about 7,500 gal total or about 2,000 gal/day.

c. Decontamination Water

Water generated from steam cleaning and decontamination is estimated at about a volume equal to 4 to 6 drums per boring, or about 2,000 gal for six exploratory borings. Based on 20 field days for exploratory boring work, the volume would be approximately 100 gal/day.

Considering the above, the estimated quantity of liquid generated during the exploratory boring construction is about 6,000 gal/day. The daily volume could be somewhat higher or somewhat lower depending upon drilling production, characteristics of the formation, etc. Liquid generation during monitoring well construction (follows exploratory borings) in unconsolidated formations (shallow and deep wells), would be lower than for the boring work, as purging and sampling with depth would not be anticipated, and since hollow stem auger construction methods are anticipated, at least for the water table (shallow) wells. Liquid generation during construction of the bedrock wells would be slightly lower than for the exploratory borings (no purge water) and is estimated to be about 4,000 gal/day.

Drilling and decontamination liquids will be handled as specified in "2221. HANDLING OF WASTES" as contained in the specifications for the drilling contract (Contract 3-91). This will entail discharge of "mud" from the drilling, purge water from sampling, and decon water to a settling basin. The settling basin will allow for separation of cuttings from the liquid. Liquid from the settling basin will flow to a sump for pumping to a 5,000 gal tank or tank trailer which will be located near the site gate. Liquids from the tank will be transferred to a 1,500 gal to 2,500 gal waste haul vehicle for delivery to the Stoughton POTW. Based on the above volumes, about 4 trips/day will be required for a 1,500 gal vehicle. A private hauler (Honey Wagon, Inc.) has indicated that they are able to perform this work. The POTW also has suitable equipment and manpower available. Hauling will be performed by Honey Wagon and/or City of Stoughton personnel. Transfer from the tank trailer to the hauling vehicle will be by submersible or (depending on equipment on hauling vehicle) vacuum pump.

If the actual volume produced exceeds the estimated 6,000 gal/day, additional equipment (storage tank and hauling vehicles) may be required. The City of Stoughton has made arrangements with the City of Janesville to use Janesville's 12,000 gal transportable "nurse" tank trailer in the event that additional on-site equalization/storage would be required. If hauling capacity requirements exceed that available with City and Honey Wagon equipment and personnel, the City will contract with additional waste hauling firms for transport of liquids to the Stoughton POTW.

At the end of each day, the system will be drained to protect from freezing (see Contract 3-91, Specification 2221.A.2.). Also, as specified, the driller is responsible for providing all pumps, piping, etc., necessary to accomplish liquid conveyance to the storage tank, and for operation and maintenance of the liquid transfer system.

Basins and sumps as needed for liquid handling will be provided utilizing livestock tankage, and constructing an impervious basin for handling liquids. The livestock tankage will be conventional tankage used in the agricultural industry. The impervious basin will be a dug basin, sloped to one corner for sumping, lined with welded joint (2" overlap) plastic ("Flexalon" by Geotextiles, Inc., or equal) sheeting, with sheeting ballasted and covered with sand/gravel as a membrane protective measure, and with berming to prevent surface water inflow. This will be of the same general design as the basin previously constructed on the site for receiving decon water.

Until Shop Drawings are submitted by the Drilling Contractor, it is not known whether a livestock tank will be used or a lined earthen basin for receiving the air/water/cuttings mixture from the drilling equipment. If a tank is used, it will be sized to allow settlement of cutting materials as well as to accommodate some settlings storage, and will include baffling of the inlet and overflow areas, or other provisions as may be required to minimize carryover of cuttings materials to the downstream tankage which will house the pump for transfer of the liquids to the on-site storage tank. A quiescent settling area having a hydraulic retention time of approximately 10 minutes would be provided with this approach. Should a lined earthen basin be employed, the surface area and depth would be sufficient to provide settlings storage and adequate quiescent hydraulic retention time (approx. 10 min) for good settling. With the earthen basin approach, it is anticipated that the bottom will be sloped to one corner of the basin where a sump would be located for pumping liquid to the on-site storage tank. Details of the final proposed installation (copies of approved Shop Drawings) will be provided to EPA and DNR when worked out with the Drilling Contractor.

2) Groundwater Monitoring Well Purge Water

About 500 gal of purge and decontamination water will be generated in one sampling round from the groundwater monitoring wells (assumes four new in addition to the twelve existing wells). This liquid will be containerized in DOT approved drums, clearly labeled, temporarily stored in the fenced and locked on-site drum storage area, sampled (composite) to verify acceptability at the City of Stoughton POTW (see Section 2.04 C. below), and hauled from the drum storage area to the POTW for disposal.

C. ACCEPTANCE OF LIQUIDS BY THE POTW

The City has computed limitations for acceptance of the liquids at the Stoughton POTW. These limitations were based upon available criteria (i.e, in the documentation for "PRELIM"-the software developed for EPA, issued DNR guidance on BETX, EPA "Quality Criteria for Water-1986", and NR 105/NR 106 based computations for potential toxics). Limitations were set for a list of pollutants of concern found in past groundwater sampling at the site. Note that barreled liquid wastes from previous RI work at the site was accepted at the Stoughton POTW following analysis which showed very low contaminant levels.

The DNR has drafted a WPDES Permit for re-issuance for the Stoughton POTW, which includes proposed effluent limitations for toxic substances based on NR 105 criteria. Final effluent limits (effective 1/1/94) are proposed for copper; zinc; mercury; pentachlorophenol; 1,2 diphenylhydrazine; hexachlorobenzene; benzo(a)pyrene; and total PAH. The proposed limits for copper, zinc and mercury are based on data which suggest that these substances may be present at levels which justify a limit. The need for limits for the remaining substances has not yet been established (no data), and data collected during the first monitoring period will be used to determine if there is a need for a limit.

In reviewing groundwater quality data from the previous RI work, and other available information, it was concluded by the City that: 1) mercury, zinc and copper were not detected; 2) no values for detected inorganics exceeded ambient water quality (NR 105) criteria; 3) pentachlorophenol was detected in one of 36 samples, at a qualified value less than 1/10 of the proposed limit; 4) PAH compounds were not detected; 5) hexachlorobenzene was not detected; 6) halomethanes were detected in some groundwater samples above NR 105 criteria, but at levels that would be reduced below criteria based on the dilution provided at the POTW headworks; 7) there are no NR 105 criteria for THF; and 8) no other organic compounds were detected at levels of concern relative to NR 105 criteria.

Limits for acceptance have been developed by the City for lead, zinc, mercury, nickel, halomethane, benzene, and total BETX based on a review of the previous RI groundwater data in conjunction with NR 105/NR 106 considerations. These limits are as follows:

Total BETX	30 mg/L
Benzene	10 mg/L
bis (2-ethylhexyl) Phthalate	no limit
Halomethanes	no limit
Tetrahydrofuran	no limit
Pentachlorophenol	20 µg/L
Benzoic Acid	no limit
Lead	40 mg/L
Mercury	3 µg/L
Nickel	125 mg/L
Zinc	200 mg/L

Note: Where "no limit" is indicated, there is no relevant surface water standard or/and computed limits are so high as to eliminate any grounds for concern.

Based on the above limits for acceptance, previous RI data, and the favorable analysis of the previous barreled waste, POTW acceptance of the liquid waste is not anticipated to be a concern.

To assess acceptability of the liquid waste generated during drilling operations, the following procedures have been developed by the City and will be followed:

1. Review 24 hr turnaround VOC/THF data from the exploratory boring samples (each set of data) for benzene, BETX, and halomethanes for acceptability relative to the established limits. A weighted average for the concentration of VOCs in the holding tank will be computed for each day on the basis of estimated liquid volume

generated (from on-site tank measurements) associated with each groundwater sample from the exploratory borings.

2. Analyze initial sample (day 1) collected from storage tank, and daily composite samples (equal blend of samples from waste hauler tank), on a three times per week basis at DNR Certified Wastewater Laboratory-(Strand or RMT depending upon workload) for lead, zinc, mercury and nickel on a 48 hr turnaround basis; and compare data relative to established limits.

3. If data review (from above steps 1. and 2.) indicates that the running weekly average of data is below established limits, continue to accept liquid wastes at the POTW.

4. If the data review (from above steps 1. and 2.) indicates that the running weekly average of data for one or more parameters exceeds the established limits, collect samples of POTW effluent (three times per week) for analysis for the parameter(s) of concern to allow an assessment as to whether or not NR 105/NR 106 based plant effluent criteria are being met. Use RMT lab for VOCs and Strand or RMT for metals. Use 48 hr turnaround timeframe.

5. If POTW effluent criteria are being met, continue sampling as for 1., 2. and 4. above, and continue to accept liquid waste.

6. If POTW effluent criteria are not being met, reject liquid waste and suspend additional RI work until response action (e.g. pretreatment of liquid waste) can be put in place.

Previous RI groundwater data and data from the analysis of previous liquid wastes from site RI work, compared to levels of acceptability at the POTW, make it very unlikely that the liquid wastes from the Additional RI Work will not be acceptable at the Stoughton POTW. In the unlikely event that the wastes would be unacceptable, however, the following steps would be employed to minimize any delays in completing the additional RI work:

1. Work would be suspended prior to the accumulation of a waste volume (approx. 10,000 gal) of unacceptable liquid that would not be feasible to containerize (DOT approved drums) and store on-site.

2. Unacceptable containerized liquid would be stored at the present fenced and locked drum storage area (enlarged as may be needed to handle number of drums).

3. Recognizing that unacceptable (at POTW) liquids would be an indication of highly contaminated groundwater, such that the boundary of the impacted zone has not been defined by the boring location, step out to a greater distance from the site and continue the exploratory boring work.

4. Investigate on-site treatments that could be quickly implemented, such as aeration or chemical precipitation, to allow POTW acceptance of liquids and to allow the investigation to continue in the highly contaminated zone so that data on magnitude/extent can be collected.

ATTACHMENT D: Waste Water Analytical Data

RMT INC.
LABORATORIES

RECEIVED
JUL 6 - 1993
JEG-CHICAGO

CLIENT: JACOBS ENGINEERING GROUP INC.
SAMPLE #: 1819-001
PROJECT #: 91518.00
WORK ORDER #: 1819
WI DNR LAB ID: 113138520

REPORT DATE: 07/01/93
COLLECTION DATE: 06/28/93
STATION ID: TANK TRUCK

INORGANIC ANALYSIS REPORT

PARAMETER	RESULT	UNITS
Lead, total	7.7	ug/L
Mercury, total	<0.20	ug/L
Nickel, total	<40	ug/L
Zinc, total	40	ug/L

Patricia M. McCentark 7/1/93
Approval Signature

RMT INC.
LABORATORIES

CLIENT: JACOBS ENGINEERING GROUP INC.
SAMPLE #: 1819-001
PROJECT #: 91518.00
WORK ORDER #: 1819

REPORT DATE: 07/02/93
COLLECTION DATE: 06/28/93
STATION ID: TANK TRUCK
SAMPLE COLLECTOR:

VOLATILE ORGANIC ANALYSIS REPORT

PARAMETER	RESULT	UNITS
Dichlorodifluoromethane	<2.0	ug/L
Chloromethane	<2.0	ug/L
Vinyl chloride	<1.0	ug/L
Bromomethane	<2.0	ug/L
Chloroethane	<2.0	ug/L
Fluorotrichloromethane	<2.0	ug/L
1,1-Dichloroethene	<1.0	ug/L
Methylene chloride	<1.0	ug/L
1,2-Dichloroethene, total	<2.0	ug/L
1,1-Dichloroethane	<1.0	ug/L
Chloroform	<1.0	ug/L
1,1,1-Trichloroethane	<2.0	ug/L
Carbon tetrachloride	<1.0	ug/L
1,2-Dichloroethane	<1.0	ug/L
Benzene	<1.0	ug/L
Trichloroethene	<2.0	ug/L
1,2-Dichloropropane	<1.0	ug/L
Bromodichloromethane	<1.0	ug/L
2-Chloroethylvinylether	<5.0	ug/L
cis-1,3-Dichloropropene	<2.0	ug/L
Toluene	<1.0	ug/L
trans-1,3-Dichloropropene	<2.0	ug/L
1,1,2-Trichloroethane	<1.0	ug/L
Tetrachloroethene	<2.0	ug/L
Chlorodibromomethane	<2.0	ug/L
Chlorobenzene	<1.0	ug/L
Ethylbenzene	<1.0	ug/L
Xylene, total	<3.0	ug/L
Bromoform	<2.0	ug/L
1,1,2,2-Tetrachloroethane	<2.0	ug/L
1,3-Dichlorobenzene	<1.0	ug/L

RMT INC.
LABORATORIES

CLIENT: JACOBS ENGINEERING GROUP INC.
SAMPLE #: 1819-001
PROJECT #: 91518.00
WORK ORDER #: 1819

REPORT DATE: 07/02/93
COLLECTION DATE: 06/28/93
STATION ID: TANK TRUCK
SAMPLE COLLECTOR:

VOLATILE ORGANIC ANALYSIS REPORT

PARAMETER	RESULT	UNITS
1,4-Dichlorobenzene	<1.0	ug/L
1,2-Dichlorobenzene	<1.0	ug/L

Kevin P. Mack 7/2/93
Approval Signature

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Phone:(608) 831-4444

IEA
An Aquarion Company

SAMPLE SUMMARY

CLIENT SAMPLE ID	IEA SAMPLE ID
BT1	931053001

IEA
An Aquarion Company

Client: METCALF & EDDY
IEA Job#: CH93053
Project #: 12E01800

ANALYTE LIST
mg/L

Matrix: WATER

Analyte	Client ID / Lab ID	BT1 31053 001					PQL
Lead – 7421		0.15					0.002
Nickel– 6010		<0.03					0.03
Mercury – 7471		<0.0002					0.0002
Zinc – 6010		<0.02					0.02

PQL = Practical Quantitation Limit

Dates of Analyses

Lead	8/12/93
Nickel	8/17/93
Mercury	8/12/93
Zinc	8/17/93

GFAA Quality Control Data

Date	8/17/93					SAMPLES:					
Analyst	EQ					31010					
Sample	31010					31053					
Wt/Vol	100 ml					31032					
Prp.Bat.	547										
Units	mg/L										
Element	Matrix Spike				Duplicate						TCLP Blk
	Org.Smp	Spk.Smp	Amt.Spkd	%REC				Int.	Dup.	%RPD	N/A
Nickel	<0.03	4.805	5.000					<0.03	<0.03	0.0	
Zinc	0.028	4.802	5.000					0.028	0.028	0.0	
Lead	<0.05	4.801	5.000					<0.05	<0.05	0.0	

Serial Dil	Smp #		ERR	Post SpK		Sample #:	ERR	Prep Blk	LCS		
	Sample	Dilution	RPD	Org.Smp.	Amt.Spkd	Result	%REC		Org	Known	%REC
								<0.0002	N/A		
Nikel	<0.03	<0.15	0.0	<0.03	2.500	2.563	102.5	<0.03	4.920	5.000	98.4
Zinc	0.099	0.109	9.6	0.099		2.324	89.0	<0.02	4.864	5.000	97.3
Lead	<0.05	<0.25	0.0	<0.05	2.500	2.184	87.4	<0.05	4.909	5.000	98.2

IEA
An Aquarion Company

GFAA Quality Control Data

Date	8/12/93	SAMPLES:	
Analyst	PN/DOC		31007
Sample	31007		31053
Wt/Vol	100 ml		31032
Prp.Bat.	–		
Units	mg/L		

Element	Matrix Spike				Matrix Spike Duplicate						TCLP Bl
	Org.Smp	Spk.Smp	Amt.Spkd	%REC	Spk.Smp	Amt.Spkd	%REC	Int.Spk	Dup.Spk	%RPD	Result
Mercury	<0.0002	0.00239	0.00200	120	0.00236	0.00200	118	120	118	1.7	N/A

Serial Dil	Smp #	N/A		Post SpK	N/A	Sample #:	ERR	Prep Blk		LCS	N/A
	Sample	Dilution	RPD	Org.Smp.	Amt.Spkd	Result	%REC		Org	Known	%REC
Mercury								<0.0002			

IEA
An Aquarion Company

IEA
An Aquarion Company

Client: METCALF & EDDY
IEA Job#: CH931053
Project #: 12E01800

PURGEABLE HALOCARBONS
SW-846 METHOD 8010/8020 COMPOUNDS
(ug/L)

Matrix: WATER

Analyte	Lab ID						PQL
Dilution Factor (DF)		1	1				
Method Blank		VS0812	–				
Client ID		BT1	METHOD BLANK				
		31053 001	VS0812				
Benzene		U	U				1.0
Ethylbenzene		U	U				1.0
Toluene		U	U				1.0
Xylenes		U	U				1.0
Bromodichloromethane		U	U				1.0
Bromoform		U	U				1.0
Bromomethane		U	U				1.0
Carbon Tetrachloride		U	U				1.0
Chlorobenzene		U	U				1.0
Chloroethane		U	U				1.0
2-Chloroethylvinyl ether		U	U				1.0
Chloroform		U	U				1.0
Chloromethane		U	U				1.0
Dibromochloromethane		U	U				1.0
1,2-Dichlorobenzene		U	U				1.0
1,3-Dichlorobenzene		U	U				1.0
1,4-Dichlorobenzene		U	U				1.0
1,1-Dichloroethane		U	U				1.0
1,2-Dichloroethane		U	U				1.0
1,1-Dichloroethene		U	U				1.0
1,2-Dichloroethene (total)		U	U				1.0
1,2-Dichloropropane		U	U				1.0
cis-1,3-Dichloropropene		U	U				1.0
trans-1,3-Dichloropropene		U	U				1.0
Methylene Chloride		U	U				1.0
1,1,2,2-Tetrachloroethane		U	U				1.0
Tetrachloroethene		U	U				1.0
1,1,1-Trichloroethane		U	U				1.0
1,1,2-Trichloroethane		U	U				1.0
Trichloroethene		U	U				1.0
Trichlorofluoromethane		U	U				1.0
Vinyl Chloride		U	U				1.0
Date Received		8/12/93	–				
Date Analyzed		8/12/93	8/12/93				

PQL – Pratical Quantitation Limit

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

PURGEABLE AROMATICS SW-846 METHOD 8021 COMPOUNDS

EA REFERENCE NUMBER: 31029021

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene	30	<1	31	103	75-125
Trichloroethene	30	<1	30	100	75-125
Benzene	30	<1	31	103	75-125
Toluene	30	<1	28	93	75-125
Chlorobenzene	30	<1	29	97	75-125

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene	30	34	113	9	20	75-125
Trichloroethene	30	32	107	7	20	75-125
Benzene	30	33	110	7	20	75-125
Toluene	30	30	100	7	20	75-125
Chlorobenzene	30	31	103	6	20	75-125

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

* Values outside of QC limits

D: 0 out of 5 outside limits

Spike Recovery: 0 out of 10 outside limits

COMMENTS: PID CONCENTRATIONS USED _____

CORRESPONDING SAMPLES:

8-12-93

ATTACHMENT E: Grain Size Analytical Data

IEA
An Aquarion Company

CASE NARRATIVE - CH931039

Grain size analysis was performed by IEA - Connecticut.

IEA
An Aquarion Company

TABLE 1.0
30930-0869
IEA, INC.
MISCELLANEOUS

SAMPLE IDENTIFICATION: MW7-S-10

Sieve#	Mass (Grams)	% of Total
Greater than 3"	0.00	0.00
Between 3" and #4	2.08	1.99
Between #4 and #10	2.83	2.71
Between #10 and #40	23.87	22.83
Between #40 and #80	52.87	50.56
Between #80 and #200	17.40	16.64
Smaller than #200	5.52	5.28
Total	104.57	100.01

IEA
An Aquarion Company

TABLE 1.0
30930-0869
IEA, INC.
MISCELLANEOUS

SAMPLE IDENTIFICATION: MW9-S-16

Sieve#	Mass (Grams)	% of Total
Greater than 3"	0.00	0.00
Between 3" and #4	22.78	19.43
Between #4 and #10	11.24	9.58
Between #10 and #40	35.80	30.53
Between #40 and #80	36.82	31.40
Between #80 and #200	8.46	7.21
Smaller than #200	2.16	1.84
Total	117.26	99.99

IEA
An Aquarion Company

TABLE 1.0
30930-0869
IEA, INC.
MISCELLANEOUS

SAMPLE IDENTIFICATION: MW7-I-56

Sieve#	Mass (Grams)	% of Total
Greater than 3"	0.00	0.00
Between 3" and #4	36.65	30.49
Between #4 and #10	28.69	23.87
Between #10 and #40	18.93	15.75
Between #40 and #80	27.55	22.92
Between #80 and #200	6.37	5.3
Smaller than #200	2.02	1.68
Total	120.21	100.01