TECHCITY

TOWN OF ULSTER, ULSTER COUNTY NEW YORK

SITE ID: 356002
ORDER ON CONSENT INDEX: D3-10023-6-11

GROUNDWATER MONITORING PLAN

July 2013

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1.0 GROUNDWATER MONITORING PLAN

This Groundwater Monitoring Plan (GMP) has been prepared for the TechCity site (the Site) located at 300 Enterprise Drive, Kingston, Ulster County, New York (see Figure D-1) to satisfy the requirements detailed in the Order on Consent (Order), Index # D3-10023-6-11, for Site 356002.

This GMP conforms to the extent practicable to the NYSDEC Program Policy *DER-10, Technical Guidance for Site Investigation and Remediation (May 3, 2010)*. The GMP provides protocols and specifies methods which will allow for the collection and analysis of representative groundwater samples and related field data to assess the performance of the groundwater remediation. The GMP also includes specific Quality Assurance / Quality Control (QA/QC) requirements for associated groundwater monitoring activities.

This GMP may only be revised with the approval of the New York State Department of Environmental Conservation (NYSDEC).

1.1 Site Background

The Site is listed as a Class 4 Site (Site # 356002) in the Registry of Inactive Hazardous Waste Disposal Sites in New York State and was managed in compliance with the October 4, 1996 Hazardous Waste Management Permit #3-5154-00067/00090 (6 NYCRR Part 373) (RCRA Permit) issued to International Business Machines Corporation (IBM) until the Order on Consent (Order) was signed with New York State Department of Environmental Conservation (NYSDEC) by IBM and TechCity Properties on July 8, 2011.

The Order, which supersedes and replaces the former RCRA Permit, divides the Site into ten Operable Units (OUs). The locations of the OUs are depicted in Figure D-2. Table D-1 presents a list of the OUs, including the proposed OU use and which OUs will remain listed as a Class 4 Inactive Hazardous Waste Disposal Site.

Prior to the execution of the Order, IBM completed extensive RCRA Facility Investigations (RFIs) from the 1990s through 2002 to delineate the occurrence and extent of volatile organic compounds (VOCs) in groundwater beneath the Site. Groundwater remediation implemented by IBM includes the operation and maintenance of a perimeter control system that intercepts the groundwater plume. The perimeter control system consists of two stormwater sewer systems, an unsaturated portion of the surficial sand unit that underlies the Site, a utility trench barrier wall and a groundwater collection system (GWCS) (see Figure D-2).

Table D-1: Listing of Operable Units, Proposed Use and Status		
Operable Unit	**Proposed Use**	**Status**
OU1	Commercial	To be removed from Class 4 Inactive Hazardous Waste Disposal Site # 356002 subject to OU specific restrictions.
OU 2	Commercial	To be removed from Class 4 Inactive Hazardous Waste Disposal Site # 356002 subject to OU specific restrictions.
OU 3	Commercial	Included as part of the Class 4 Inactive Hazardous Waste Disposal Site # 356002
OU 3a	Commercial	Included as part of the Class 4 Inactive Hazardous Waste Disposal Site # 356002
OU 4	Restricted Residential	To be removed from Class 4 Inactive Hazardous Waste Disposal Site # 356002 subject to OU specific restrictions.
OU4a	Commercial	To be removed from Class 4 Inactive Hazardous Waste Disposal Site # 356002 subject to OU specific restrictions.
OU5	Commercial	Included as part of the Class 4 Inactive Hazardous Waste Disposal Site # 356002
OU6	Commercial	To be removed from Class 4 Inactive Hazardous Waste Disposal Site # 356002 subject to OU specific restrictions.
OU7	Commercial	To be removed from Class 4 Inactive Hazardous Waste Disposal Site # 356002 subject to OU specific restrictions.
OU8	Commercial	To be removed from Class 4 Inactive Hazardous Waste Disposal Site # 356002 subject to OU specific restrictions.

1.2 Groundwater Plume Areas

Four groundwater plumes have been identified at the Site, including:

- The North Parking Lot Area (NPLA) Plume (located to the north of Buildings (B001 and B003) is primarily composed of volatile organic compounds (VOC) including trichloroethene (TCE) and trichloroethane (TCA), and to a lesser degree tetrachloroethene (PCE). Based on historic groundwater quality sampling and soil vapor screening investigations, the source areas for this plume are likely associated with historic manufacturing activities in B001, B002, B003, B004 and B005S. The primary source area appears to be the industrial waste sewer lines located beneath these buildings (as noted below) and north of B001 and B003. Concentrations of PCE, TCE and TCA in the NPLA Plume appear to originate in the central and western portions of the Site.
- The B005 Plume Area, located beneath B001, B002, B003, B004 and B005, is primarily composed of TCE and TCA. Based on historic groundwater quality sampling and soil vapor screening investigations, this plume is believed to have originated from activities in B001, B003, B004 and B005S.
- An isolated PCE plume, extending from the southern portion of B005 to the 42-inch sewer and originating from a release(s) at a PCE tank located in the southeastern corner of B005.
- The Industrial Waste Treatment Facility (IWTF) Plume, located in the vicinity of the former IWTF, near B036. The plume in this area is not likely to have originated from the IWTF, but is believed to have migrated from the eastern campus plume along the underground utility pipes prior to the installation of the utility trench barrier wall.

Figure D-3 presents a generalized depiction of areas where groundwater is impacted by VOCs.

1.3 Generalized Geologic and Groundwater Flow Conditions

The Site is located within the Hudson-Mohawk Lowland Physiographic Province. The bedrock underlying the western portion of the Site consists of siltstone and shale of the Middle Devonian Age Lower Hamilton Group. The eastern portion of the Site is underlain by both the Lower Hamilton Group and the Lower Devonian Age Onondaga Limestone. The exact location and nature of the contact between these units is not known. The Lower Hamilton Group forms a north-northwest trending bedrock high approximately coincident with Enterprise Drive, and is described as a calcareous shale in boring logs completed during previous Site investigations.

Literature on regional geologic conditions indicate that a glacially-derived sand and gravel unit directly overlies the bedrock west of Enterprise Drive and a glacial till unit overlies the bedrock east of Enterprise Drive. These unconsolidated units are overlain by a varved silt and clay unit that is interpreted to be of lacustrine origin, with a thickness of zero feet in an area where it is absent proximate to the bedrock high, to over 180-feet in the central portion of East Campus as determined by previous Site borings. The clay portion of the varved silt and clay unit serves as an aquitard throughout most the Site, except in the localized area in the vicinity of the bedrock high where it is absent.

A well sorted, fine to coarse-grained sand of lacustrine origin, with intermittent, thin, silty-clay zones, overlies the varved silt and clay (or bedrock where the varved silt and clay is absent in the vicinity of the bedrock high). This surficial sand unit ranges in thickness across the Site from approximately 6-feet in the area of the bedrock ridge to greater than 30-feet in the central portion of the East Campus. A discontinuous transition zone of relatively fine-grained materials is present at the base of the surficial sand unit in some areas of the Site (GSC, 1997).

Generalized descriptions of the near-surface lithologic units encountered at the Site are as follows:

- **Surficial SAND Unit:** Consists of a light brown, fine to medium grained sand containing variable amounts of finer-grained silt and clay. This unit is typically saturated below a depth of approximately 6 to 7-feet below ground surface (ft bgs).
- **SILTY-SAND and CLAY Transition Unit:** Consists of variable amounts of reddish-brown to gray silt, sand, and clay. Typical appearance in a soil core is a silty-sand matrix containing thin lenses of silt and sandy clay. This unit, if present, is generally encountered between 15 to 20-ft bgs in the vicinity of Building 001 (B001).
- **Varved CLAY Unit:** Consists of red-brown and gray, plastic, cohesive, wet clay with intermittent silt zones. Typical appearance in a soil core is clay with laminae of silt and sometimes very fine-grained sand. This unit is typically encountered at approximately 20 to 25-ft bgs in the B001 area, with greater or lesser depths of first occurrence in localized areas.

The varved clay unit serves as an aquitard throughout most the Site. Therefore groundwater in the bedrock and in the deep sand and gravel and glacial till units that underlie the varved silt and clay is under confined conditions. Groundwater within the surficial sand unit that overlies the varved silt and clay unit is unconfined. The surficial sand unit is typically unsaturated in the area of the bedrock high along Enterprise Drive.

An east-west trending groundwater divide has been identified at the Site underlying B001, Building 002 (B002), B003, Building 004 (B004) and Building 005 (B005) (see Figure 3). Groundwater to the north of the divide flows west and northwest. Groundwater to the south of the divide flows west and southwest. The water table gradient in the eastern portion of the Site and in the vicinity of the Groundwater Collection System (GWCS) is reportedly higher than the water table gradient in the south and central portion of the Site, and estimated horizontal groundwater flow velocities range from approximately 0.8 ft/day to 2 ft/day (GSC, 1997b).

Groundwater flow is influenced by the presence of the perimeter control system (see Figure D-3), which is composed of:

- A 42-inch diameter storm sewer pipe that extends from east to west along a line south of B001 through B005, and then passes under Enterprise Drive to the south of Building 201 (B201).
- An unsaturated portion of the surficial sand unit that intersects the 42-inch storm sewer south of B201, and extends east-northeast back across Enterprise Drive, and then continues toward the north portion of the Site.
- The GWCS extends along the western and northern perimeter of the NPLA. The GWCS is comprised of a set of groundwater cut-off trenches. Water collected in the trenches is treated via air stripping.
- A 60-inch diameter storm sewer pipe that intersects the GWCS and extends along the western portion of the North Parking Lot Area.
- A utility trench barrier wall, consisting of an approximately 250-foot long trench backfilled with clay with the base keyed into the Varved Clay Unit and the top of the barrier wall completed a minimum of two feet above the recorded high water table. This barrier wall was installed to

> mitigate the potential for groundwater migration along the underground utility pipes which ultimately terminate at the former IWTF.

The groundwater VOC plume is contained within the Site by this system.

1.4 Groundwater Monitoring Plan Design

Groundwater monitoring wells have been installed under various regulatory and other voluntary programs to monitor groundwater conditions at the Site. The groundwater monitoring plan has been designed to ascertain upgradient and down gradient conditions at the site control perimeter and to monitor conditions within the core portions of the Site. Attachment A contains copies of boring logs for each well installed at the Site; these boring logs contain well construction details and total depth. Attachment B contains a listing of wells by OU and details if the well is currently monitored under the GMP.

The groundwater quality sampling and analysis plan which includes the hydraulic effectiveness monitoring well locations are detailed in Table 1 of Attachment C. Hydraulic effectiveness monitoring wells include all groundwater quality locations shown on Figure D-4. Table 2 of Attachment C provides the anticipated sampling schedule.

2.0 SAMPLING PROTOCOL

All monitoring well sampling activities will be recorded in a field book on a groundwater sampling field data sheet presented in Attachment D. Other observations (e.g. well integrity, etc.) will be noted on the physical well inventory form presented in Attachment D. This physical well inventory form will serve as the inspection form for the groundwater monitoring well network.

2.1 Pre-sampling Preparation and Tasks

This section describes the procedures to be followed by field sampling personnel prior to the initiation of the sampling event.

2.1.1 Field Equipment Inspection, Calibration and Maintenance

Prior to the sampling event, sampling equipment will be inspected to verify cleanliness and to ensure proper working order. Preventive maintenance of field measuring instruments and field sampling devices will be accomplished as per the manufacturer's specifications. All field equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions.

2.1.2 Procurement and Preparation of Sample Containers

All samples shall be collected into laboratory-prepared containers. Containers with preservative shall be tagged as such by the laboratory. Field personnel shall collect samples in appropriate containers for the required analytical methods.

2.1.3 Equipment Storage, Handling and Decontamination Procedures

Sampling equipment will be stored in a manner to prevent contact with contaminated equipment or materials. Whenever possible, dedicated sampling equipment shall be used to reduce the need for field decontamination of equipment. Purging and sampling equipment must be handled with gloved hands. Gloves shall be changed following each activity that may contaminate them and, at a minimum, between wells.

Since the hazardous constituents being monitored in groundwater at this Site are primarily VOCs, all non-dedicated well evacuation devices shall be decontaminated prior to placement down the borehole by high-pressure steam cleaning and thoroughly rinsing with organic-free deionized (DI) water.

Dedicated well evacuation and sampling equipment shall be decontaminated in a similar way prior to being placed in service, and whenever it is removed for inspection and repair.

Other non-dedicated field measurement devices such as water level indicators and pH, temperature and conductivity instruments shall be decontaminated prior to obtaining a measurement in such a manner so as not to damage the equipment. This non-dedicated field equipment shall be decontaminated by thoroughly rinsing with DI water.

2.1.4 Personnel Protective Equipment / Health and Safety Measures

A Health and Safety Plan (HASP) has been prepared specifically for the routine groundwater monitoring program and is a self-contained document reproduced as Attachment E to the GMP. Section 4 of the HASP presents an assessment of chemical hazards identified at the Site as a result of extensive and continuing sampling efforts. Section 6 of the HASP describes the personal protective equipment required for sampling personnel.

Disposable nitrile gloves will be used for all groundwater monitoring activities, regardless of the level of contamination. Gloves will be changed following each activity that may contaminate them and, at a minimum, between wells.

2.2 Water Level Measurements

Depth to water will be measured at all monitoring wells as per the schedule specified in Table 1 of Attachment C for Hydraulic Effectiveness Monitoring in addition to static water level measurements conducted as part of water quality sampling activities. All static water level measurements shall be obtained following this same procedure and will be recorded on a field form.

Depth to water measurements will be obtained using an electronic water level measuring device (M-scope® or equivalent) with 0.01 foot increments. These measurements will be taken at the designated permanent reference survey point marked on each well casing. In all instances, data will be reported and groundwater elevations calculated based on the measurement from the permanent reference survey point.

2.3 Purge Methods

For sampling techniques where well purging is appropriate, the purge volume for each well will be calculated based on water level measurement, well depth measurement, and well diameter. The depth to bottom of the well will be sounded and the purge volume will be calculated using the following formula:

Purge Volume = n x (*Depth To Bottom –Depth To Water*) x 3	
Where n =	0.09 gal/ft for 1.5-inch diameter wells
	0.16 gal/ft for 2-inch diameter wells
	0.37 gal/ft for 3-inch diameter wells
	0.65 gal/ft for 4-inch diameter wells
	1.47 gal/ft for 6-inch diameter wells
	2.61 gal/ft for 8-inch diameter wells

The intake structure of any purge device shall be positioned in a manner which allows for the removal of all stagnant water from the well. Confirmation of the removal of all stagnant water shall be accomplished by verifying the drawdown of any pump used for purging or by bailing from the top of the column.

Monitoring wells will be purged using one of the following configurations or equivalent methods:

- A dedicated or non-dedicated submersible pump constructed of stainless steel and Teflon® components equipped with appropriate low-sorption discharge tubing.
- A variable-speed Teflon®-and-stainless-steel submersible pump with low sorption discharge tubing.
- A self-priming variable-speed low-volume peristaltic pump equipped with Teflon®/silicone tubing. The tubing is typically dedicated to the well.
- A bailer constructed of PVC, Teflon® or stainless steel.
- Other NYSDEC approved methods.

If any of the above equipment is dedicated, it will be stored in the well or in a dedicated storage container (PVC canisters or plastic bags) between sampling rounds.

2.4 Groundwater Containment / Disposal of Purge Water

Purge water from wells located in non-paved areas can be returned to the ground within a 20-foot radius of the well. In instances where purge water cannot be returned to the ground within a 20-foot radius of the well (e.g. paved area) and the well does not show evidence of the presence of non-aqueous phase liquid purge water will be properly disposed. If the presence of non-aqueous phase liquid is discovered in a well, that purge water will be contained and disposed of properly.

2.5 Sample Collection Methods

To ensure that a groundwater sample is representative, in all instances physical alteration of the sample will be minimized and chemical contamination must be prevented during the sampling process. The following is a list of sampling equipment and techniques that may be used to collect groundwater samples at this Site:

- *Teflon® or stainless steel bailers equipped with double check valves and a valved bottom emptying devices.* The bailers will be lowered slowly into the water column so as to minimize agitation of the water column. After the sample is brought to the surface, it will be emptied into the sample container using the bottom emptying device.
- *A variable-speed Teflon®-and-stainless-steel submersible pump.* The groundwater sample will be collected directly from the discharge line of the pump with the flow rate adjusted until as slow and steady a flow as possible is achieved.
- Other NYSDEC approved methods.

All samples will be collected into laboratory prepared, properly preserved sample containers.

VOC samples will be transferred to sampling containers in such a way as to minimize agitation and aeration. VOC sample containers shall be filled in such a manner as to have no headspace (air bubbles).

Dissolved metals samples will be field-filtered through a 0.45-micron filter made of Teflon®, polypropylene, nylon, cellulose, or borosilicate glass. A new filter, sample transfer bottle and tubing shall be used for each sample collected. Samples shall be collected into clean sample transfer containers prior to undergoing filtration and shall be filtered immediately into properly preserved sample containers. Where required, total metals samples will be collected using the same equipment as for dissolved metals samples but will not be field filtered upon removal from the well. Dissolved and total metals samples will be acidified to pH<2. Preservative is added to the sampling containers prior to sample collection.

Field parameters (pH, specific conductance, and temperature) will be determined using a field meter after all samples have been collected following the sampling order specified in Table D-2. The measurement will be recorded after the meter reading has stabilized. Field measurements will be recorded in the sampling log book and will be entered into the field parameters database.

Sample collection will follow the priority listed in Table D-2 below.

Table D-2: Sample Collection Order

Priority	Parameter
1	Volatile Organics
2	Metals
3	Phenol
4	Field Parameters: pH Temperature Specific Conductance

2.6 Field Quality Assurance / Quality Control (QA/QC) Requirements

Field QA/QC requirements will be followed in the field to ensure the reliability and validity of field data gathered as part of the overall GMP. The field QA/QC program is based on the routine collection and analysis of three types of QC samples: trip blanks, duplicate samples, and equipment rinse blanks. All field QA/QC samples will be entered onto the Chain of Custody along with the primary samples. Equipment rinse blanks and trip blanks will also be recorded on Field QA/QC index forms, a sample of which is provided in Attachment D.

2.6.1 Trip Blanks

Trip blanks are used to verify that VOC bottles and samples are not contaminated during transportation and storage. Trip blanks shall be prepared by the laboratory and shall accompany sample containers throughout the event from collection through shipment to the laboratory for analysis.

- One trip blank will be submitted for analysis for every twenty (20) samples collected or at a minimum of one trip blank per shipped cooler that contains VOC samples.

2.6.2 Field Duplicates

Field duplicates serve as a check on the validity of the sample, sampling technique and laboratory precision. Each field duplicates is assigned a unique sample identification number from the primary environmental sample. Field duplicates shall be collected by alternating primary and field duplicate sample containers during sample collection.

- Field duplicates will be collected for all required analyses at a frequency of not less than 20 percent of the total number of environmental samples collected.

2.6.3 Equipment Rinse Blanks

Equipment rinse blanks will be collected in the field by passing laboratory supplied, analyte-free water over decontaminated non-dedicated equipment. Equipment rinse blanks confirm the effectiveness of decontamination procedures and will be analyzed for VOCs.

- Equipment Rinse Blanks will be collected once per sampling day from a piece of non-dedicated equipment, such as a water level indicator, non-dedicated purge pump, or sample bailer.

2.7 Sample Numbering and Labeling

A unique sample identification system will be used for all trip blanks, equipment blanks, duplicates, and environmental samples. All containers from one sample shall be labeled with this unique identification number. Samples will be labeled as follows:

Environmental Sample	K9999YYMMDDS where K designates Kingston; 99999 represents the location ID (e.g. 403S); YYMMDD is the date the sample was collected (e.g. 100112 = 2010, January 12) and for the suffix S, G indicates the sample is the original groundwater sample, X is a split sample collected at that location (analyzed by secondary laboratory) and D is duplicate collected at that location (to primary laboratory)
Trip Blanks	KTZYMMDDMMDD where K designates Kingston; T indicates the sample is a trip blank; Z designates the sampler id; Y is the last digit of the year (e.g. 1 = 2011); and MMDDMMDD is the period for which the trip blank is valid (e.g. 01230124 is January 23 through January 24)
Equipment Rinse Blanks	KEQYMMDDXXXX where K designates Kingston; EQ indicates the sample is an equipment rinse blank; YMMDD is the date that the rinse blank was collected and XXXX is an abbreviation for the type of rinse blank collected (e.g. BALR is bailer, PUMP is non-dedicated pump, WLID is water level indicator)

2.8 Chain of Custody Procedures

The chain of custody allows for the tracing of possession and handling of individual samples from the time of field collection through laboratory analysis. The chain of custody form identifies each sample collected, the individuals responsible for sample collection, shipment and receipt. The intent of the chain-of-custody procedure is to provide guidance to maintain sample integrity.

Upon sample collection, but prior to storage shipment or transportation, the field personnel shall properly and completely fill out the chain-of-custody form with a waterproof ink pen. If an error is made during the completion of the chain-of-custody form, a line shall be drawn through the error and the correction entered. The field personnel completing the form shall initial and date the error. Under no circumstances is white-out or erasing acceptable.

Preparation of the chain-of-custody form shall be as follows:

- Complete the chain-of-custody form. The project name, client name, the person to whom the laboratory analytical report shall be addressed and invoicing (Project Number) shall be identified in the top section of the form;
- Each person taking possession of the sample(s) shall sign and date the chain-of-custody as a recipient and shall also sign and date the chain-of-custody upon relinquishment of the sample(s). When the sample(s) have been delivered to the laboratory, the laboratory sample custodian will sign off the chain-of-custody as the last recipient of the samples.
- Sample-specific information shall include, at a minimum, unique sample identification number, date and time of sample collection, type of sample (e.g. groundwater), analyses requested, preservative (if any), volume/type of bottles, temperature of temperature blank in sample container (if necessary), and requested turn-around time. Any information relating to condition of samples upon receipt shall be written on the Chain of Custody form as a comment.

2.9 Sample Storage & Shipment

In the field, samples will be kept in a cooler lined with ice until such time as the samples can be refrigerated or received at the laboratory. The temperature of samples will be checked and recorded on the chain-of-custody form upon receipt of the samples by the laboratory.

Samples will be hand-delivered to the laboratory or shipped via a commercial priority overnight delivery service. In cases where the samples leave the immediate control of the sampling team (i.e. shipment via common carrier), the shipping container must be sealed and a custody seal will be provided on the shipping container to ensure that the samples have not been disturbed during transport. Samples which are at all times in the possession of the field crew or their designee will not require custody seals on the coolers.

Samples must be sent to the laboratory as soon as practicable and should be received by the laboratory within 48 hours of sampling.

3.0 INABILITY TO OBTAIN REPRESENTATIVE SAMPLES

This section describes the actions that will be taken when a well in the groundwater monitoring network cannot provide representative groundwater elevations or water quality data.

3.1 Well Damage

If it is determined that a well cannot provide representative samples or accurate piezometric values because it is damaged, NYSDEC will be notified of the problem. The notification to NYSDEC, will include information which describes the following: a) the nature of the problem, b) how the problem with the well has been rectified, and c) a schedule for the rehabilitation or replacement of the well. If a problem with a well prevented the collection of a scheduled sample, an initial characterization sample will be collected within twenty-one days after the rehabilitation or replacement of the well.

3.2 Resampling

When it is determined that a sample has been collected or analyzed out of protocol, the affected well will be re-sampled for the affected parameters within twenty-one days of such knowledge, unless this requirement is waived by NYSDEC after consultation.

3.3 Dry Wells

If any well does not contain sufficient water for a representative sample due to regional conditions that lower water levels in monitoring wells across the Site (e.g., drought conditions), then that well may go un-sampled for one sampling event. The viability of the well shall be evaluated by collection of additional water level measurements prior to the next scheduled sampling of the well. If this evaluation indicates that the well still does not contain sufficient water for a representative sample, then a proposal shall be submitted to the NYSDEC to either replace the well or substitute another existing well. If a well is dry on a recurring basis due to groundwater extraction activities, it may go un-sampled.

4.0 WELL INSPECTION AND MAINTENANCE PLAN

The groundwater monitoring system will be maintained to ensure that all monitoring points yield representative samples of high integrity.

The number for each well and piezometer shall be permanently affixed to or engraved into the well casing or cap and maintained in a legible condition. Steel security casings shall be painted and maintained as necessary to prevent corrosion. Monitoring wells which may be obscured by vegetation during the summer shall be flagged, and the flagging maintained or replaced as necessary so that the wells may be readily located.

During each sampling event, all contaminant monitoring wells shall be inspected for integrity and the results of which shall be recorded in the comments section of the Sampling Field Data Sheet. Depth to bottom measurements for program wells shall be conducted such that if the depth to bottom of the well differs from the baseline depth to bottom by more than 0.5 feet, the well must be redeveloped prior to the next scheduled sampling event.

All water quality monitoring, hydraulic effectiveness monitoring wells and other non-GMP wells shall be inspected on an annual basis. The physical well inventory form presented in Attachment D will serve as the inspection form for the groundwater monitoring well network. The results of this inspection will be included in the Periodic Review Report.

Should a well or piezometer be found to be damaged beyond usability, blocked or broken, or fail to recharge properly or as expected, it will either be repaired; decommissioned or replaced, as necessary. Should any significant cracking or frost heaving of grout be observed, repairs shall be made and the measuring point resurveyed, to ensure accurate computation of groundwater elevations. All necessary repairs or replacements shall be completed as soon as possible but not to exceed 120 days after identification of the problem. NYSDEC will be notified prior to repair or replacement and the repair or decommissioning and replacement process will be documented in the Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures". Monitoring wells that are decommissioned because they have been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by NYSDEC.

5.0 LABORATORY METHODS AND ANALYTICAL PROTOCOLS

All laboratories utilized under the GMP shall have current and appropriate certification, New York State Department of Health Environmental Laboratory Program (NYSDOH ELAP), for the parameters analyzed. Laboratories performing the analyses must provide appropriate notice should certification lapse.

5.1 Analytical Methods, Sampling Containers, Preservatives and Holding Times

Table D-3: Analytical Methods, Sample Containers, Preservatives, and Holding Times

Analyte	Methodology(s)	Sample Container	Sample Volume	Preservative	Holding Time
Volatile Organics	SW-846 8021B	Glass - VOA	3 @ 40 ml	P-1a P-1b	7 days 14 days
Metals	Current EPA or SW-846 methodologies	Polyethylene**	500 ml	P-2	6 months Hg (28 days)
Phenol	EPA 420.1	Glass-Amber	1 liter	P-3	28 days

**	Fluorocarbon resin may also be used.
P-1a	Cool to 4°C.
P-1b	Preserve with NaHSO4 or concentrated HCl, cool to 4°C.
P-2	Preserve with concentrated HNO3 to pH<2, cool to 4°C.
P-3	Preserve with concentrated H2SO4 to pH<2 and cool to 4°C.

Site specific parameter lists are provided in Table 1 of Attachment F.

5.2 Documentation and Reporting Format

The sample analytical report documentation will include the required elements, as described in the NYSDEC Division of Environmental Remediation (DER) *DER-10 Technical Guidance for Site Investigation and Remediation*, Appendix 2B (dated May 2010) for New York State Analytical Services Protocol (ASP), Category B.

Analytical data will be provided in an electronic format in accordance with DER-10.

5.3 Laboratory Quality Assurance / Quality Control

Laboratories will follow all quality assurance / quality control procedures specified in the approved analytical methods. The quality assurance plans for each laboratory that may analyze samples for the Site under the GMP are reproduced in Attachment F.

6.0 DATA MANAGEMENT & REPORTING REQUIREMENTS

6.1 Data Management and Documentation

Field data will be recorded on field data sampling sheets. The field data will be summarized and reported, as appropriate. Field data validation will be accomplished through review of sampling field data sheets and periodic review of data collection procedures.

The laboratory will provide data following NYSDEC ASP Category B data deliverable requirements and will follow the documentation procedures identified in the respective Laboratory Quality Assurance Project Plan included in Attachment F.

6.2 Data Evaluation Procedures

One hundred (100) percent of the laboratory-analyzed data will undergo a data evaluation and review and will consist of checks of chain of custody documentation, laboratory case narrative, holding times, duplicate results, blank results, and surrogate recoveries.

The findings of the data evaluations will be presented as a Data Usability Summary Report (DUSR). The DUSR will be prepared, to the extent possible, in accordance with the DUSR guidelines described in Appendix 2B of *DER-10 Technical Guidance for Site Investigation and Remediation*, dated May 2010.

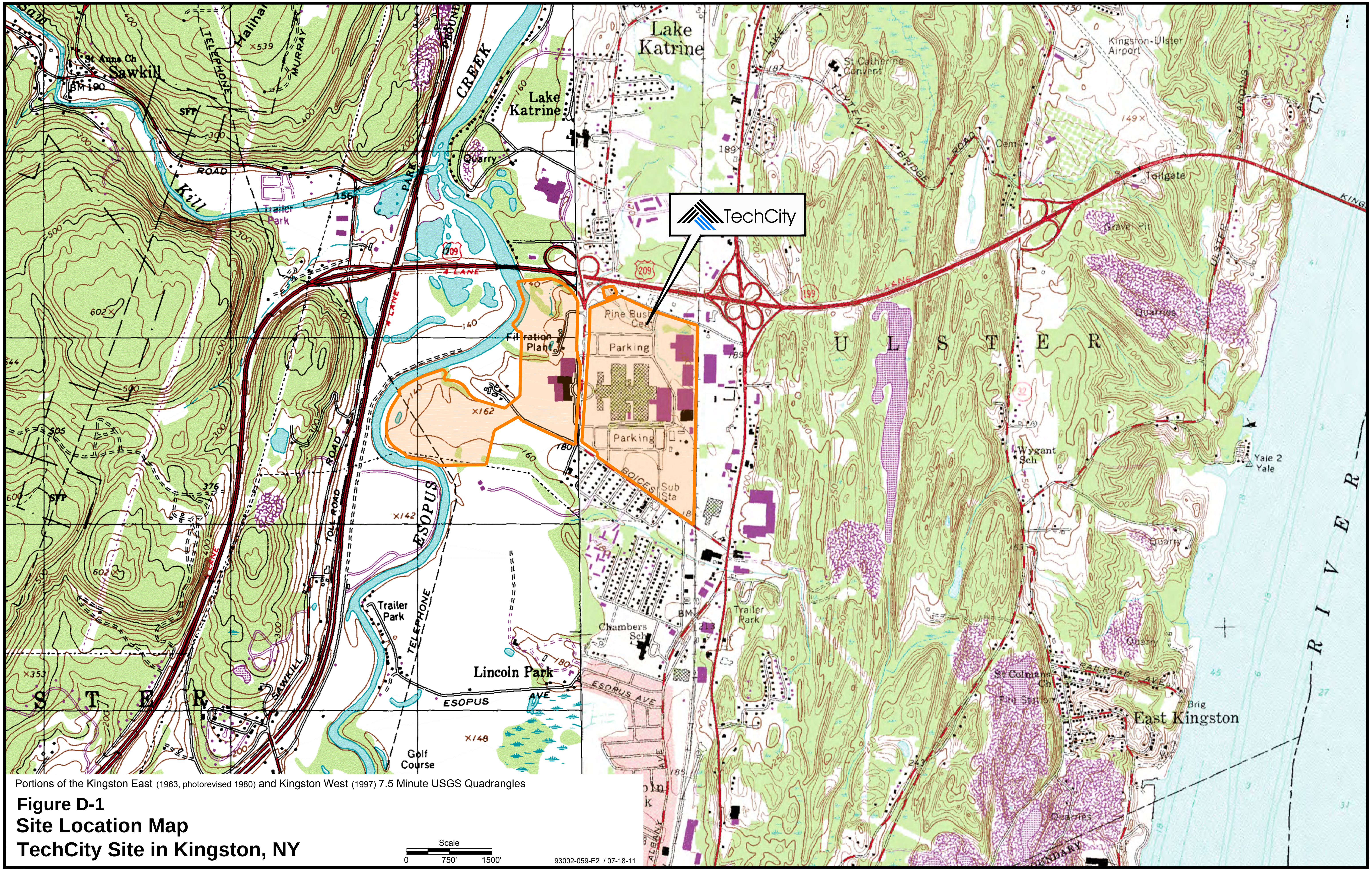
Upon completion and resolution of data validation issues, the data will be entered into computer databases. Field and laboratory data will be stored in database files which contain certain field data such as the date and time of sampling, the sampler's initials, a unique field identification number, and a sample description; and certain analytical data such as parameter names, methods of analysis, reported results, and units of measure.

Groundwater elevation data is stored in computer spreadsheet and database files.

6.3 Reporting Requirements

All data generated will be submitted in an electronic data deliverable (EDD) format in accordance with DER-10.

A Periodic Review Report (PRR) will be submitted to NYSDEC which will include media sampling results such as those generated under the GMP. The PRR will be prepared in accordance with DER-10 and will be submitted within the schedule determined by the NYSDEC.



Portions of the Kingston East (1963, photorevised 1980) and Kingston West (1997) 7.5 Minute USGS Quadrangles

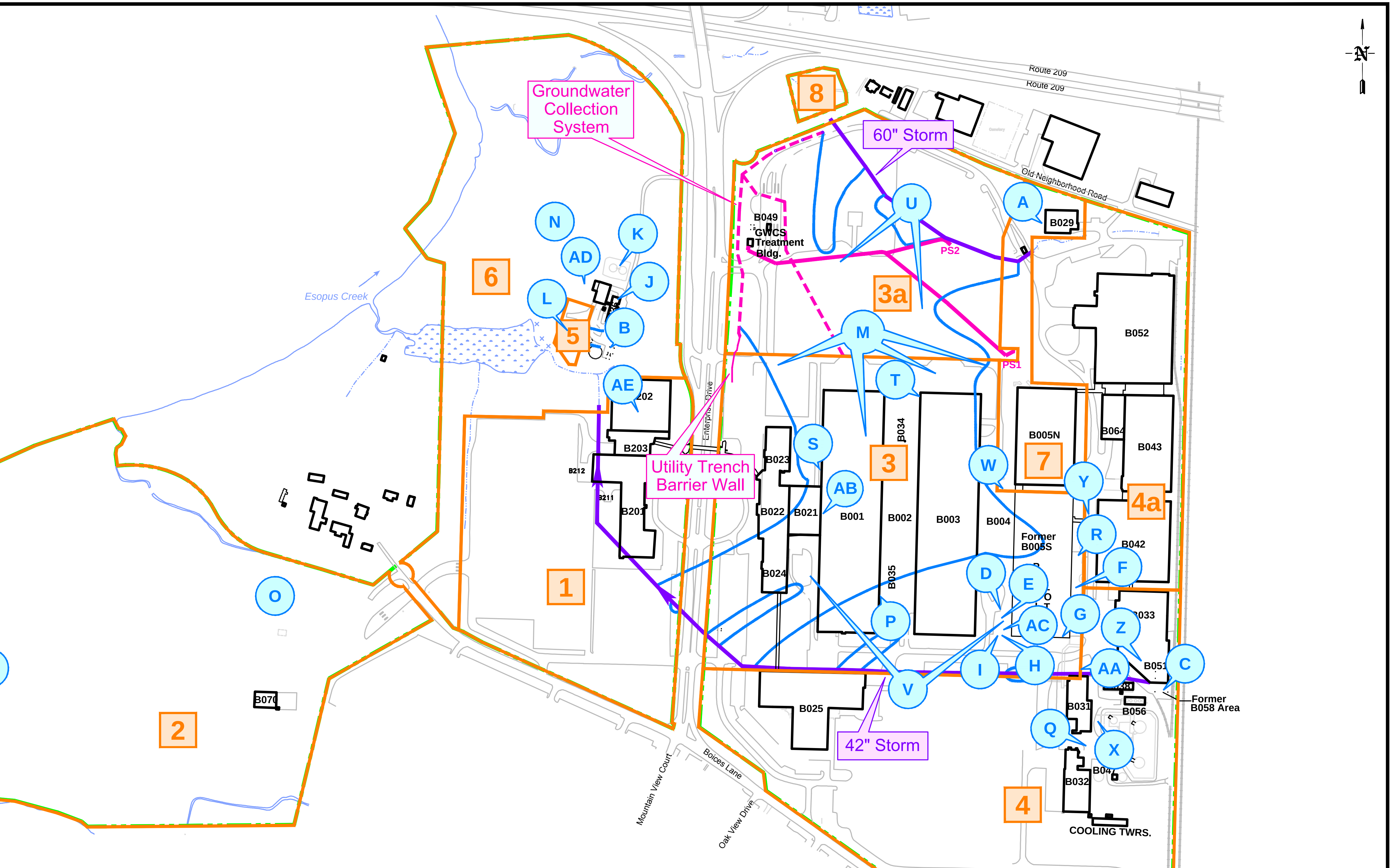
Figure D-1
Site Location Map
TechCity Site in Kingston, NY

Scale
0 750' 1500'

93002-059-E2 / 07-18-11

SOLID WASTE MANAGEMENT UNITS (SWMUs)

A: B029 Chemical Distribution Center
B: B036 Container Storage Area
C: Former B058
D: Former Waste Acetone Storage Tank
E: Former Waste IPA Storage Tank
F: Former East Side Waste Tanks
G: Former Waste PCE Tank
H: Former East SRP Tank
I: Former West SRP
J: Wastewater Treatment Tanks
K: Emergency Wastewater Holding Tanks
L: Former Industrial Waste Sludge Lagoon
M: Industrial Waste Sewer Lines
N: Inactive B036 Construction and Debris Landfill
O: Salt Barn Parking Lot Sand Fill Area
P: Former B035 Dry Well
Q: Former B031 Lagoon
R: Former Waste TCA Tank (B005(S))
S: Former Waste TCA Tank (B001)
T: Former Waste Oil Tank
U: North Parking Lot Area Plume
V: B005 Plume
W: Former B004 Separator Tank
X: B031 Separator
Y: Former Fluoride Wastewater Ejector Tank
Z: Inactive B033 Septic System
AA: Inactive B031 Septic System
AB: Former B001 TCA Recovery Unit
AC: Former B005(S) Solvent Recovery Process Unit
AD: Former Fire Training Area
AE: B202 Elevator No. 2
AF: Inactive West Demolition Debris Fill Area



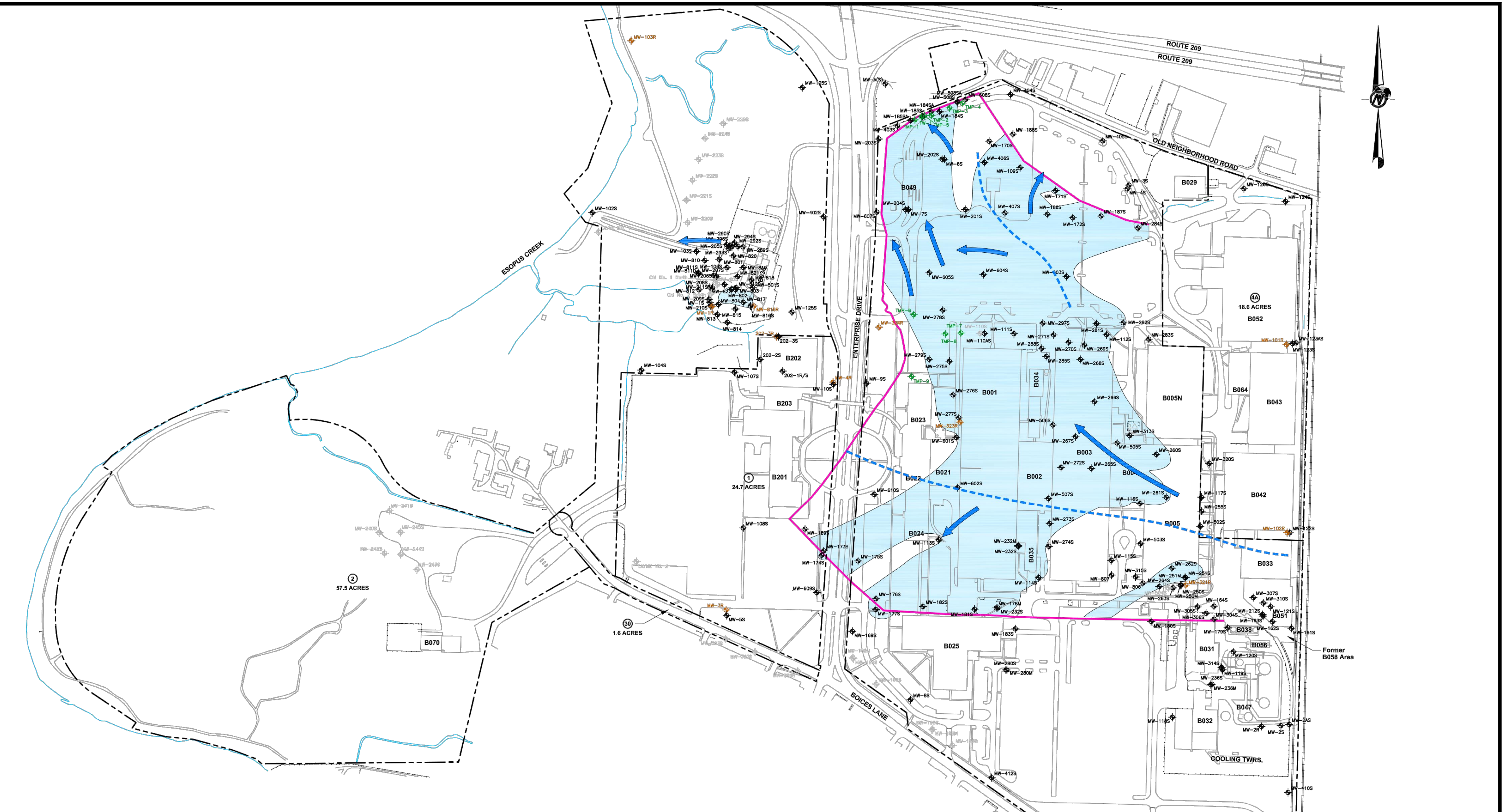
LEGEND

- Storm Sewer Line
- Area of 1,1,1-Trichloroethane/ Tricholoroethene >5 µg/l (5/08)
- Groundwater Collection System (GWCS)
- Utility Trench Barrier Wall
- ○ - Solid Waste Management Unit
- # - Operable Unit
- Property Line

Figure D-2
Site Layout
TechCity Site in Kingston, NY

Scale
0 220' 440'

93002-113-D / 09-16-11



LEGEND

— · —	PROPERTY/PARCEL BOUNDARY
—	RIVER/STREAM
—	SITE PERIMETER CONTROL SYSTEM
- - -	INFERRED GROUNDWATER DIVIDE
⟵	INFERRED DIRECTION OF GROUNDWATER FLOW
B003	BUILDING NUMBER
⊕	GROUNDWATER MONITORING WELL
⊕	BEDROCK MONITORING WELL
⊕	TEMPORARY SOIL MONITORING WELL
⊕	ABANDONED MONITORING WELL
①	ENVIRONMENTAL PARCEL NUMBER AND APPROXIMATE ACREAGE
▢	GENERALIZED AREA OF VOC GROUNDWATER PLUME

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL CAD FILE SITEMAP.DWG, DRAWING NUMBER 93002-SITEMAP/2 ENTITLED "SITE MAP," DATED MAY 9, 2005, PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

2.) PROPERTY LINES/PARCEL BOUNDARIES DIGITIZED FROM A HARD COPY FIGURE ENTITLED "ENVIRONMENTAL PARCELS," DATED DECEMBER 12, 2006, FIGURE 2, PREPARED BY DIVNEY TUNG SCHWALBE.

3.) GENERALIZED AREA OF VOC GROUNDWATER PLUME COMPILED FROM DIGITAL CONSTITUENT FILES FROM THE 2010 ANNUAL GROUNDWATER MONITORING REPORT, DATED MARCH 30, 2011, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

4.) INFERRED GROUNDWATER DIVIDE AND INFERRED DIRECTION OF GROUNDWATER FLOW DIGITIZED FROM A HARD COPY FIGURE ENTITLED "SURFICIAL SAND AQUIFER GROUNDWATER CONTOUR MAP, NOVEMBER 11 – 12, 2010 (FOURTH QUARTER 2010)", DATED MARCH 30, 2011, PREPARED BY GROUNDWATER SCIENCES CORPORATION.

Figure D-3

Monitoring Well Network and Generalized VOC Plume Area Map

TechCity Site in Kingston, NY

Scale

0 220' 440'

93002-120-A2 / 08-22-11

From Golder Associates, File 08387071K003, 8/8/11 (Figure 3).

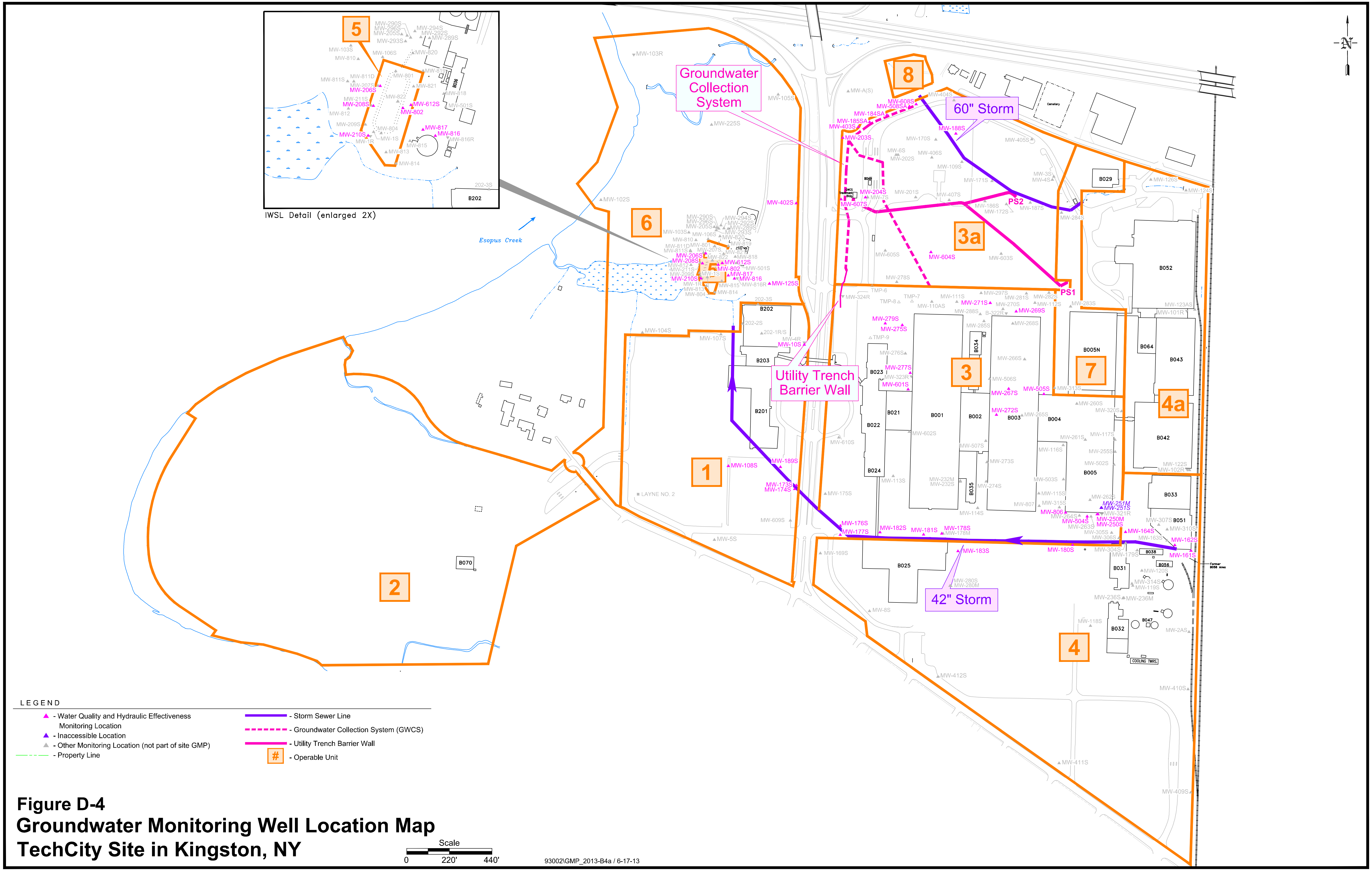


Figure D-4
Groundwater Monitoring Well Location Map
TechCity Site in Kingston, NY

93002\GMP_2013-B4a / 6-17-13

ATTACHMENT A

BORING LOG &

MONITORING WELL CONSTRUCTION DETAILS

MONITORING WELL MW-A

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
10-2-92	Brinnier & Larios	172.54'	172.39'

MONITORING WELL MW-A

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 158.03'

- Depth prior to development: 158.57' Depth after development: 158.57'
- Difference in depth from installation: 0.54' Difference in depth from installation: 0.54'

Change in depth (in feet): no change

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 158.03'

- Depth prior to development: 158.84' Depth after development: 158.63'
- Difference in depth from installation: 0.81' Difference in depth from installation: 0.60'

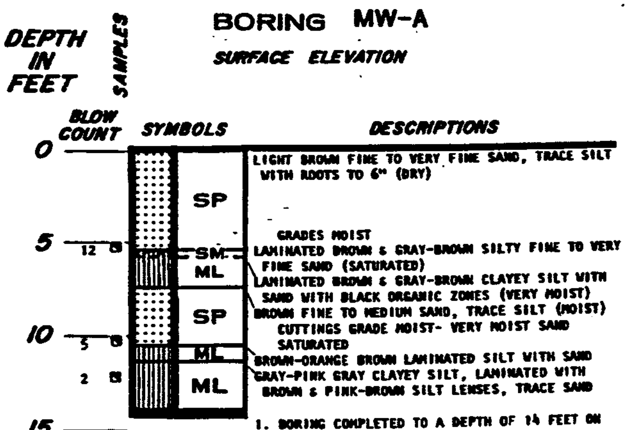
Change in depth (in feet): 0.21'

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

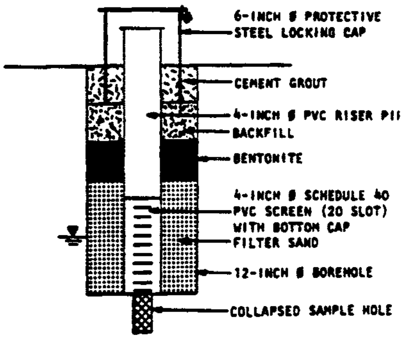
MONITORING WELL MW-A

I. BORING LOG



1. BORING COMPLETED TO A DEPTH OF 14 FEET ON 5/13/85.
2. MONITORING WELL INSTALLED ON 5/13/85.
3. NO DRILLING MUD USED.

II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 5-13-85
- Well Type: Shallow-Overburden
- Location: Neighborhood Road
- Top of casing elevation at date of installation from IBM Datum: *172.54'
- Top of screen elevation at date of installation from IBM Datum: *163.03'
- Bottom of screen elevation at date of installation from IBM Datum: *158.03'
- Protective casing material: Steel
  Diameter: 6"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 4" Slot size: 0.020

Note:

* = Installation survey information for MW-A is not available. The elevations are based on well construction logs and the 10/2/92 survey data.

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

1.0 INTRODUCTION

Dames & Moore is pleased to submit this report "Evaluation of Layne Well No. 2." which was performed in accordance with our proposal dated July 28, 1988.

The background on the project is presented in Chapter 2.0. Chapter 3.0 discusses the regulatory requirements. The pumping test is reviewed in Chapter 4.0. The analytical results on the ground water are discussed in Chapter 5.0. Chapter 6.0 presents the pumping test results. The maximum capacity of the well screen is discussed in Chapter 7.0. The recommendations are presented in Chapter 8.0.

2.0 BACKGROUND

Layne Well No. 2 is located west of Neighborhood Road, in the southwest corner of Parking Lot No. 7, at the IBM - Kingston, New York facility (Figure 1). The well consists of a 6-inch diameter casing extending through approximately 99 feet of yellowish silty clay and clayey silt from approximately Elevations +167.31 to +68 feet above mean sea level. A 19-foot long screen extends from the base of this stratum into the fine to medium sand and gravel-water bearing zone. Figure 2 shows the cross-section of the Layne Well No. 2.

The water bearing zone is confined by the overlying silty clay layer which makes it an artesian aquifer. The static piezometric surface is within the clay zone, approximately 31 feet below the land surface and approximately 68 feet above the water bearing zone.

As shown in Figure 2, the sand and gravel layer pinches out to the north. The extent of the aquifer in the southerly and westerly directions is not known. The presence of the overlying silty clay layer and the confined conditions would likely afford significant protection.

A short-term (8-hour) pumping test was performed on the well on June 19, 1985. The results of this pumping test were not conclusive with respect to long term high volume pumping and a 72-hour test was recommended to verify the original conclusions.

3.0 REGULATORY REQUIREMENTS

Due to the quantity of discharge water anticipated during the pumping test, the New York State Department of Environmental Conservation (NYSDEC) was contacted prior to pumping. Ground water analyses of the Layne Well No. 2 and a description of the proposed test was submitted to NYSDEC on August 12, 1988.

MONITORING WELL MW-1R

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting & labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair, installation of water tight cap, and inscription of reference mark

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
11-29-78	Brinnier & Larios	150.99'	---
10-2-92	Brinnier & Larios	151.20'	---

MONITORING WELL MW-1R

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 59.32'

Depth prior to development: 60.90'
Difference in depth from installation: 1.58'

Depth after development: 59.87'
Difference in depth from installation: 0.55'

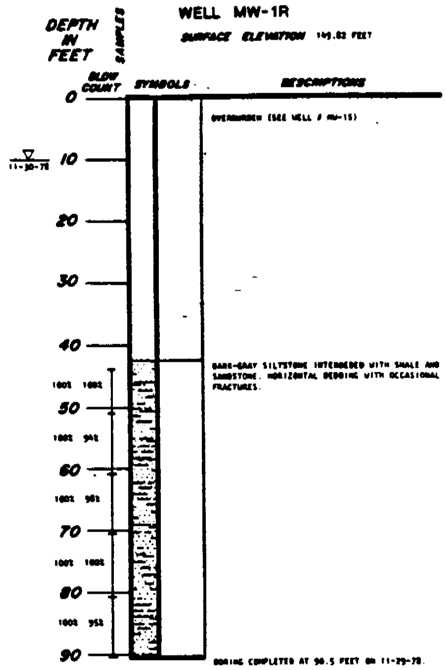
Change in depth (in feet): 1.03'

- Redevelopment method: Submersible Pump

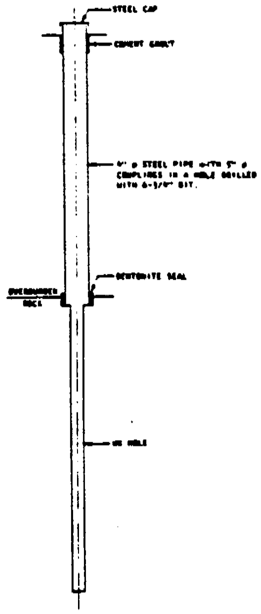
- Performed by: Dames & Moore

MONITORING WELL MW-1R

I. BORING LOG



II. WELL CONSTRUCTION LOG

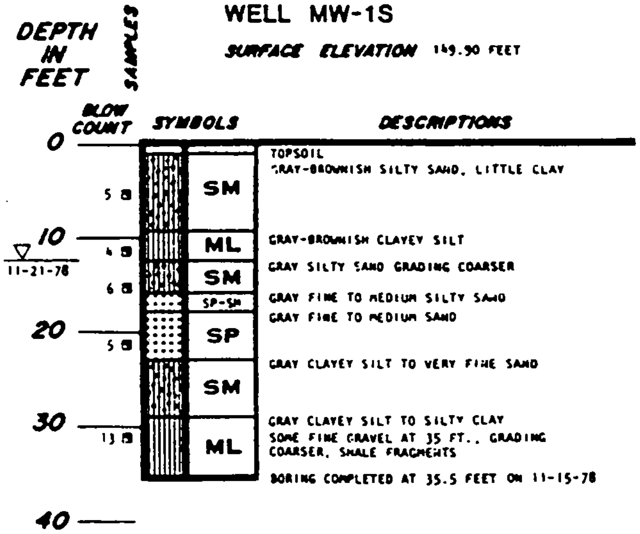


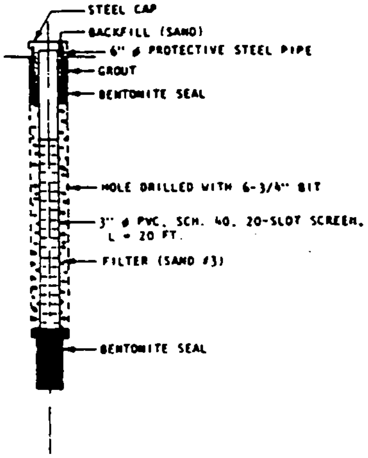
III. CONSTRUCTION DETAILS

- Installation Date: 11-29-78
- Well Type: Deep-Bedrock
- Location: IWTF
- Top of casing elevation at date of installation from IBM Datum: 150.99′
- Bottom of casing elevation at date of installation from IBM Datum: 107.32′
- Bottom of well elevation at date of installation from IBM Datum: 59.32′
- Protective casing material: Steel
  Diameter: 4"

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual (June)
- Analytical Parameters:
  - Volatile organic compounds (VOCs) by 8010
  - Inorganic Compounds:
    - arsenic
    - chlorides
    - chromium (hexavalent)
    - lead





LOG AND MONITORING WELL DETAILS

NOTES:

1. THE FIGURES IN THE COLUMN LABELED "BLOW COUNT" REFER TO THE NUMBER OF BLOWS REQUIRED TO DRIVE A STANDARD SPLIT-SPOON SAMPLER A DISTANCE OF ONE FOOT USING A 140 POUND DRIVE WEIGHT FALLING 30 INCHES. THE STANDARD SPLIT-SPOON SAMPLER IS 2 INCHES O.D. AND 1-3/8 INCHES I.D.

   THE LETTER "P" IN THE "BLOW COUNT" COLUMN INDICATES THAT THE SAMPLER WAS ADVANCED BY THE WEIGHT OF THE DRILL ROD AND DRIVE WEIGHT WITHOUT DRIVING.

   PERCENT FIGURES IN THE "BLOW COUNT" COLUMN INDICATE THE PERCENT OF CORE RECOVERY FOR A DOUBLE TUBE CORE BARREL NX SIZE CORE RUN (EXCEPT WHERE NOTED ON LOG). THE CORE BARREL IS 2-1/8 INCHES I.D.

2. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM.

3. THE DISCUSSION IN THE TEXT OF THE REPORT IS NECESSARY FOR A PROPER UNDERSTANDING OF THE NATURE OF THE SUBSURFACE MATERIALS.

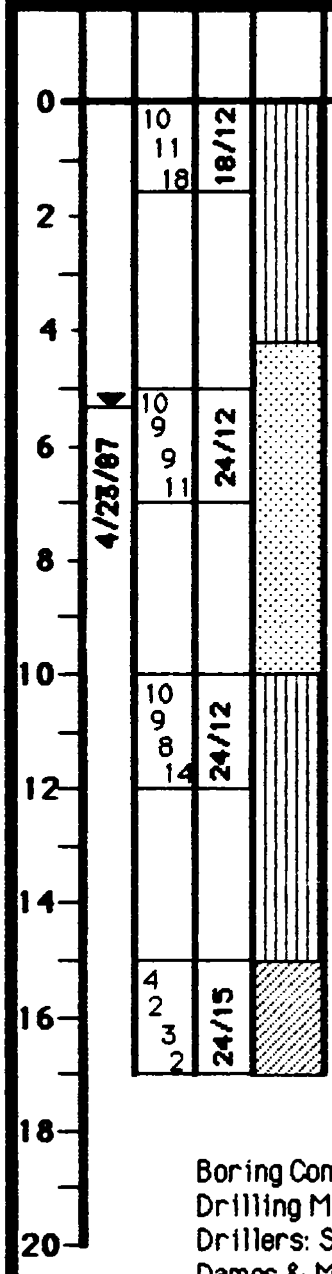
DAMES & MOORE

FIGURE 20/1

MONITORING WELL - 2A-S

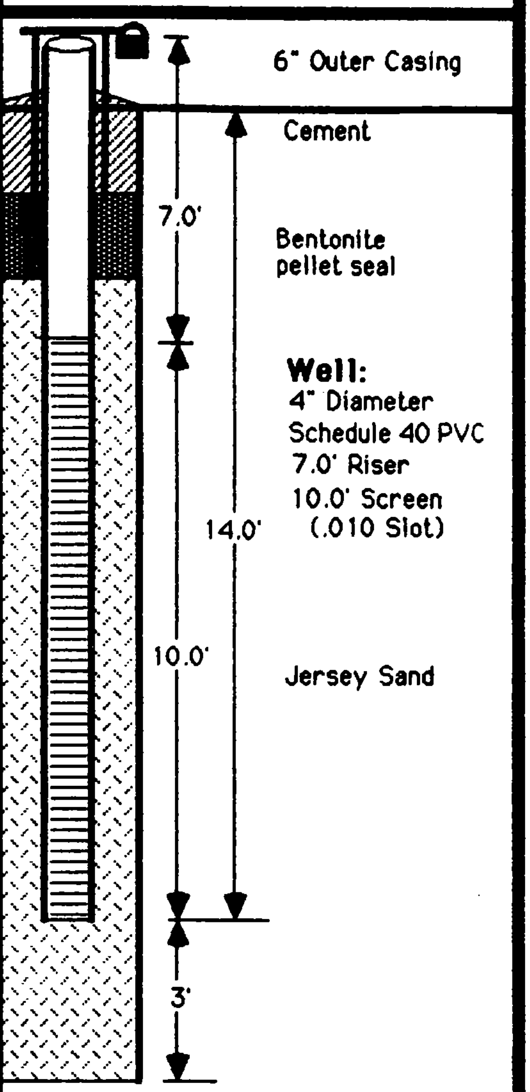
SURFACE ELEVATION - 184 Ft.(approx)

WELL CONSTRUCTION DETAILS



DESCRIPTION OF SUBSURFACE MATERIALS

Water Elevation	Blows /6 Inches	Inches Driven/ Inches Recovered	Classification Symbols	Description of Subsurface Materials
	10 11 18	18/12	ML	Silt with Little to Some Fine Sand, Trace Medium Sand, Brown, Moist, Very Stiff, No Odor
4/23/87	10 9 9 11	24/12	SP	Fine Sand with Little Silt, Dark Brown, Saturated, Medium Dense, No Odor
	10 9 8 14	24/12	ML	Silt with Little to Some Clay, Grey, Moist, Very Stiff
	4 2 3 2	24/15	CL	Layered Clay and Silt with Little to Some Clay (Varved - Clay Layer [1"] Silt Layers [1/4"]), Grey, Moist, Soft



Well:
4" Diameter
Schedule 40 PVC
7.0' Riser
10.0' Screen
(.010 Slot)

Boring Completed to 17 Feet on April 23, 1987
Drilling Method: Rotary Wash, 6-1/2" O. D.
Drillers: Soil & Material Testing, Inc., Castleton, NY
Dames & Moore Geologist: Dave Wagner
Well Developed on April 24, 1987

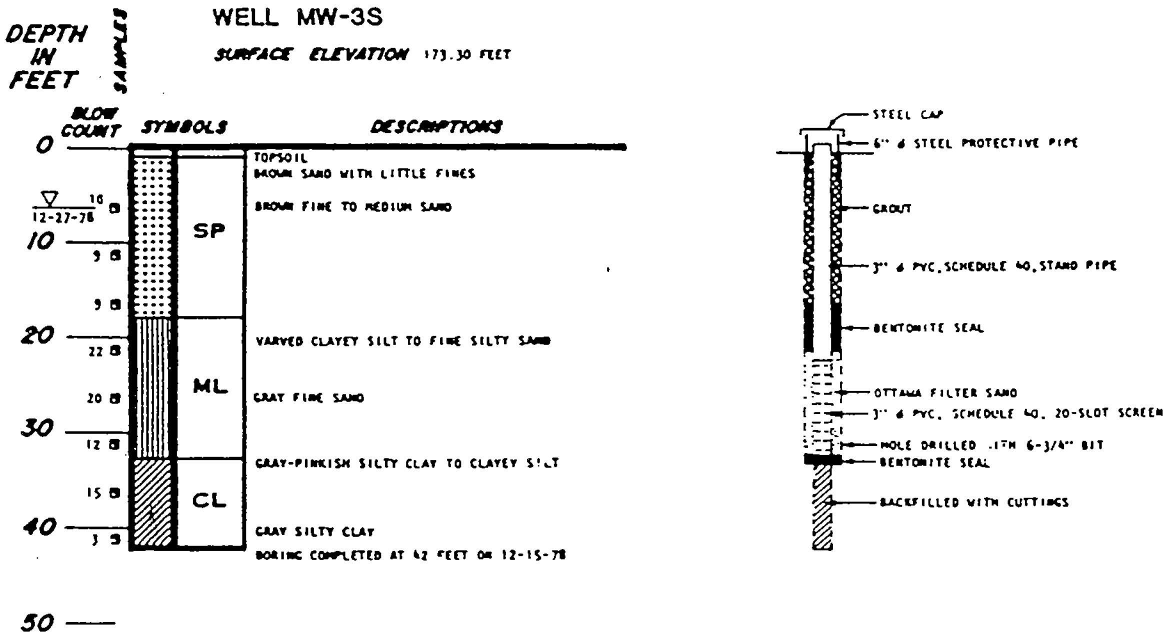
Monitoring Well 2A-S was installed as a replacement for MW 2-S on 4/23/87.

IBM CORPORATION
KINGSTON, NEW YORK

Dames & Moore Job No. 3558-213

BORING AND WELL CONSTRUCTION DETAILS

PAGE 1 OF 1



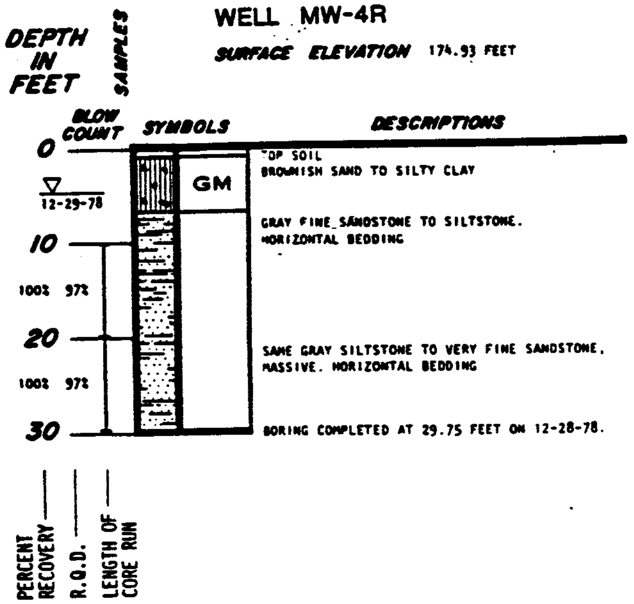
LOG AND MONITORING WELL DETAILS

DAMES & MOORE

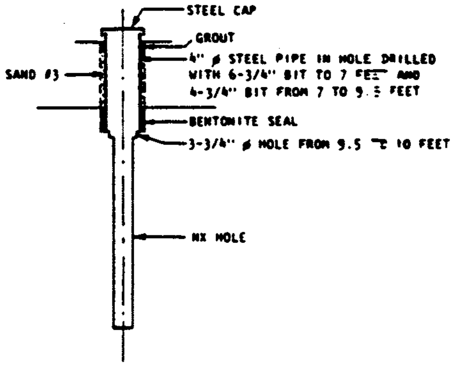
FIGURE 20/2

MONITORING WELL MW-4R

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-28-78
- Well Type: Deep Bedrock
- Location: Building 202 & Neighborhood Road
- Top of casing elevation at date of installation from IBM Datum: 175.93'
- Bottom of casing elevation at date of installation from IBM Datum: 168.63'
- Bottom of well elevation at date of installation from IBM Datum: 144.93'
- Protective casing material: Steel
  Diameter: 4"

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual
- Analytical Parameters:
  - Volatile organic compounds (VOCs) by 8010
  - Inorganic Compounds:
    - arsenic
    - chloride
    - chromium (hexavalent)
    - lead

MONITORING WELL MW-4R

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting & labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair, installation of water tight cap, and inscription of reference mark

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-28-78	Brinnier & Larios	175.93′	---
10-2-92	Brinnier & Larios	176.15′	---

MONITORING WELL MW-4R

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 144.93'

- Depth prior to development: 147.45'
- Difference in depth from installation: 2.52'

Depth after development: 145.99'
Difference in depth from installation: 1.06'

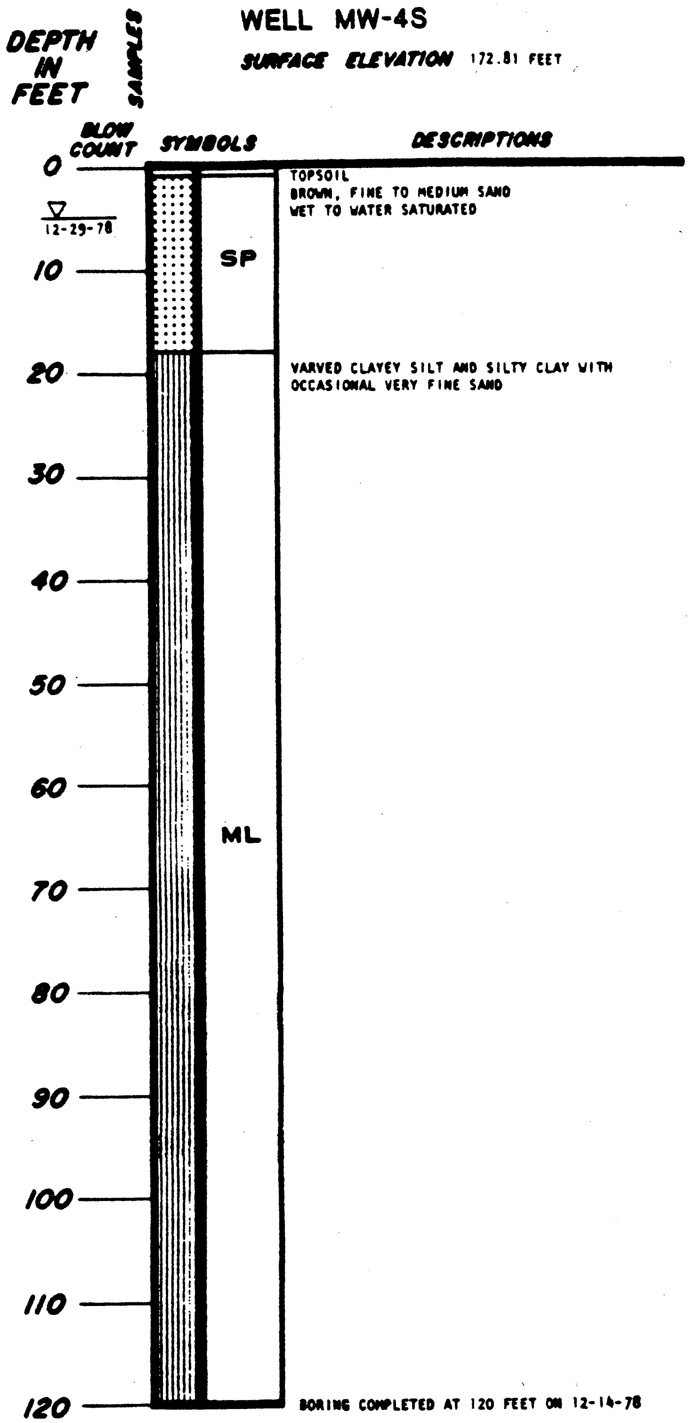
Change in depth (in feet): 1.46'

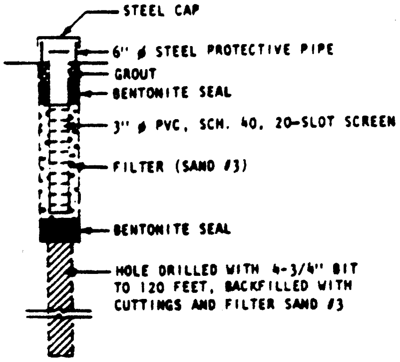
- Redevelopment method: Submersible Pump

- Performed by: Dames & Moore

WELL MW-4S

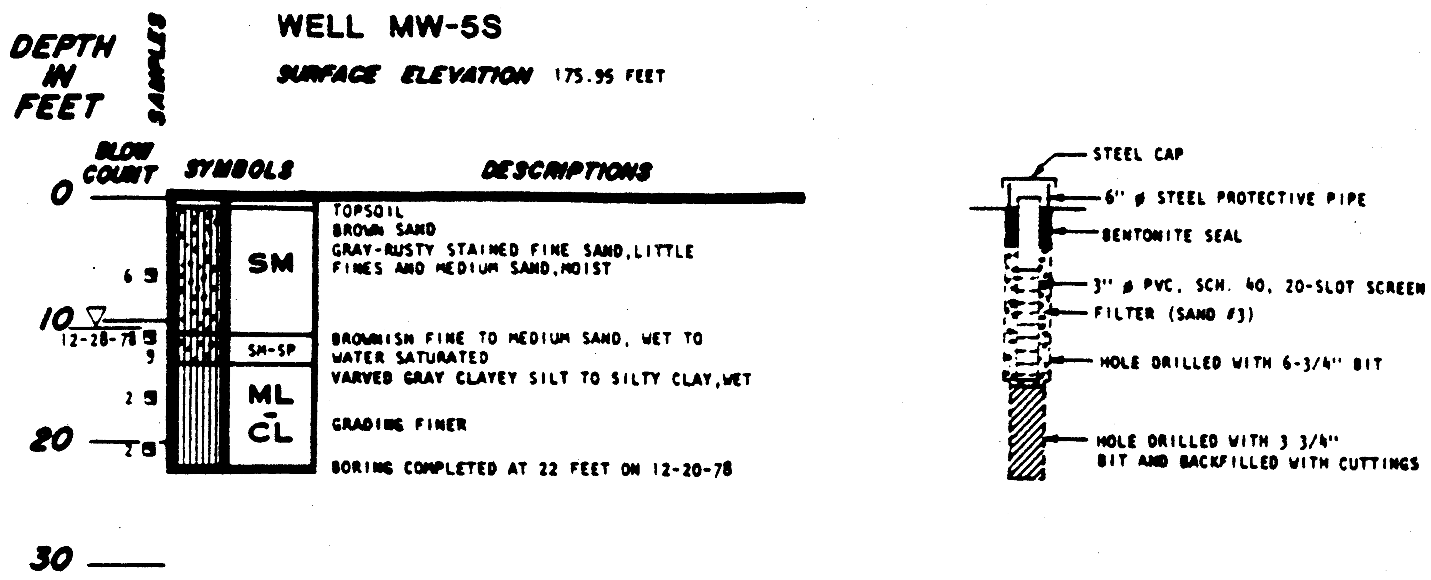
SURFACE ELEVATION 172.81 FEET





LOG AND MONITORING WELL DETAILS

DAMES & MOORE

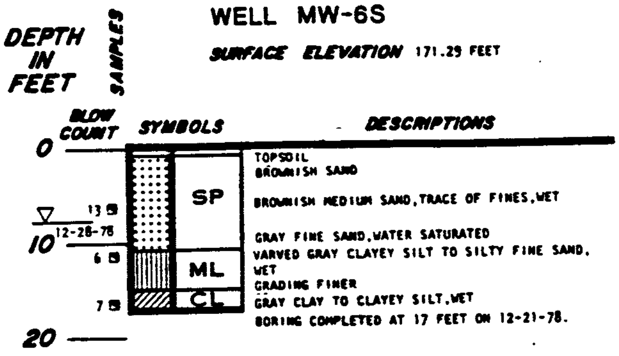


LOG AND MONITORING WELL DETAILS

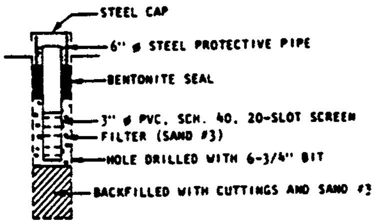
Dames & Moore

MONITORING WELL MW-6S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-21-78
- Well Type: Shallow-overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 172.71'
- Top of screen elevation at date of installation from IBM Datum: 164.79'
- Bottom of screen elevation at date of installation from IBM Datum: 159.79'
- Protective casing material: Steel
  Diameter: 6"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-6S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair, installation of water-tight cap, and inscription of reference mark

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-21-78	Brinnier & Larios	172.71'	---
10-2-92	Brinnier & Larios	172.99'	172.76'

MONITORING WELL MW-6S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 159.79'

Depth prior to development: 160.69'
Difference in depth from installation: 0.90'

Depth after development: 160.16'
Difference in depth from installation: 0.37'

Change in depth (in feet): 0.53'

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 159.79'

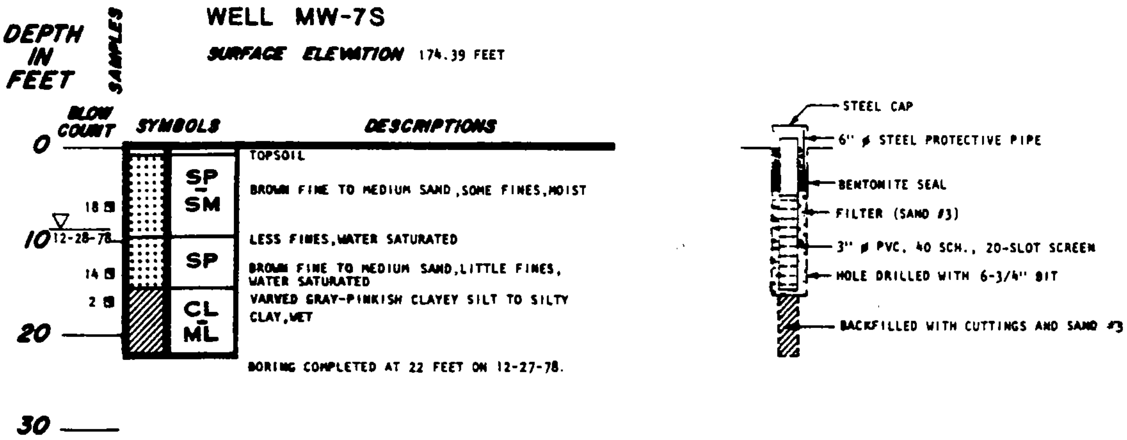
Depth prior to development: 161.54'
Difference in depth from installation: 1.75'

Depth after development: 160.53'
Difference in depth from installation: 0.74'

Change in depth (in feet): 1.01'

- Redevelopment method: Bladder Pump

- Performed by: CTM Analytical Laboratories, Ltd.



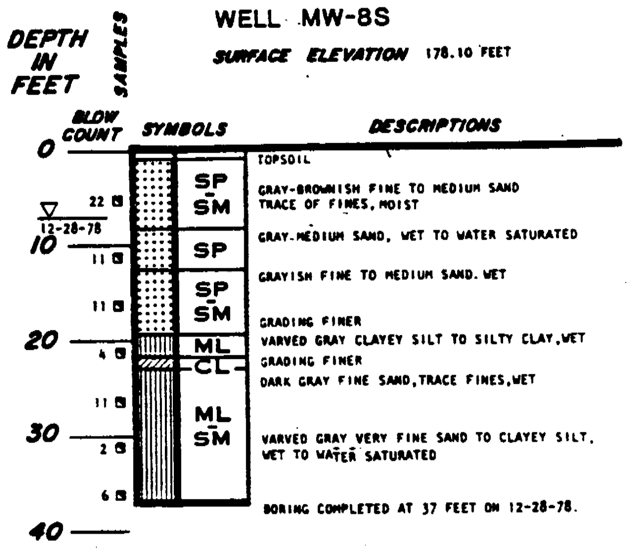
LOG AND MONITORING WELL DETAILS

DAMES & MOORE

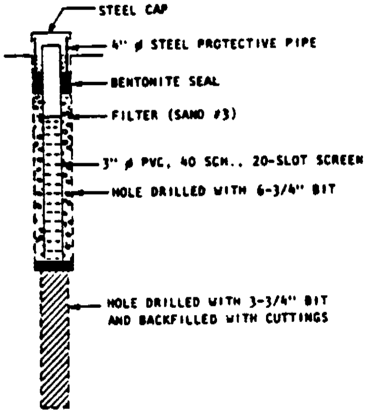
FIGURE 20/4

MONITORING WELL MW-8S

I. BORING LOG



II. WELL CONSTRUCTION LOG

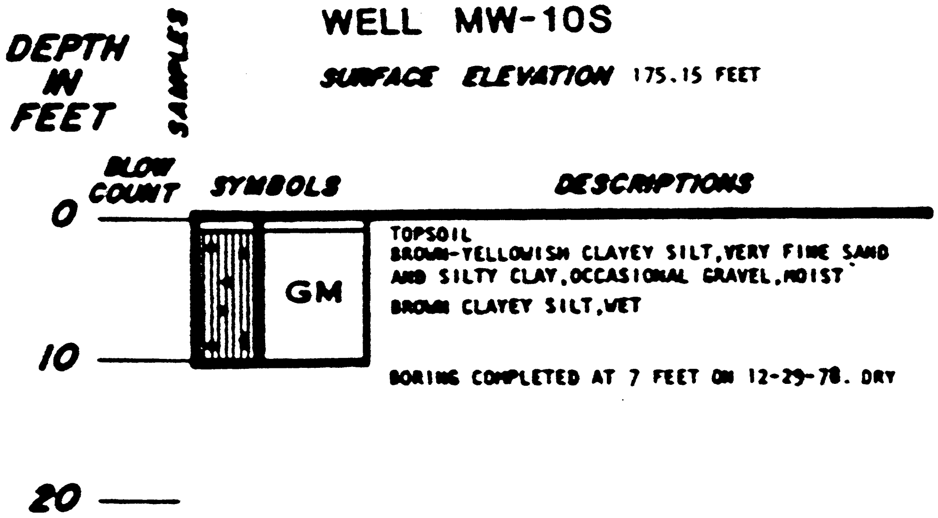


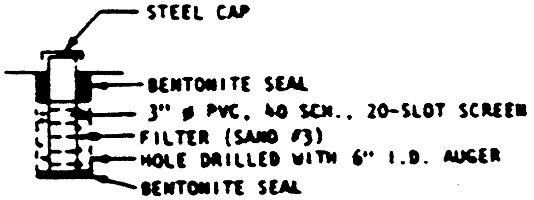
III. CONSTRUCTION DETAILS

- Installation Date: 12-28-78
- Well Type: Shallow-overburden
- Location: Building 025
- Top of casing elevation at date of installation from IBM Datum: 179.43′
- Top of screen elevation at date of installation from IBM Datum: 171.10′
- Bottom of screen elevation at date of installation from IBM Datum: 156.10′
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

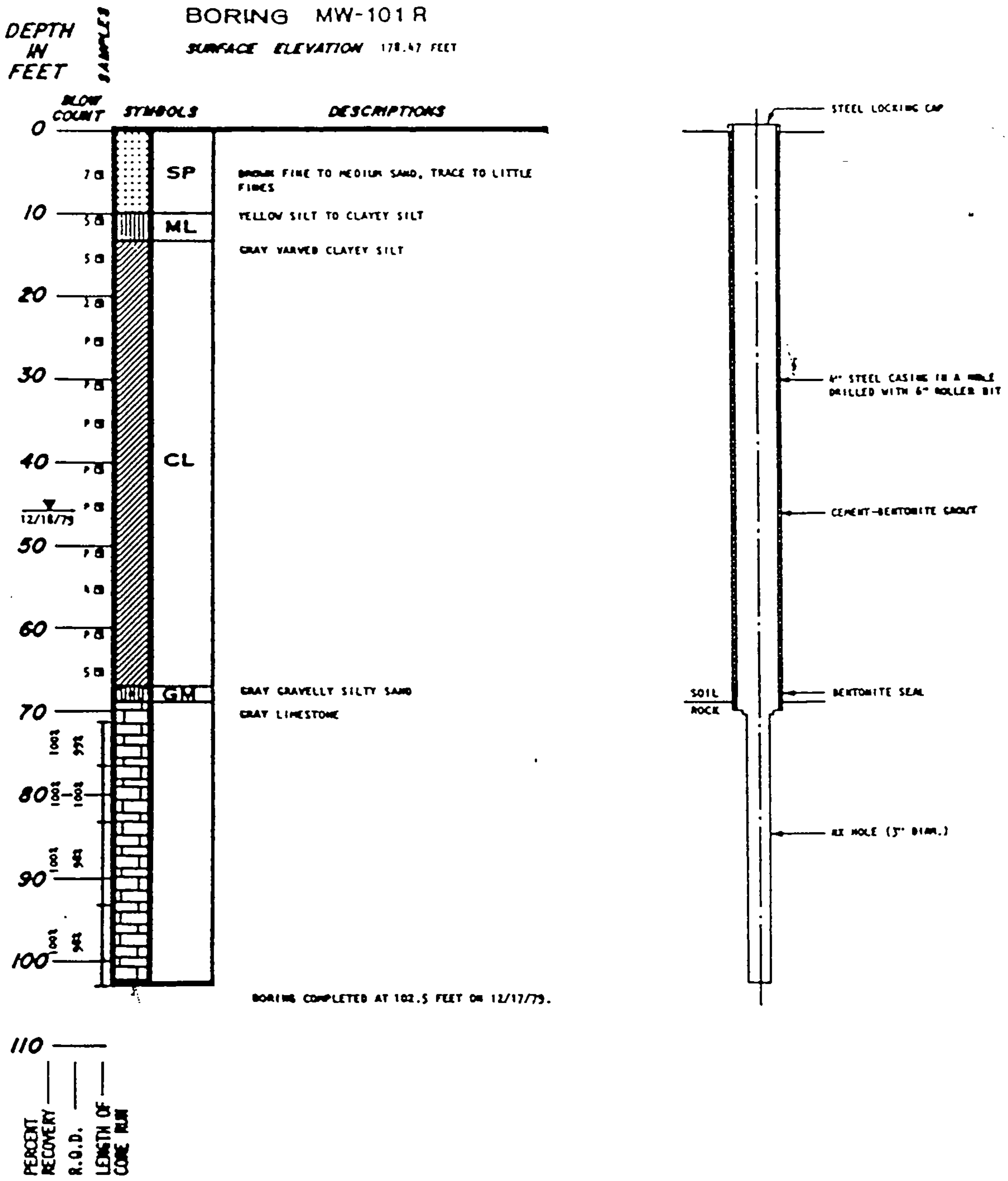




LOG AND MONITORING WELL DETAILS

DAMES & MOORE

FIGURE 20/5



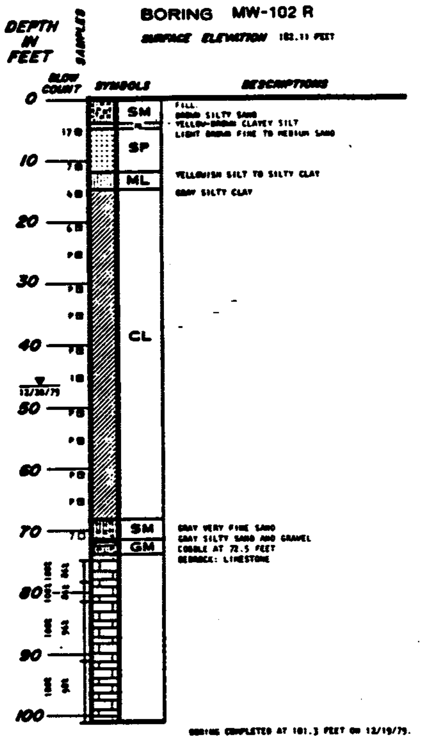
LOG AND MONITORING WELL DETAILS

DAMES & MOORE

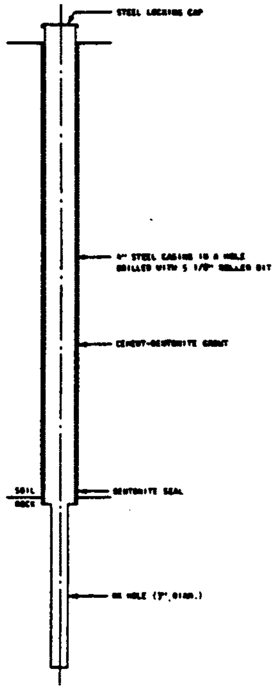
FIGURE 20/19

MONITORING WELL MW-102R

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-19-79
- Well Type: Deep-Bedrock
- Location: Bldgs. 033/042
- Top of casing elevation at date of installation from IBM Datum: 184.91'
- Bottom of casing elevation at date of installation from IBM Datum: 108.11'
- Bottom of well elevation at date of installation from IBM Datum: 80.81'
- Protective casing material: Steel
  Diameter: 4"

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual
- Analytical Parameters:
  - Volatile organic compounds (VOCs) by 8010
  - Inorganic compounds:
    - arsenic
    - chloride
    - chromium (hexavalent)
    - lead

MONITORING WELL MW-102R

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-19-79	Brinnier & Larios	184.91'	---
10-2-92	Brinnier & Larios	184.03'	---

MONITORING WELL MW-102R

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

- Total well depth at date of installation:

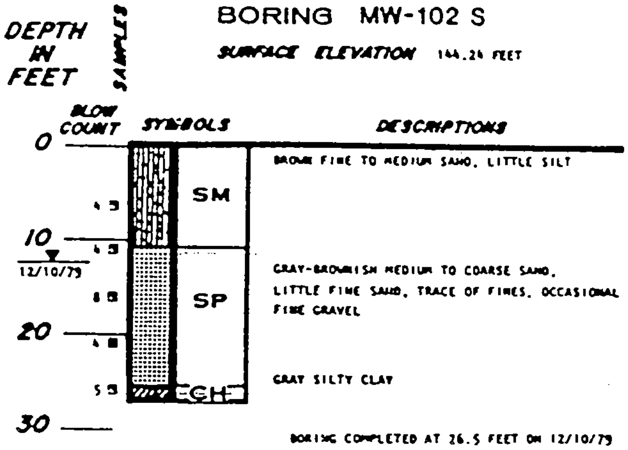
- Depth prior to development:
- Difference in depth from installation:

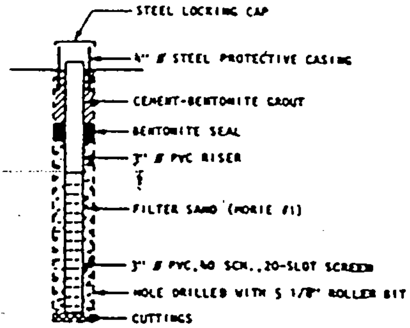
Depth after development:
Difference in depth from installation:

Change in depth (in feet):

- Redevelopment method:

- Performed by:





LOG AND MONITORING WELL DETAILS

NOTES:

1. THE FIGURES IN THE COLUMN LABELED "BLOW COUNT" REFER TO THE NUMBER OF BLOWS REQUIRED TO DRIVE A STANDARD SPLIT-SPOON SAMPLER A DISTANCE OF ONE FOOT USING A 140 POUND DRIVE WEIGHT FALLING 30 INCHES. THE STANDARD SPLIT-SPOON SAMPLER IS 2 INCHES O.D. AND 1-3/8 INCHES I.D.

   THE LETTER "P" IN THE "BLOW COUNT" COLUMN INDICATES THAT THE SAMPLER WAS ADVANCED BY THE WEIGHT OF THE DRILL ROD AND DRIVE WEIGHT WITHOUT DRIVING.

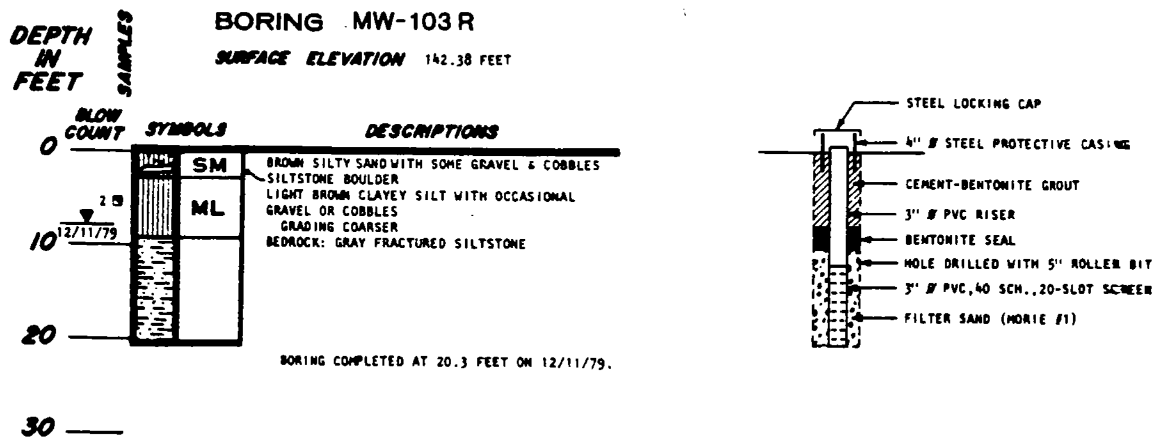
   PERCENT FIGURES IN THE "BLOW COUNT" COLUMN INDICATE THE PERCENT OF CORE RECOVERY FOR A DOUBLE TUBE CORE BARREL NX SIZE CORE RUN (EXCEPT WHERE NOTED ON LOG). THE CORE BARREL IS 2-1/8 INCHES I.D.

2. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM.

3. THE DISCUSSION IN THE TEXT OF THE REPORT IS NECESSARY FOR A PROPER UNDERSTANDING OF THE NATURE OF THE SUBSURFACE MATERIALS.

DAMES & MOORE

FIGURE 20/10



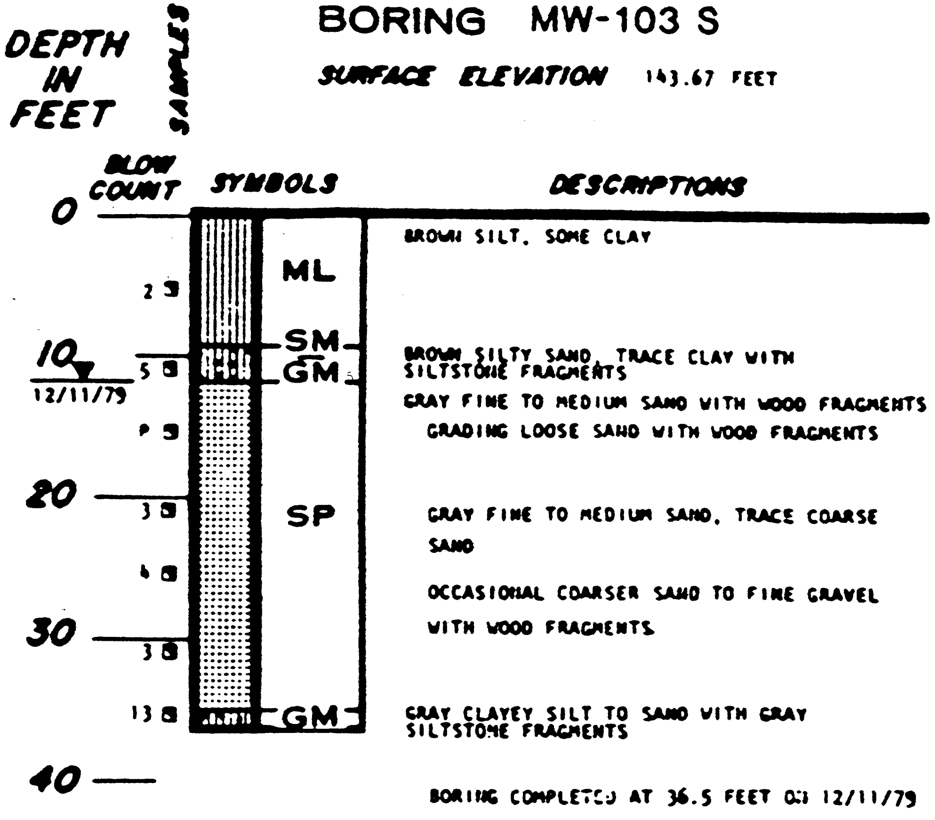
LOG AND MONITORING WELL DETAILS

DAMES & MOORE

FIGURE 20/20

BORING MW-103 S

SURFACE ELEVATION 143.67 FEET



BROWN SILT, SOME CLAY

BROWN SILTY SAND, TRACE CLAY WITH SILTSTONE FRAGMENTS

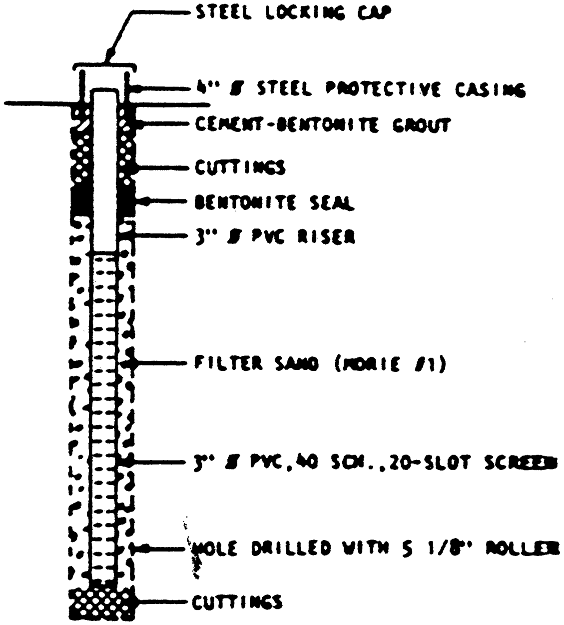
GRAY FINE TO MEDIUM SAND WITH WOOD FRAGMENTS GRADING LOOSE SAND WITH WOOD FRAGMENTS

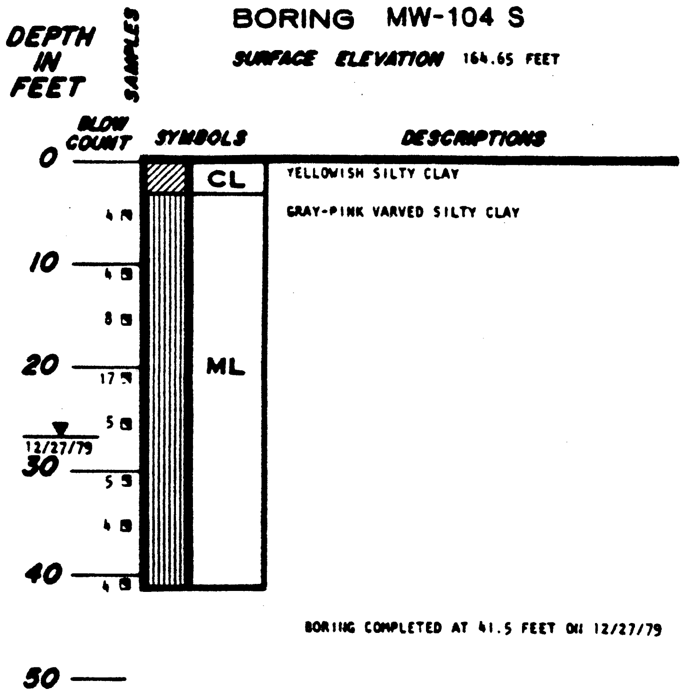
GRAY FINE TO MEDIUM SAND, TRACE COARSE SAND

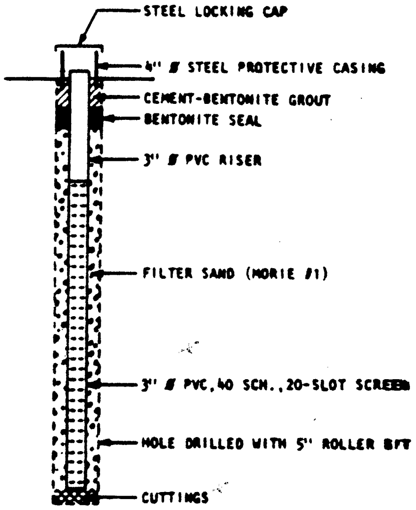
OCCASIONAL COARSER SAND TO FINE GRAVEL WITH WOOD FRAGMENTS

GRAY CLAYEY SILT TO SAND WITH GRAY SILTSTONE FRAGMENTS

BORING COMPLETED AT 36.5 FEET ON 12/11/79

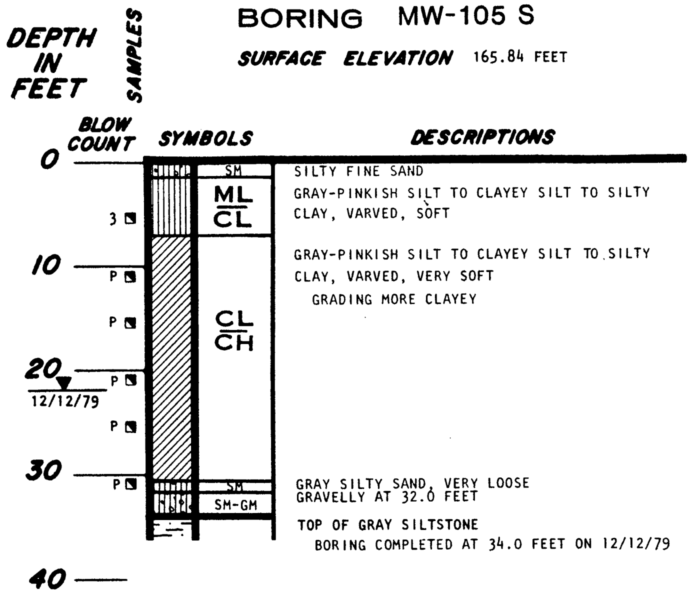


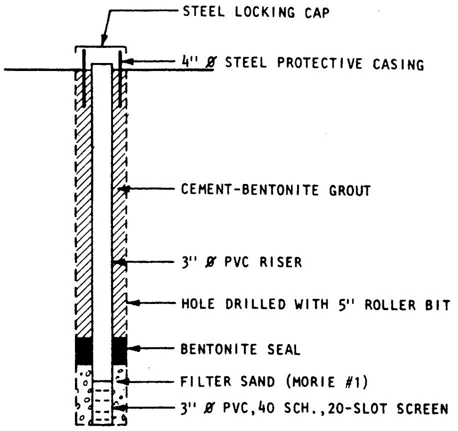




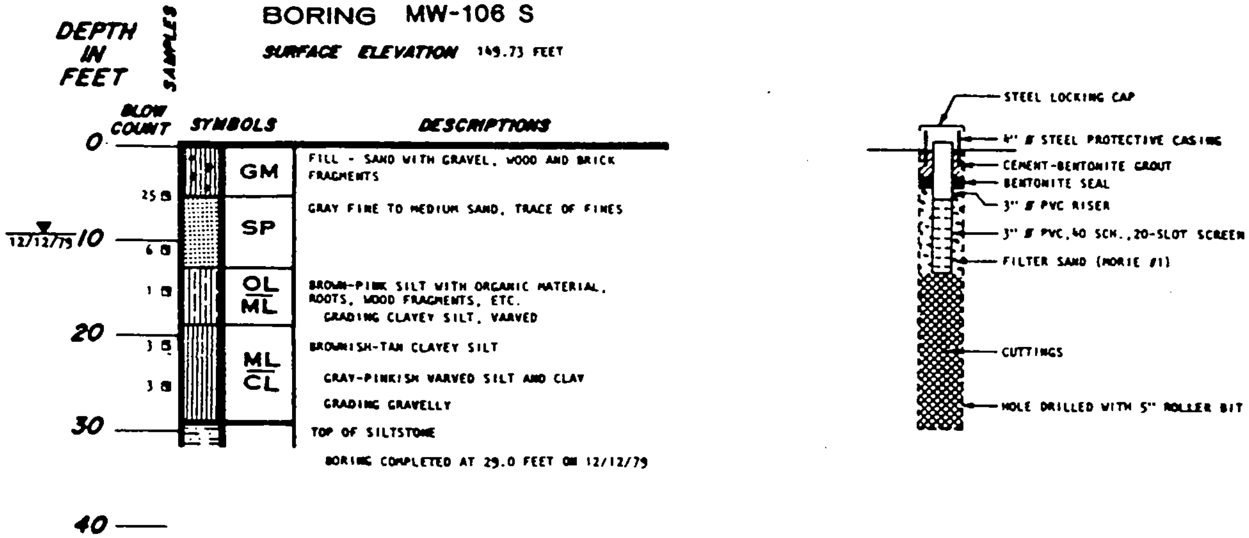
LOG AND MONITORING WELL DETAILS

DAMES & MOORE





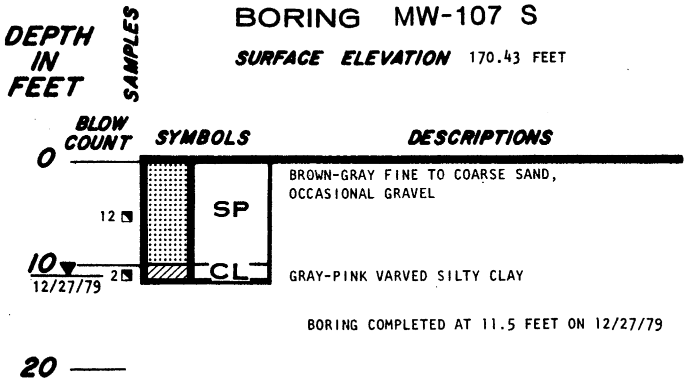
LOG AND MONITORING WELL DETAILS

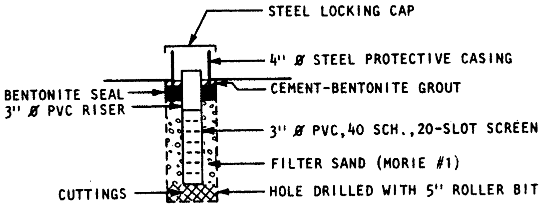


LOG AND MONITORING WELL DETAILS

DAMES & MOORE

FIGURE 20/12

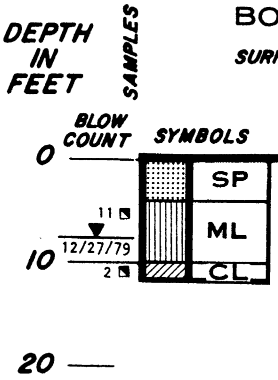




LOG AND MONITORING WELL DETAILS

BORING MW-108 S

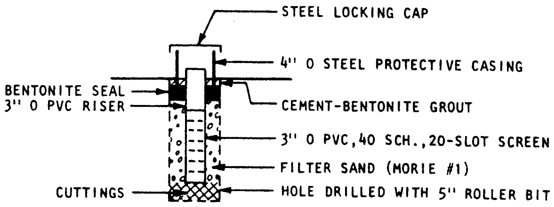
SURFACE ELEVATION 174.32 FEET



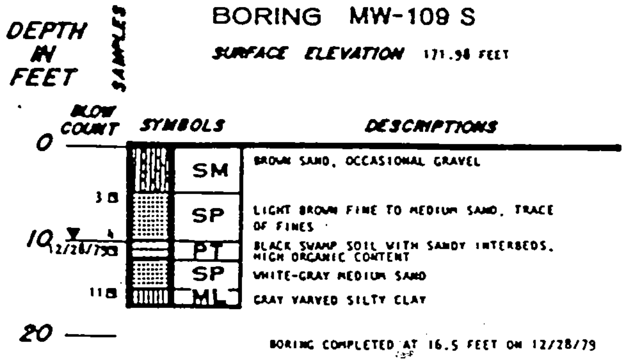
DESCRIPTIONS

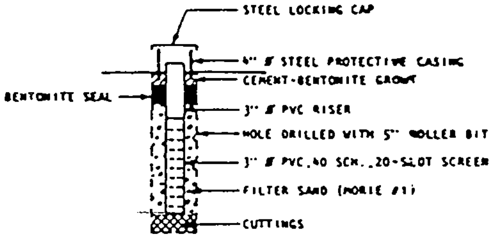
SP	GRAY FINE TO COARSE SAND, LITTLE FINES, OCCASIONAL GRAVEL AND ROCK FRAGMENTS
ML	GRAY SILT TO VERY FINE SAND, TRACE OF CLAY
CL	GRAY-PINK VARVED SILTY CLAY

BORING COMPLETED AT 11.5 FEET ON 12/27/79



LOG AND MONITORING WELL DETAILS





LOG AND MONITORING WELL DETAILS

DAMES & MOORE

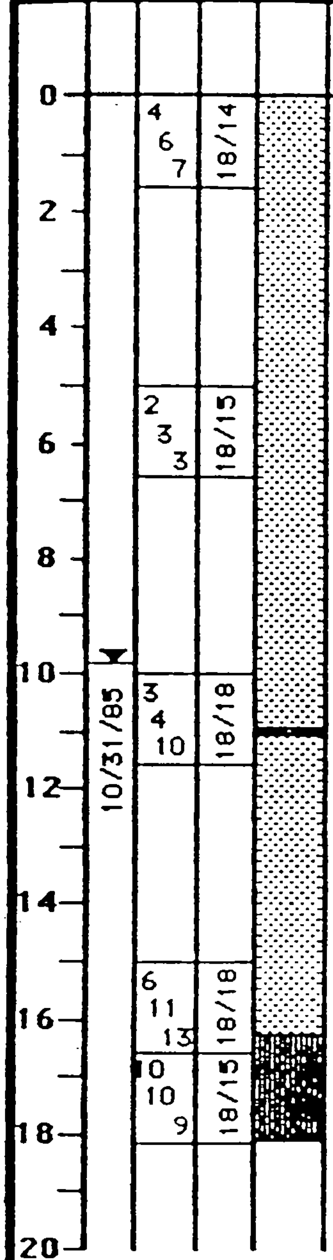
FIGURE 20/13

MONITORING WELL - 110A-S

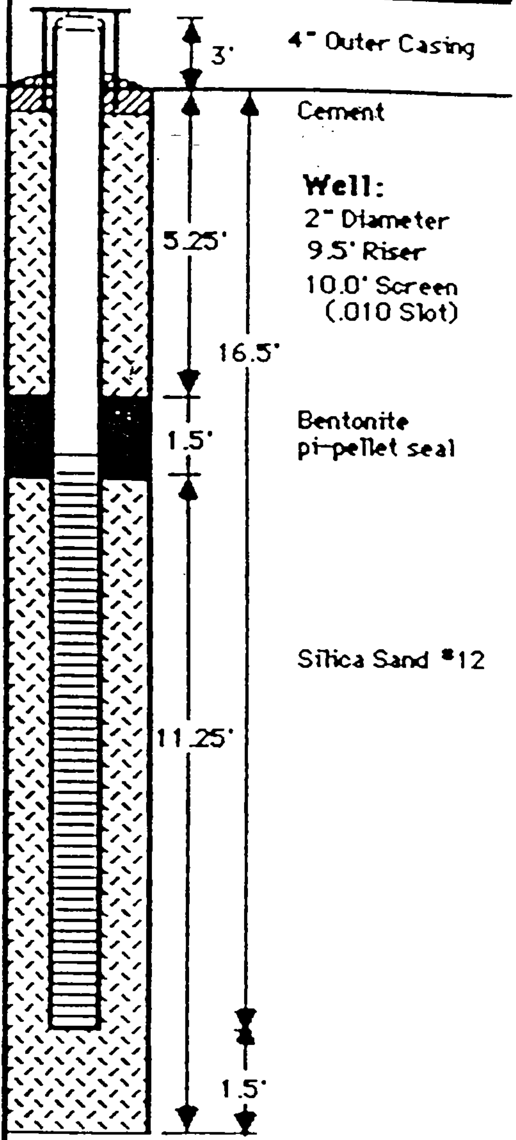
SURFACE ELEVATION - 178 Ft.(approx)

WELL CONSTRUCTION DETAILS

DESCRIPTION OF SUBSURFACE MATERIALS



Blows /6 Inches	Inches Driven/ Inches Recovered	Classification Symbols	Description
4 6 7	18/14	SM	Silty Sand, Medium to Fine
2 3 3	18/15	SM	Silty Sand, Medium to Fine
3 4 10	18/18	ML	Silty Sand, Medium to Fine Lense of Silty Clay - 1" Thick at 11.0 Feet
6 11 13	18/18	SM	Silty Sand, Medium to Fine
10 10 9	18/15	ML	Grey Clay / Silt



Monitoring Well 110A-S was installed as a replacement for MW 110-S on 10/31/85

IBM CORPORATION
KINGSTON, NEW YORK

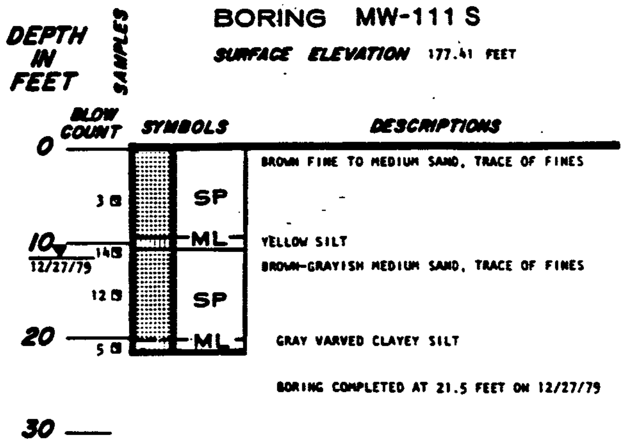
Dames & Moore Job No. 3558-189

BORING AND WELL CONSTRUCTION DETAILS

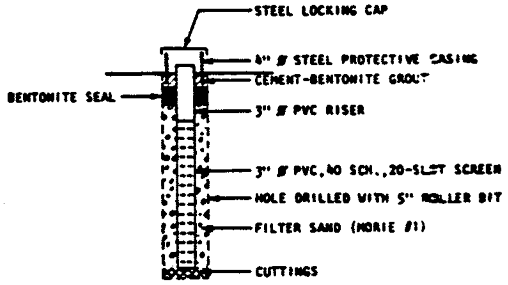
PAGE 1 OF 1

MONITORING WELL MW-111S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-27-79
- Well Type: Shallow-overburden
- Location: Bldg. 001 and North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 179.66'
- Top of screen elevation at date of installation from IBM Datum: 171.91'
- Bottom of screen elevation at date of installation from IBM Datum: 156.91'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-111S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-27-79	Brinnier & Larios	179.66'	---
10-2-92	Brinnier & Larios	179.59'	178.40'

MONITORING WELL MW-111S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

- Total well depth at date of installation:

- Depth prior to development:
- Difference in depth from installation:

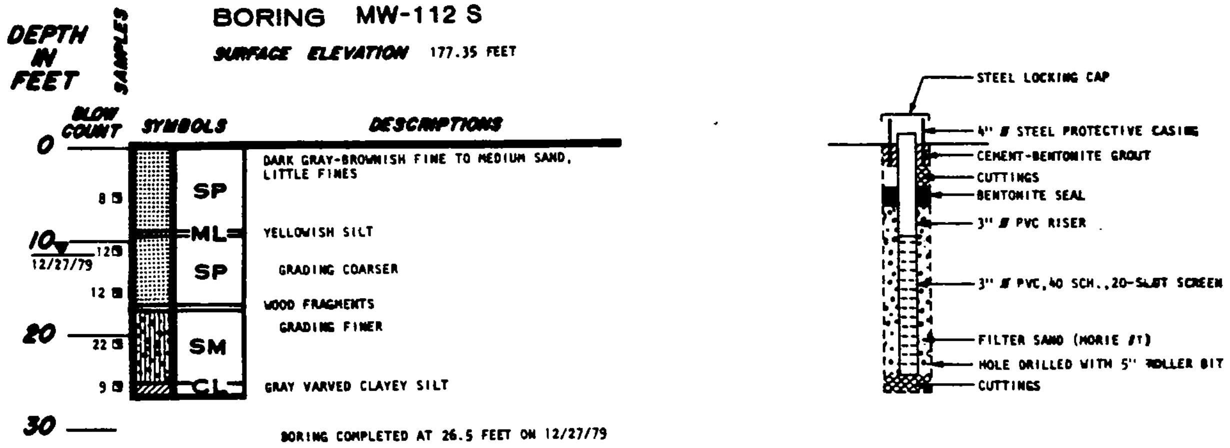
Depth after development:

Difference in depth from installation:

Change in depth (in feet):

- Redevelopment method:

- Performed by:



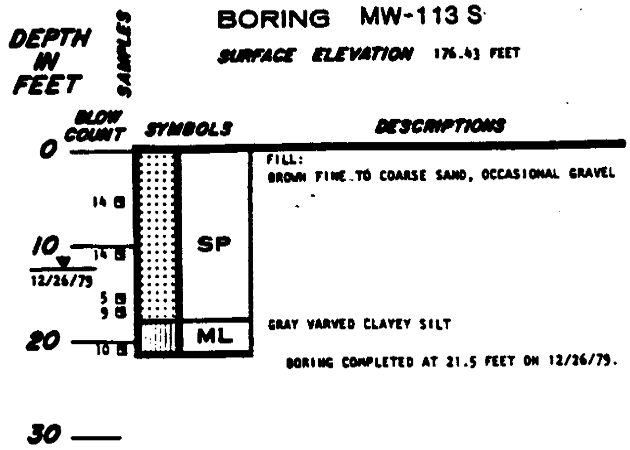
LOG AND MONITORING WELL DETAILS

DAMES & MOORE

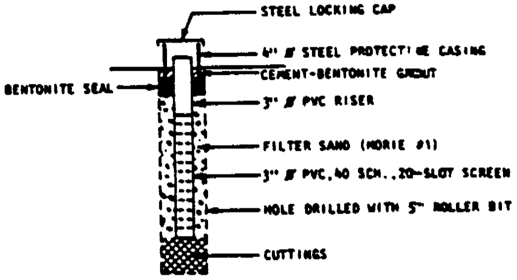
FIGURE 20/14

MONITORING WELL MW-113S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-26-79
- Well Type: Shallow-overburden
- Location:
- Top of casing elevation at date of installation from IBM Datum: 179.23'
- Top of screen elevation at date of installation from IBM Datum: 171.43'
- Bottom of screen elevation at date of installation from IBM Datum: 158.43'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-113S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair, extension of PVC casing (1.5'), and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-26-79	Brinnier & Larios	179.23'	---
10-2-92	Brinnier & Larios	180.60'	180.05'

MONITORING WELL MW-113S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 158.43'

- Depth prior to development: 160.20' Depth after development: 159.47'
- Difference in depth from installation: 1.77' Difference in depth from installation: 1.04'

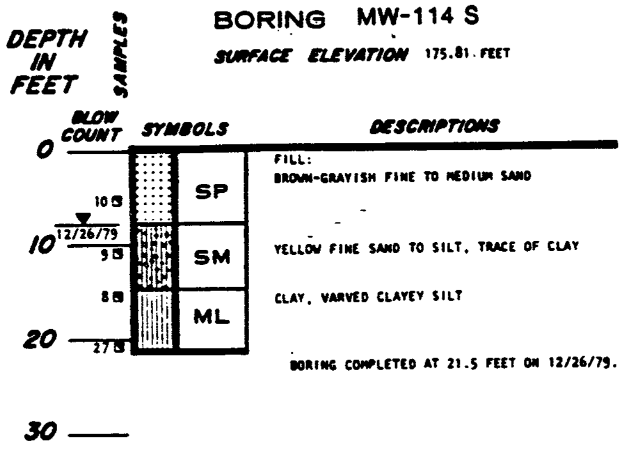
Change in depth (in feet): 0.73'

- Redevelopment method: Bladder Pump

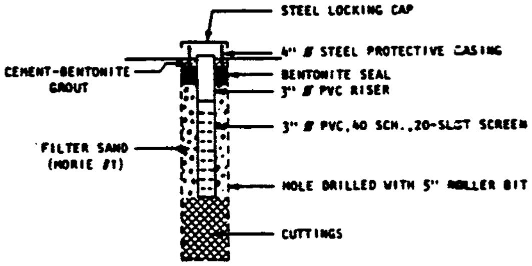
- Performed by: CTM Analytical Laboratories, Ltd.

MONITORING WELL MW-114S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-26-79
- Well Type: Shallow-overburden
- Location: Bldg. 035 and South Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 177.11'
- Top of screen elevation at date of installation from IBM Datum: 170.81'
- Bottom of screen elevation at date of installation from IBM Datum: 160.81'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-114S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-26-79	Brinnier & Larios	177.11'	---
10-2-92	Brinnier & Larios	177.24'	176.89'

MONITORING WELL MW-114S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

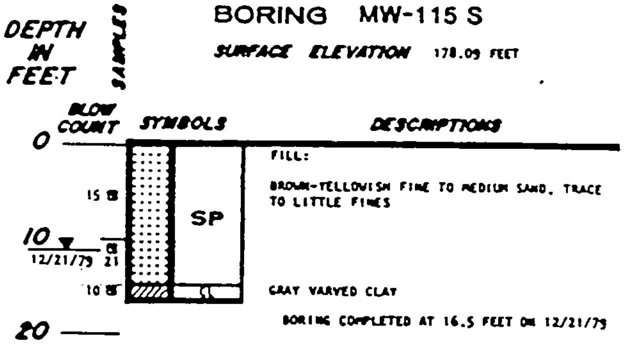
- Total well depth at date of installation: __________

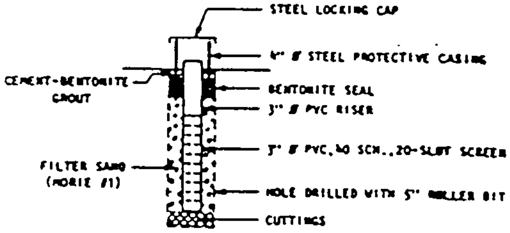
- Depth prior to development: __________ Depth after development: __________
- Difference in depth from installation: __________ Difference in depth from installation: __________

Change in depth (in feet): __________

- Redevelopment method: __________

- Performed by: __________



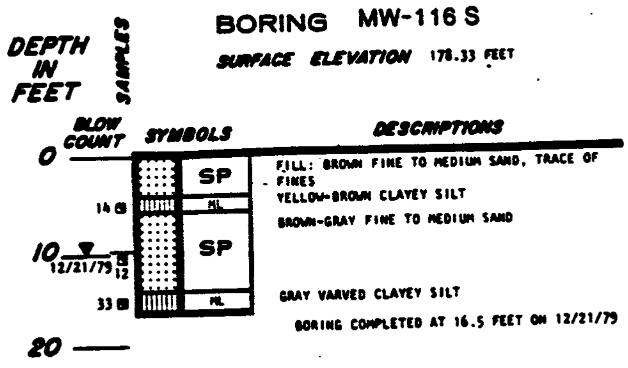


LOG AND MONITORING WELL DETAILS

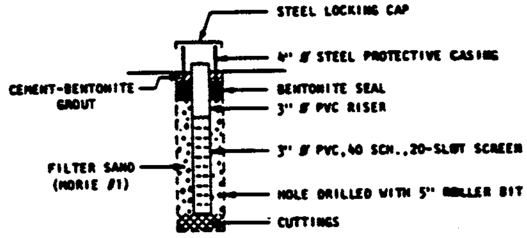
DAMES & MOORE

MONITORING WELL MW-116S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-21-79
- Well Type: Shallow-overburden
- Location: Bldgs. 004/005
- Top of casing elevation at date of installation from IBM Datum: 181.23'
- Top of screen elevation at date of installation from IBM Datum: 173.33'
- Bottom of screen elevation at date of installation from IBM Datum: 163.33'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-116S

V. MODIFICATION DETAILS

Modification Date: 7-22-92

- Modifications involved the following activities:

Painting and labelling of casing

- Performed by: Dames & Moore

- Modification Date: 9-30-92

- Modifications involved the following activities:

Surface seal repair and installation of water-tight cap

- Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-21-79	Brinnier & Larios	181.23'	---
10-2-92	Brinnier & Larios	181.35'	179.79'

MONITORING WELL MW-116S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 163.33'

- Depth prior to development: 164.63' Depth after development: 164.63'
- Difference in depth from installation: 1.30' Difference in depth from installation: 1.30'

Change in depth (in feet): no change

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 163.33'

- Depth prior to development: 164.10' Depth after development: 163.75'
- Difference in depth from installation: 0.77' Difference in depth from installation: 0.42'

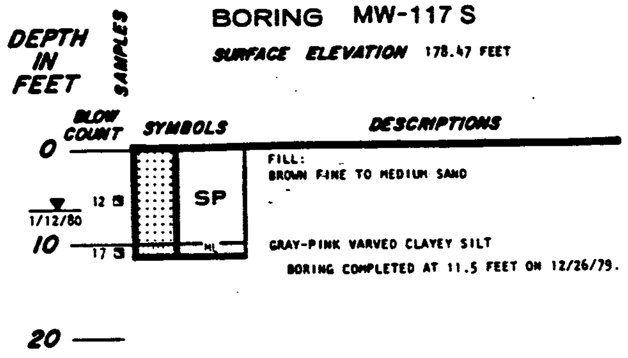
Change in depth (in feet): 0.35'

- Redevelopment method: Bladder Pump

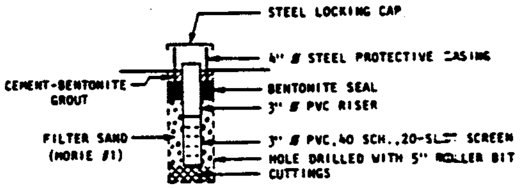
- Performed by: CTM Analytical Laboratories, Ltd.

MONITORING WELL MW-117S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-26-79
- Well Type: Shallow-overburden
- Location: Bldgs. 005/042
- Top of casing elevation at date of installation from IBM Datum: 180.87′
- Top of screen elevation at date of installation from IBM Datum: 173.47′
- Bottom of screen elevation at date of installation from IBM Datum: 168.47′
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-117S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-26-79	Brinnier & Larios	180.87′	---
10-2-92	Brinnier & Larios	181.02′	179.47′

MONITORING WELL MW-117S

VI. DEVELOPMENT HISTORY

Redevelopment Date: 7-22-92

- Total well depth at date of installation: 168.47'

- Depth prior to development: 168.85' Depth after development: 168.85'
- Difference in depth from installation: 0.38' Difference in depth from installation: 0.38'

Change in depth (in feet): no change

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

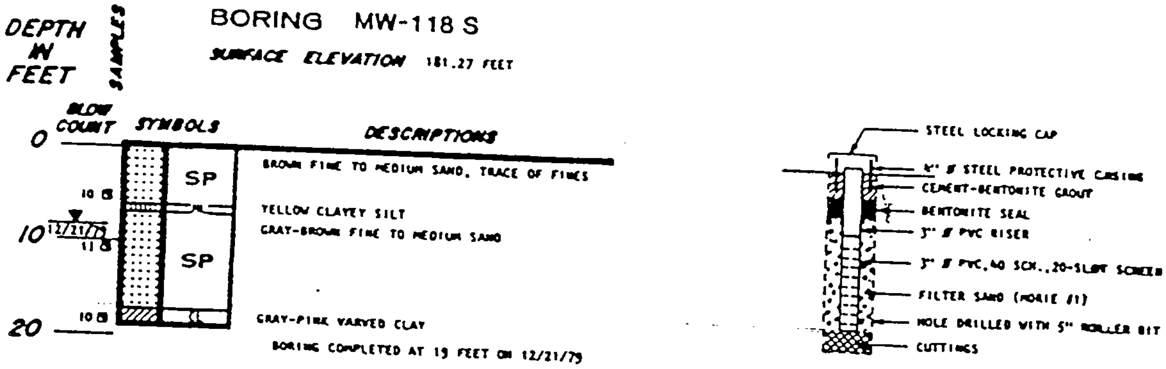
- Total well depth at date of installation: 168.47'

- Depth prior to development: 169.12' Depth after development: 168.87'
- Difference in depth from installation: 0.65' Difference in depth from installation: 0.40'

Change in depth (in feet): 0.25'

- Redevelopment method: Bladder Pump

- Performed by: CTM Analytical Laboratories, Ltd.



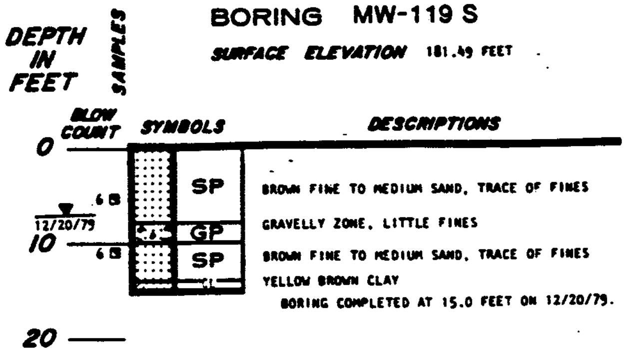
LOG AND MONITORING WELL DETAILS

DAMES & MOORE

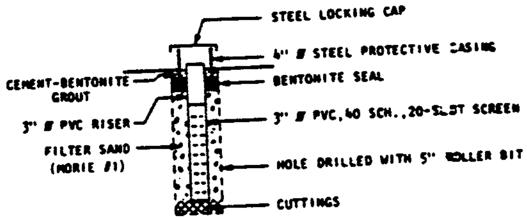
FIGURE 20/16

MONITORING WELL MW-119S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-20-79
- Well Type: Shallow-overburden
- Location: Boiler House (Bldg. 031)
- Top of casing elevation at date of installation from IBM Datum: 183.84'
- Top of screen elevation at date of installation from IBM Datum: 177.49'
- Bottom of screen elevation at date of installation from IBM Datum: 167.49'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual
- Analytical Parameters:
  - Volatile organic compounds (VOCs) by 8010
  - Polynuclear Aromatic Hydrocarbons (PAHs) by 610

MONITORING WELL MW-119S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-20-79	Brinnier & Larios	183.84'	---
10-2-92	Brinnier & Larios	183.92'	182.70'

MONITORING WELL MW-119S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

  - Total well depth at date of installation: 167.49'
  - Depth prior to development: 168.40' Depth after development: 168.40'
  - Difference in depth from installation: 0.91' Difference in depth from installation: 0.91'

  Change in depth (in feet): no change

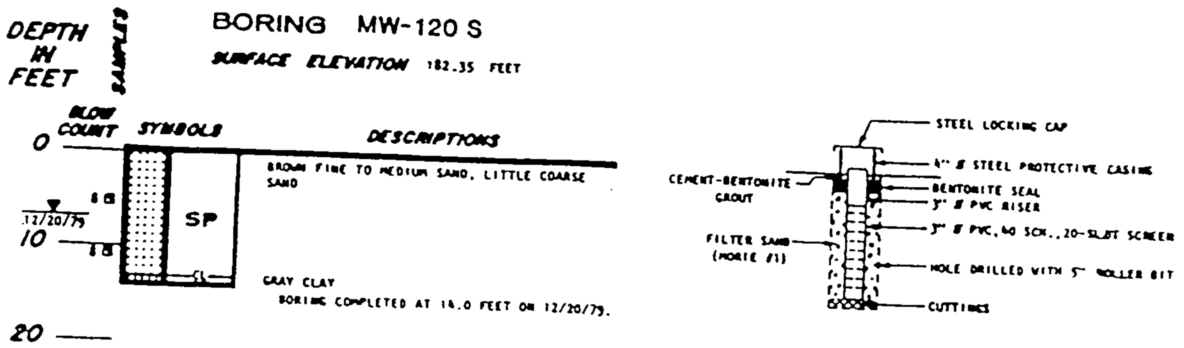
  - Redevelopment method: Centrifugal Pump
  - Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

  - Total well depth at date of installation: 167.49'
  - Depth prior to development: 168.12' Depth after development: 168.09'
  - Difference in depth from installation: 0.63' Difference in depth from installation: 0.60'

  Change in depth (in feet): 0.03'

  - Redevelopment method: Bladder Pump
  - Performed by: CTM Analytical Laboratories, Ltd.



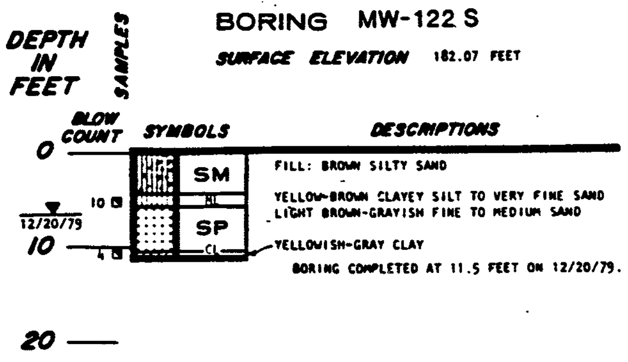
LOG AND MONITORING WELL DETAILS

DAMES & MOORE

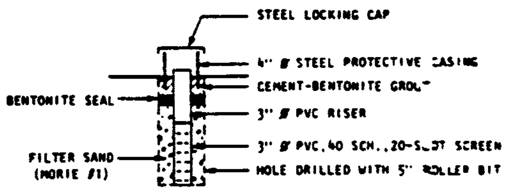
FIGURE 20/16

MONITORING WELL MW-122S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-20-79
- Well Type: Shallow-overburden
- Location: Bldgs. 033/042
- Top of casing elevation at date of installation from IBM Datum: 184.92'
- Top of screen elevation at date of installation from IBM Datum: 177.07'
- Bottom of screen elevation at date of installation from IBM Datum: 170.57'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual
- Analytical Parameters:
  - Volatile organic compounds (VOCs) by 8020
  - Inorganic compounds:
    - arsenic
    - chloride
    - chromium (hexavalent)
    - lead

MONITORING WELL MW-122S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

  Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

  Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-20-79	Brinnier & Larios	184.92′	---
10-2-92	Brinnier & Larios	184.12′	186.35′

MONITORING WELL MW-122S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

- Total well depth at date of installation:__________

- Depth prior to development:__________ Depth after development:__________
- Difference in depth from installation:__________ Difference in depth from installation:__________

Change in depth (in feet):__________

- Redevelopment method:__________

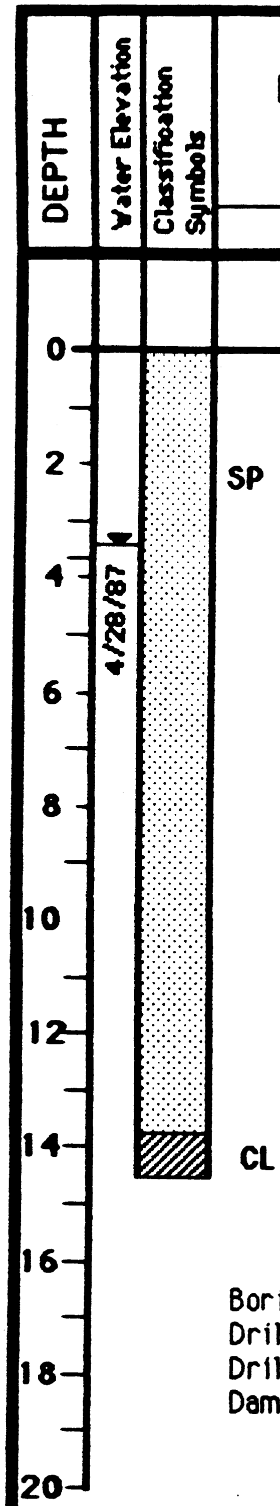
- Performed by:__________

MONITORING WELL - 123A-S

SURFACE ELEVATION - 178 Ft.(approx)

WELL CONSTRUCTION DETAILS

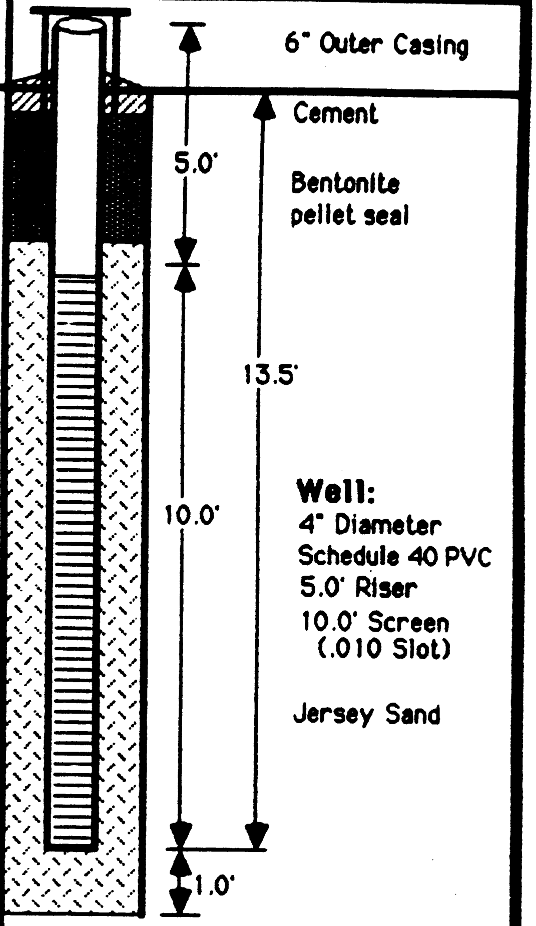
DESCRIPTION OF SUBSURFACE MATERIALS



Brown Fine to Medium Sand,
Trace of Fines

Grey Varved Silty Clay

Boring Completed to 14.5 Feet on April 23, 1987
Drilling Method: Rotary Wash, 6-1/2" O. D.
Drillers: Soil & Material Testing, Inc., Castleton, NY
Dames & Moore Geologist: Dave Wagner



Monitoring Well 123A-S was installed as a replacement for MW 123-S on 4/23/87. Subsurface description taken from MW 123-S Boring Log.

IBM CORPORATION
KINGSTON, NEW YORK

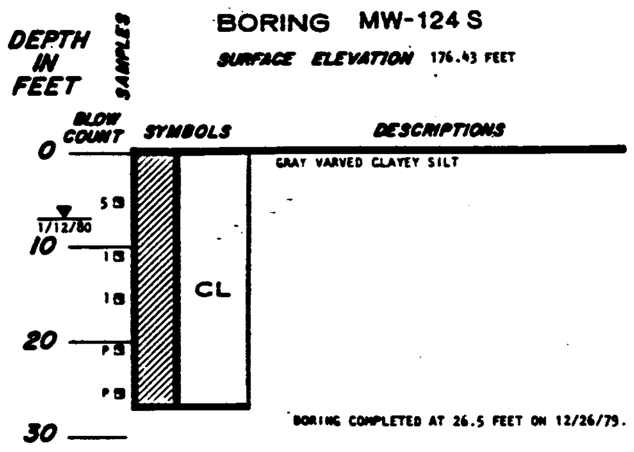
Dames & Moore Job No. 3558-213

BORING AND WELL CONSTRUCTION DETAILS

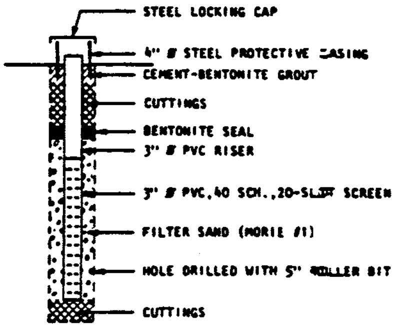
PAGE 1 OF 1

MONITORING WELL MW-124S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-26-79
- Well Type: Shallow - Overburden
- Location: Building 029 & Old Neighborhood Road
- Top of casing elevation at date of installation from IBM Datum: 179.13′
- Top of screen elevation at date of installation from IBM Datum: 166.43′
- Bottom of screen elevation at date of installation from IBM Datum: 151.43′
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC - Schedule 20
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual
- Analytical Parameters:
  - Volatile organic compounds (VOCs) by 8020
  - Inorganic compounds:
    - arsenic
    - chloride
    - chromium (hexavalent)
    - lead

MONITORING WELL MW-124S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair, extension of PVC casing (1.25'), and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
12-26-79	Brinnier & Larios	179.13'	---
10-2-92	Brinnier & Larios	179.48'	179.21'

MONITORING WELL MW-124S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

  - Total well depth at date of installation: 151.43'

  - Depth prior to development: 153.49' Depth after development: 151.86'
  - Difference in depth from installation: 2.06' Difference in depth from installation: 0.43'

  Change in depth (in feet): 1.63'

  - Redevelopment method: Centrifugal Pump

  - Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

  - Total well depth at date of installation: 151.43'

  - Depth prior to development: 154.78' Depth after development: 151.98'
  - Difference in depth from installation: 3.35' Difference in depth from installation: 0.55'

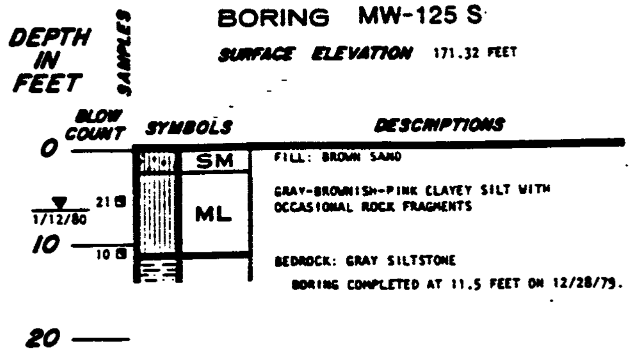
  Change in depth (in feet): 2.80'

  - Redevelopment method: Bladder Pump

  - Performed by: CTM Analytical Laboratories, Ltd.

MONITORING WELL MW-125S

I. BORING LOG



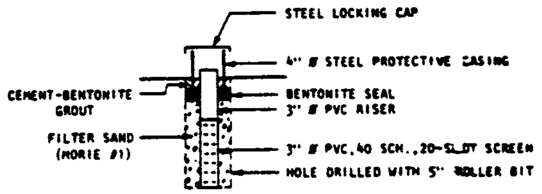
FILL: BROWN SAND

GRAY-BROWNISH-PINK CLAYEY SILT WITH OCCASIONAL ROCK FRAGMENTS

BEDROCK: GRAY SILTSTONE

BORING COMPLETED AT 11.5 FEET ON 12/28/79.

II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 12-28-79
- Well Type: Shallow-Overburden
- Location: Building 202 & Neighborhood Road
- Top of casing elevation at date of installation from IBM Datum: 174.32'
- Top of screen elevation at date of installation from IBM Datum: 166.82'
- Bottom of screen elevation at date of installation from IBM Datum: 159.82'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010
- Sampling Frequency: Annual
- Analytical Parameters: Inorganic Compounds:
  - arsenic
  - chloride
  - chromium (hexavalent)
  - lead

MONITORING WELL MW-125S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

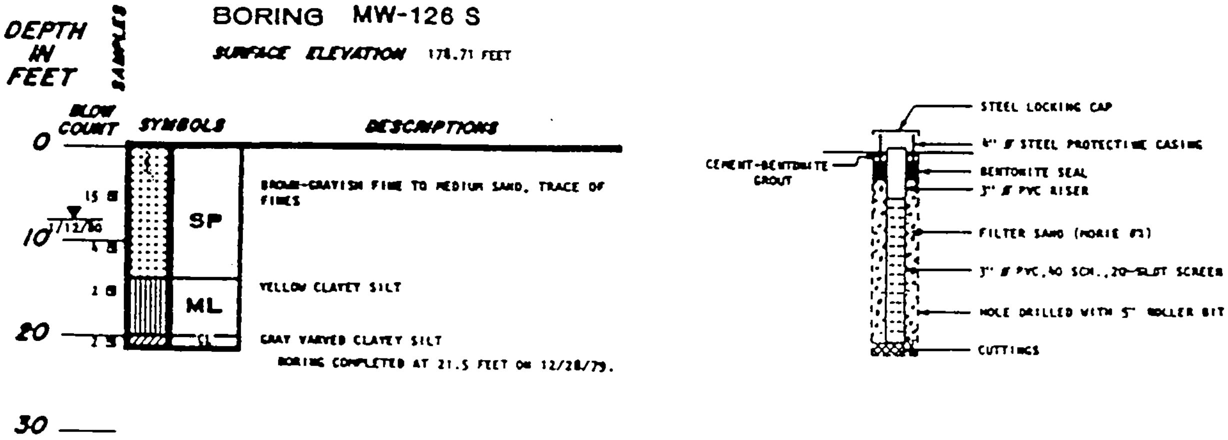
  - Modifications involved the following activities:

    Surface seal repair, extension of PVC casing (4.5'), and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-11-80	Brinnier & Larios	174.32'	---
10-2-92	Brinnier & Larios	174.67'	174.25'



LOG AND MONITORING WELL DETAILS

DAMES & MOORE

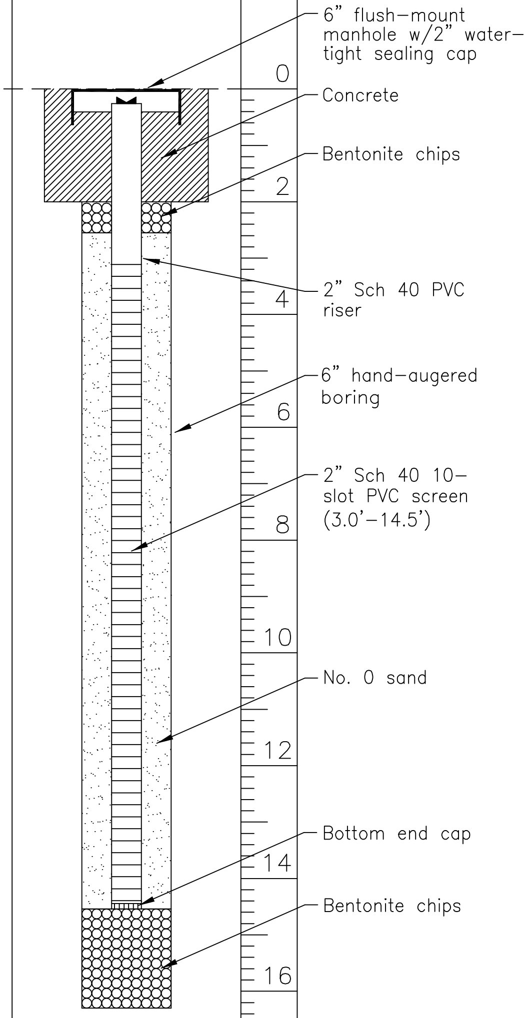
FIGURE 20/18

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93005

Boring No. MW–161S TOC Elev. 183.36'
Location Southeast corner B051
Page 1 of 1

Depth Feet	Sample Number	Overburden/Lithologic Description	USCS	Volatile Scan * (ppm)
0		Ground Surface		
		Blacktop to 3". FILL: SAND: poorly graded, little silt, occ. f–c pebbles, occ. cobble, loose, moist, olive gray (gray brown w/asphalt chips from 17").	FILL	
2	0203	FILL: SAND: well graded, very fine to coarse, some silt, fine to medium subangular to subround pebbles, occ. asphalt frags, loose, moist, gray brown and yellow brown.		0
4	0405	SAND: well graded, very fine to coarse, little silt, trace fine pebbles, loose, saturated, brown.	SW	0
6	0607	SAND: mod. poorly graded, coarse sand, some very fine to med. sand, little silt, trace clay, loose, saturated, gray brown to dark yellow brown.	SP	0
8	0809	SAND: as above.		0.2
		: fining below 9.75' to fine to very fine sand.		
10	1011	SAND: well graded, very fine to find sand, little silt, compact, saturated, dark yellow brown to gray br. : pink quartz pebble at 11.5' (1.5" diameter). SILT & CLAY LAYER: (.5') at 11.7', plastic, stiff, yellow brown.	SW–SM	0
12	1213	LAYERED SAND & SILT/CLAY: SAND: mod. poorly graded, med–coars, loose, saturated, brown; SILT/CLAY: plastic, stiff, saturated, varved light brown, dark yellow brown–brown gray.	SP	0.3
14		SAND: well graded, very fine to med., some silt, stiff, saturated, brown gray.	SW	0
		SILT & CLAY: plastic, stiff, saturated, finely laminated, varved brown gray and gray red.	ML–CL	
16		Total Depth: 16.25'		
18				
20				

Well Construction Graphic / Well Construction Details



Driller: M. Ruchin, GSC
Logged by: S. Fisher, GSC
Drilling Started: 4–2–93
Drilling Completed: 4–3–93
Well Construction: 4–3–93
Well Developed: 4–7–93
Well Coords.: N717215.10
E592651.91

Notes:
* FID

Hand augered.

Static Water Level 3.61' (from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–161S

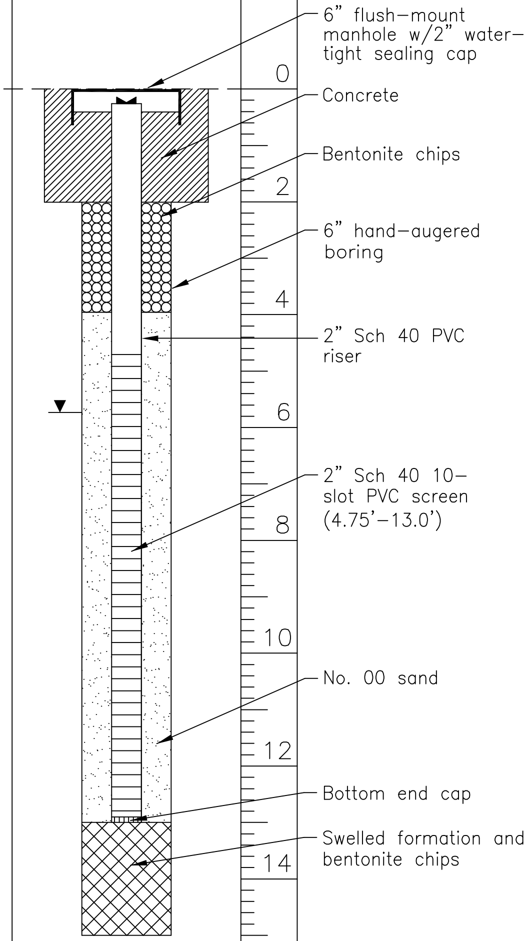
Revised 9/1/94

Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93005

Boring No. MW–162S
TOC Elev. 184.36'
Location Inside south portion B051
Page 1 of 1

Depth Feet	Sample Number	Overburden/Lithologic Description	USCS	Volatile Scan * (ppm)
0		Ground Surface		
		Concrete to 1.5'.		
2	0203	FILL: SAND: mod poorly graded, little silt, occasional pebble, angular–subangular, loose, moist, dark yellow brown.	FILL and concrete	0
4	0405	FILL: SAND: GRAVELLY: well graded, lit. silt; GRAVEL: angular–subang., f–c, loose, moist, dk. yellow br. FILL: GRAVEL: SILTY SAND: angular–subang. gravel, loose, moist, dk. yellow br., gravel stained orange and dark brown, petroleum odor and septic odor.		1
6	0607	FILL: GRAVEL: angular–subang., loose pebbles, tr f sand & silt, loose, saturated, stained dk. br.–orng. SAND: well graded, some silt, trace gravel, loose, saturated, dark yellow brown.		4
8	0809	SAND: well graded, med–c, some silt, trace clay/silt stringers, loose, saturated, dk. yellow brown–brown.	SW	0
10	1011	LAYERED SAND & SILT: SAND: well graded, f–med., some silt, loose, saturated, dark yellow brown; SILT: plastic, stiff, saturated, laminated with clay and very fine sand, yellow brown, pale red, lt. br.	SW–ML	0
12	1213	LAYERED SAND & SILT: SAND: well graded, f–c, lit. silt, loose, saturated, dk. yellow brown; SILT: some clay, stiff, wet, yellow brown w/pale red laminae; (13') SILT: some clay, plastic, very stiff, saturated, brown gray.	ML	0
15		Total Depth: 15.0'		
16				
18				
20				



Driller: A. Nadell, GSC
Logged by: S. Fisher, GSC
Drilling Started: 4–17–93
Drilling Completed: 4–18–93
Well Construction: 4–18–93
Well Developed: 4–19–93
Well Coords.: N717243.51
E592568.50

Notes:
* FID
Hand augered.
6" diam. red clay pipe at 4.75' (dry).

Static Water Level 5.75'.

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–162S

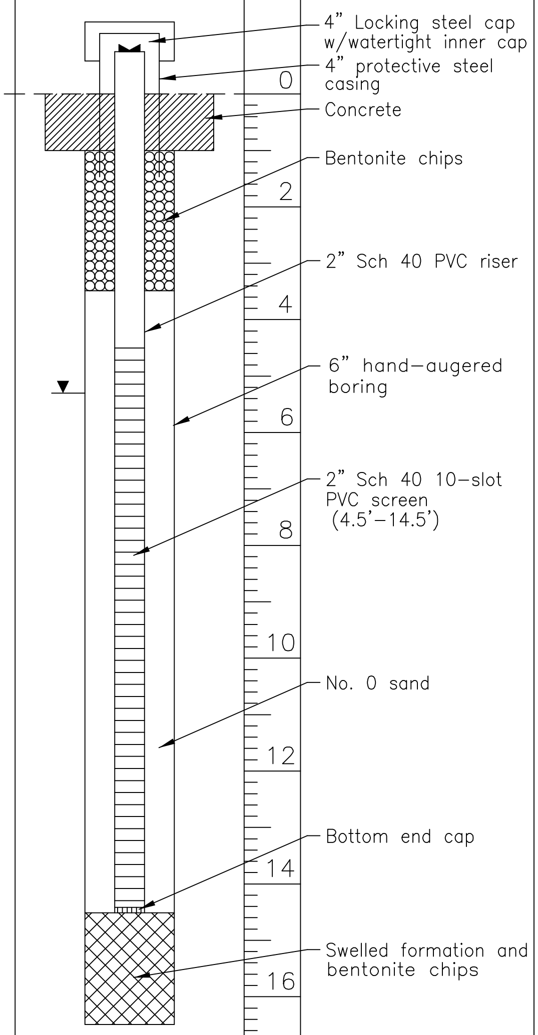
Revised 9/1/94

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93005

Boring No. MW-163S
TOC Elev. 185.65'
Location Next to SW wall of B051
Page 1 of 1

Depth Feet	Sample Number	Overburden/Lithologic Description	USCS	Volatile Scan * (ppm)
0		Ground Surface		
		Landscaping bark to 2" underlain by fabric. SILTY SAND with rootlets.	FILL	
2	0203	SAND: poorly graded, med-c, some silt, occasional silt, fine-med. pebble, loose, brown to dark yellow brown; (7") siltstone cobble at 3.75'.	SP	0
4	0405	SAND: poorly graded, med-c, some silt, some ang. to subang. pebbles, loose, moist, dk. yellow brown.		1
		Saturated at 5.25'.		
6	0607	SAND: well graded, coarse, little silt, loose, saturated, yellow brown to brown.	SW	2
		: change to dark gray.		
8	0809	SAND: well graded, f-c, some silt, loose, saturated, gray brown.		1.5
10	1011	SAND: well graded, f-m, some silt, loose, saturated, dark yellow brown, fining with depth. LAYERED SAND & SILT/CLAY: SAND: poorly graded, fine, loose, saturated; SILT/CLAY: stiff, wet, laminated, yellow brown, brown, pale red.	SM-ML	0
12	1213	SILT & CLAY: stiff, saturated, laminated, yellow br., pale brown, occ. pale red; (13') SILT & CLAY: tr vf sand, stiff, saturated, dk yel br; SAND: SILT STRINGERS: vf-f sand, dense, saturated.	ML SP-ML	0
14	1415	SAND & SILT: poorly grade,d vf-f sand, tr silt and med. sand, tr silt/clay stringers, very loose, saturated, dark yellow brown. SILT & CLAY: (14.5') plastic, stiff, saturated, brown gray to gray red.	SM SP-ML ML-CL	1
		Total Depth: 16.5'		
18				
20				

Well Construction Graphic / Well Construction Details



Driller: M. Ruchin, GSC
Logged by: S. Fisher, GSC
Drilling Started: 4-5-93
Drilling Completed: 4-5-93
Well Construction: 4-5-93
Well Developed: 4-8-93
Well Coords.: N717267.79
E592528.36

Notes:
* FID
Hand augered.

Static Water Level 5.25'.

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-163S

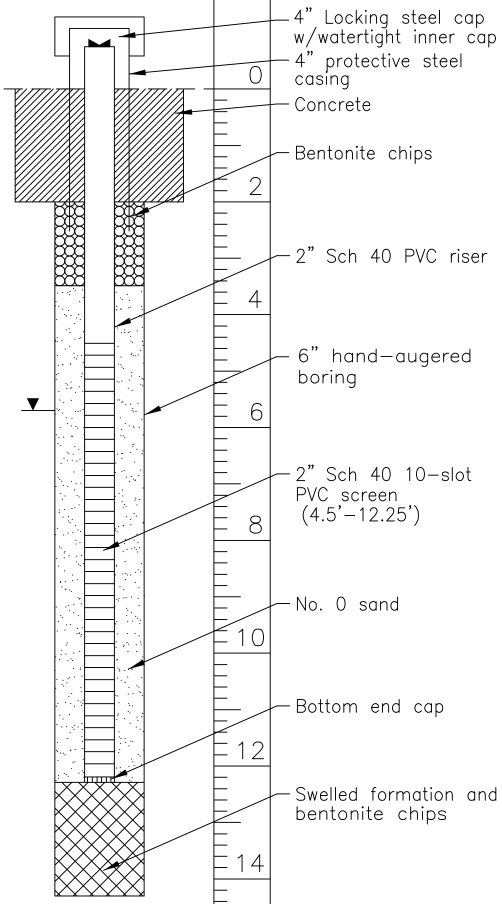
Revised 12/15/94

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93005

Boring No. MW-164S
TOC Elev. 182.31'
Location Southwest of B051
Page 1 of 1

Depth Feet	Sample Number	Overburden/Lithologic Description	USCS	Volatile Scan * (ppm)
0		Ground Surface		
		Grass and topsoil to 5". SILT & SAND: fine sand, dark brown.		
		FILL: SILT, SAND, ANGULAR GRAVEL: moist.		
2	0203	FILL: GRAVEL: SILT & SAND: angular-subangular, well graded sand, occ. rootlet, loose, moist, yellow br.	FILL	0.3
4	0405	SAND: well graded, med-c, some f sand & silt, occ. angular-subangular gravel, loose, moist, dark yellow brown : olive gray at 5.5'.	SW	0.2
6	0607	SILT: plastic, stiff, saturated, laminated w/organics and some vf-med sand, yellow brown.	OL	0
		SAND: mod. poorly graded, med-c, some fine sand and silt, loose, saturated, dark yellow brown.	SP	
8	0809	SAND: mod. poorly graded, med-c, little fine sand and silt, loose saturated, dark yellow brown.		0
10	1011	SILTY SAND: mod. well graded, silt stringers, loose, saturated, yellow brown.	SM	0
		(11.6') SILT: stiff, yellow brown (<0-25").	ML	
		SILT & CLAY: trace very fine sand, plastic, stiff, saturated, brown to yellow brown.	ML-CL	
12	1213	SILT & CLAY: trace very fine sand, plastic, stiff, saturated, brown to yellow brown.	ML-CL	
		SILT & CLAY: (12.25') plastic, stiff, saturated, brown gray to gray red.	ML-CL	
14				
		Total Depth: 14.25'		
16				
18				
20				

Well Construction Graphic / Well Construction Details



Driller: M. Ruchin, GSC
Logged by: S. Fisher, GSC
Drilling Started: 4-4-93
Drilling Completed: 4-4-93
Well Construction: 4-4-93
Well Developed: 4-8-93
Well Coords.: N717311.42
E592314.24

Notes:
* FID
Hand augered.
TRENCH FILL ZONE 1.5'-4.0'.

Static Water Level 5.75'.

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-164S

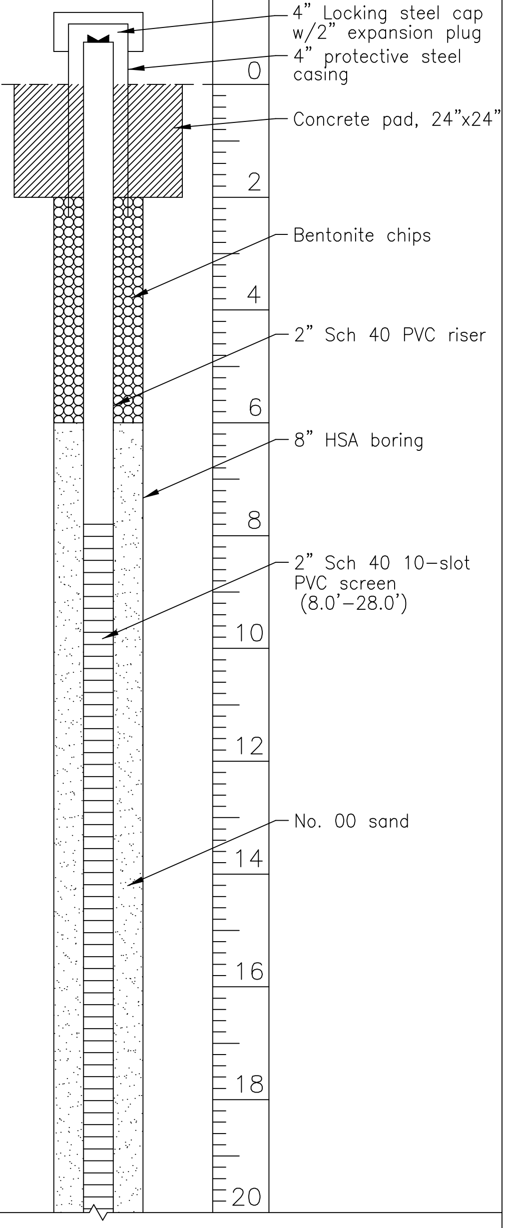
Revised 9/1/94

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 92041.04

Boring No. MW-169S TOC Elev. 180.08'
Location Approx. 150' N of MW-168S
Page 1 of 2

Depth Feet	Blow Counts	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Volatile Scan * (ppm)
0	Ground Surface					
2	HAND AUGERED			SILTY SAND: vf-med., tr c sand, roots, occ. subang-subround pebble, moist.	SM	
4				SAND: well graded, f-med, tr silt, occ. SA-SR pebble, loose, moist, yel. br. : increased moisture at 4', med. gray color 4-4.5'.	SW	
6				: organic rich layer at 5.5'.		
8	5-4-6-6	1	17"	SAND: well graded, vf-fine, some silt, occ. organics, silt laminae at 13", loose, moist, mottled dark yellow br. and med. gray.		NR
10	5-4-3-2	2	18"	SAND: well graded, vf-fine, some silt (silt layer 6-8"), loose, saturated, dark yellow brown.		NR
12	1/12"-1-1	3	20"	SAND: well graded, f-med., little silt (laminations), loose, saturated, dark yellow brown.		NR
14	1/12"-1-1	4	15"	SAND: well graded, f-med, tr to little silt, very loose, saturated, dark yellow brown.		NR
16	1-2-2-3	5	16"	SAND: well graded, f-med., silt and coarse sand laminations, loose, saturated, dark yellow brown.		NR
18	4-3-4-6	6	24"	SAND: well graded, f-med., occ. silt zones, coarsening below 12", loose, saturated, dark-med. yellow brown.		NR
20	2-3-4-9	7	24"	SAND: well graded, f-med., tr to little silt, loose, saturated, dark yellow br. (increased silt over lower 5").		NR

Well Construction Graphic / Depth Feet / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 6-7-93
Drilling Completed: 6-7-93
Well Construction: 6-7-93
Well Developed: 6-8-93
Well Coords.: N717201.73
E590738.57

Notes:
* FID
Hand augered to 6.0'.
Running sand: 22', 24', 26'.
NR = No Reading
Water level at 9.0' on 6-7-93.

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-169S

Revised 9/1/94

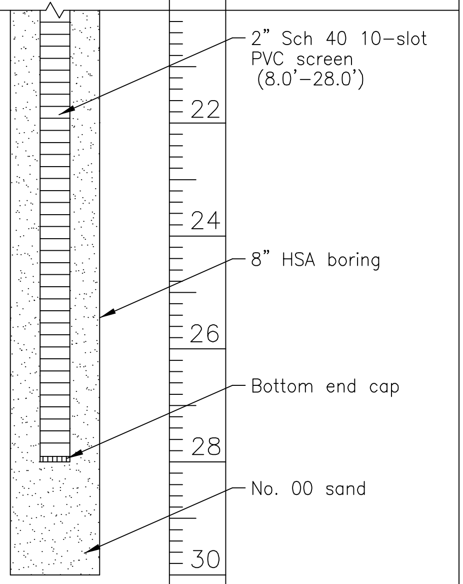
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 92041.04

Boring No. MW–169S TOC Elev.
Location Approx. 150' N Of MW–168S
Page 2 of 2

Depth Feet	Blow Counts	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Volatile Scan * (ppm)
22	2–3–5–13	8	24"	SAND: well graded, f–med., little silt (masses), loose, saturated, dark yellow brown (increased silt over lower 5").	SW	NR
24	2–3–3–7	9	24"	SAND: well graded, f–med, tr–little silt, thin silt laminae lower 2", loose, saturated, dk. yel. br change to dk. gray below 18", silt laminae brown gray.		NR
26	1–3–4–11	10	10"	SAND: well graded, very fine to fine, some silt, silt laminae 1", 2–3" and 9", compact, saturated, dark gray.		NR
28	8–8–9–9	11	10"	SAND: well graded, very fine to fine, little silt, increasing silt in lower 6", stiff, dense, saturated, dark gray.		NR
30	4–3–4–6	12	18"	SILT: trace clay, occasional very fine sand zone (3–5", 16–18"), plastic, dense, varved, brown gray–pale red.	ML	NR
32				Total Depth: 30.0'		
34						
36						
38						
40						
42						

Well Construction Graphic

Well Construction Details



GROUNDWATER SCIENCES CORPORATION

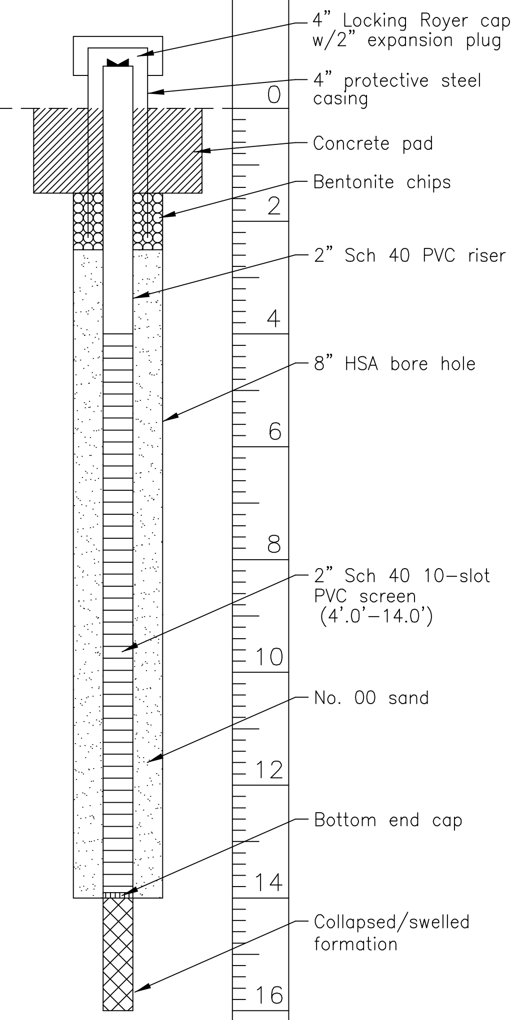
Geologic Log: MW–169S

Revised 9/1/94

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW-170S
TOC Elev. 174.36'
Location N of helipad, N Parking Lot
Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–3	HAND AUGERED				Grass and soil w/roots, 0-4". SAND: mod br to dk yel br, f-c S, some vf S, lit-some vc S, lit f gravel, tr m gravel, SA-SR, dry, v hard & sl indurated, crumbly, well graded; gravelly f-c SA-SR below 2.5' (limestone). BOULDER/COBBLE: at 3', brown siltstone. GRAVEL: below 3', w/sand & silt, moist,.loose.	FILL
3–7.5	AUGERED				BOULDER: 4'-7', brown siltstone.	BOULDER
7.5–8.5	1-8	0 4 0	1	7"	SAND: dk yel br, f-m, tr c, some silt, tr siltstone frags, poorly graded, sl cohesive. PEAT: 3-6", dk brown, moist, roots and stalks visible w/organic silt. SAND: bottom 1", f-m, silty, tr organics, moist to wet, poorly graded, olive gray.	SP-PT
8.5–10	9-13-15-12	0	2	10"	SAND: olive gray, f-m, lit c sand, grad. changing color to dk yel brown and incr. silt content, tr vf sand, loose, wet, poorly graded to well graded, tr dark organic laminae in lower 4".	SM-SW
10–12	3-4-4-6	0	3	7"	: increase in c sand, v wet, well graded.	SW-SP
12–14	5-4-4-6	0	4	16"	SAND: f-m, some vf S & silt, lit c S, var. color dk-mod yel br/yel orng, loose, wet; SAND & GRAVEL: 7-8" vf-vc, f G, loose, wet. SILT: 8-9", pale yel br w/pale red lam., tr organic fibers, wet, plastic. SAND: 9-11", c-vc, some m, lit vf-f, tr silt, loose, wet, poorly graded.	
14–16	3-3-3-3	0	5	11"	SILT: br-gray, varved, tr clay, tr organic fibers, dense, sl plastic, wet, sharp top contact. : more plastic, dense, varved, wet.	MH
16–20					Total Depth: 16.0'.	



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9-3-93
Drilling Completed: 9-3-93
Well Construction: 9-3-93
Well Developed: 9-14-93
Well Coords.: N719338.456
E591334.557

Notes:

Hand augered to 3.0'.

Original ground surface at 7.5'.

SWL 8.62' (9/14/93, 13:04; from TOC).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-170S

Revised 8/12/94

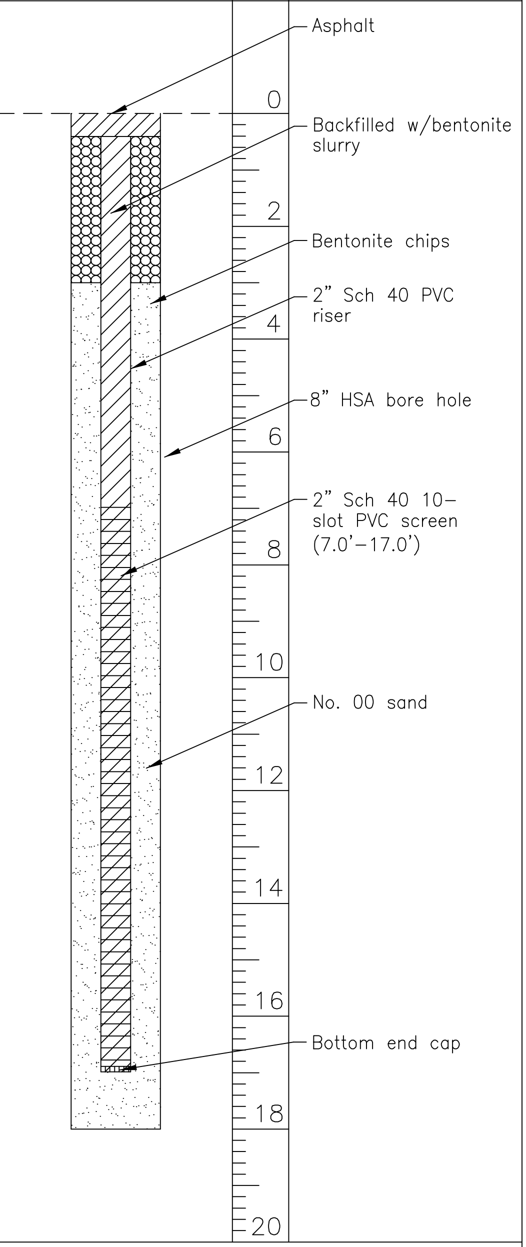
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW-171S
Location E of helipad, N Parking Lot

Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Asphalt pavement 0-2"; gravel base to 6". SILTY SAND & GRAVEL: dark brown, moist, loose (FILL). COBBLE at 2'. Pred. SILT & vf-vc SAND below 3', tr gravel; gravelly/cobbly below 3.5', moist below 4'.	FILL
8	2-2-2-7	1.0	1	17"	SAND: f-c, dk-dusky yel br, some vf S w/ silt, tr R f G, freq. rootlets, decayed leaves & twigs, dkr color, sl more silt 4-5", 8-10" and below 14", plant frag at 14", lt gray silt lams 3-3.5", moist, loose & crumbly.	SW SW-OL
10	4-2-2-3	0	2	6"	: dusky yellow brown, tr organic fragments, turning wet, large rock fragments 4-5", wet at bottom (9').	
12	2-2-2-2	0	3	15"	SAND: m-c some f, lit vf, tr silt, loose, saturated, running sand grains composed of quartz & various rock types & colors, pred. brownish-gray to olive gray, poorly graded, homogeneous texture.	SW
14	1-6-4-6	0.8 0	4	19"	: SAA top 7", tr dk br organic masses, organic lamination at 6", wet. SAND: vf, tr f S, lit silt, brownish gray, wet, more dense organic matter at top contact, sharp top contact, poorly graded, 1/4" gray silt layer at top.	SP
16	4-4-5-8	0	5	15"	: coarsening to f-vf sand w/silt, wet, cohesive, sl more brownish gray. : fining to vf sand and silt at 7", more dense & cohesive, wet, brownish gray, organic fragments throughout.	
18	7-10-7-7	0 0	6	13"	: SAA top 10", grading into unit below, poorly graded. SILT: varved, brownish gray w/pale red laminations, plastic, dense, cohesive, wet, tr vf sand, tr clay.	SP-SM MH
20					Total Depth: 18.0'.	

Well Construction Graphic — Depth Feet — Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9-16-93
Drilling Completed: 9-16-93
Well Construction: 9-16-93
Well Abandoned: 9-17-93
Well Coords.: N ~719131
E ~591624

Notes:

Hand augered to 6.0'.

Original ground surface at 6.0'.

Well abandoned; replacement well (MW-171SA) drilled 7' south.

Sample no. 3 includes organic carbon and physical sedimentary analysis.

SWL ~5.5' (9/17/93; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-171S

Revised 8/12/94

Soil Augering Log

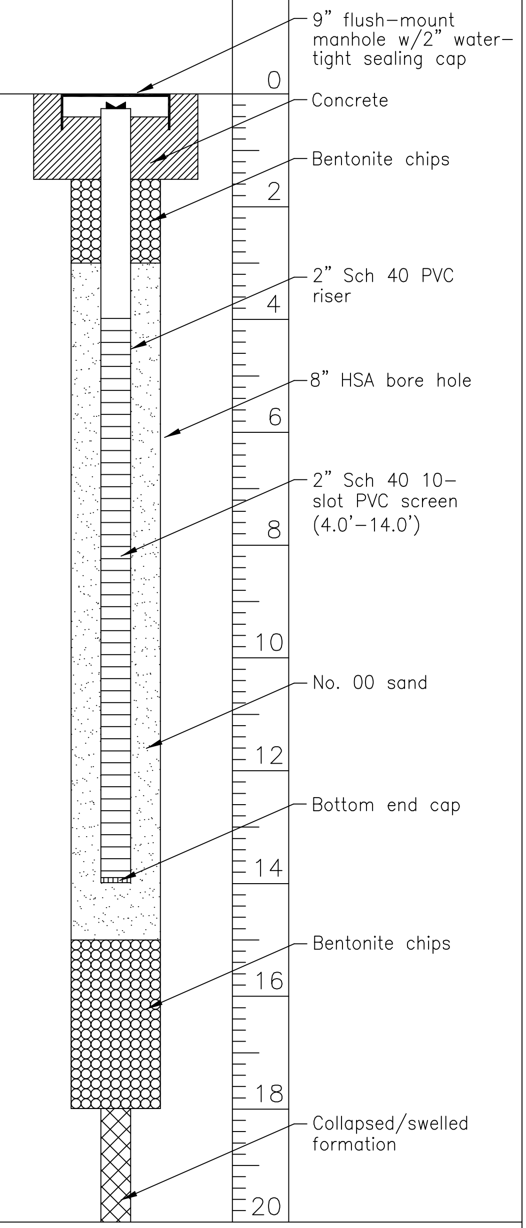
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW-172S
TOC Elev. 171.75'
Location N Parking Lot, SE of MW-171
Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Asphalt pavement. SILT, SAND & GRAVEL: loose, crumbly, f-m SA-SR gravel, some water running into hole from gravel fill just below asphalt at 4". SAND: f-m w/vf sand and silt, dusky yellow brown w/frequent roots, leaf frags and decayed twigs, moist, crumbly.	FILL SM-OL
8	5-7-8-9	1.8 0.2	1	19"	SAND: dk yel br to dusky yel br, f-m S & silt some vf S, freq. org. frags, silt is v dk & org., moist, crumbly, well graded, grades to pred. lt ol-gray to ol-gray c S & med S, some-lit f-vf S, tr silt, qtz S grains, tr f SR G, rootlets at 14" & 18", S looks homogeneous, poorly graded, moist to wet.	SW-SP
10	6-6-6-5	0	2	13"	SAND: dk-m yel br, vf-f sand, some dk yel orng. w/silt, faint horiz. lamination, poorly graded, wet, sl. cohesive, color banded, m yel br silt layer at 8.5" to 10.5", dense sl plastic, moist to wet.	SP
12	4-4-4-4	0	3	12"	: homogeneous, slight tint of gray, lower 2" saturated.	
14	2-2-3-3	0	4	12"	: slightly more dk yel brown, tr med sand, saturated, mod yellow brown lower 3".	
16	4-4-6-6	0	5	19"	: SAA top 2". SAND: brownish gray (5YR4/1) vf sand w/ silt, cohesive, dense, wet, poorly graded, homogeneous appearance, no laminations.	SP-SM
18	9-10-10-7	0	6	17"	: SAA, w/occ. pale red silt laminations, sl increase in interstitial silt.	
20	1-2-2-3	0	7	11"	SILT: varved, brownish gray w/pale red laminations, tr vf sand, dense, plastic, wet.	MH

Well Construction Graphic

Well Construction Details



Total Depth: 20.0'.

Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9-17-93
Drilling Completed: 9-17-93
Well Construction: 9-17-93
Well Developed: 9-23-93
Well Coords.: N719005.254
E591699.031

Notes:

Hand augered to 6.0'.

Original ground surface at 4.5'.

Water level of 5.5' measured when hole at 10', after ~15 minute break in drilling.

SWL 4.24' (9/23/93, 10:50; from TOC).

GROUNDWATER SCIENCES CORPORATION

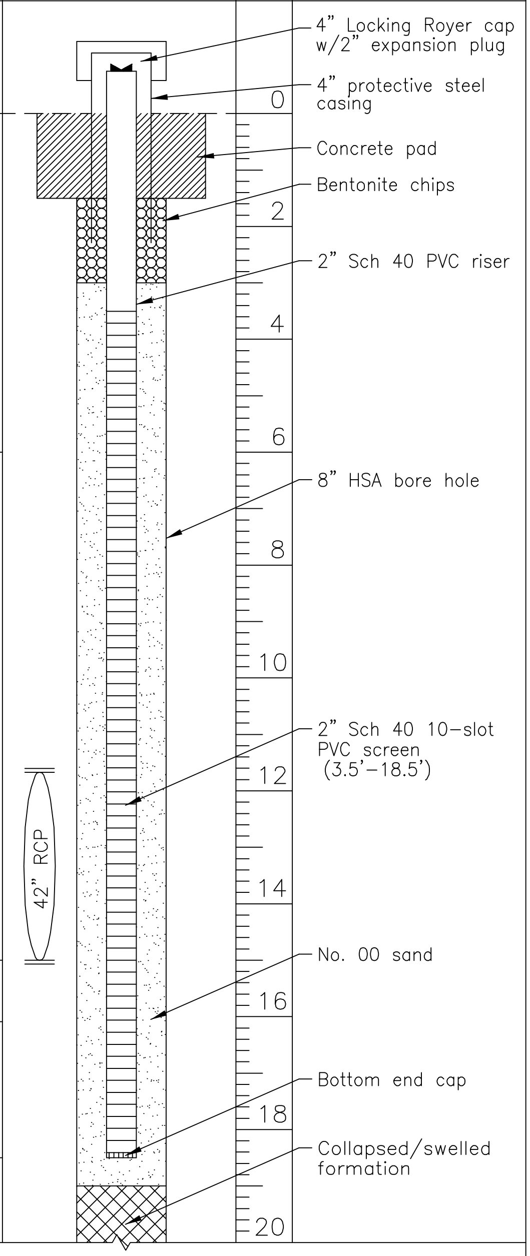
Geologic Log: MW-172S

Revised 8/12/94

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–173S TOC Elev. 179.83'
Location 10' off W side Neighborhood Rd.
N MW 609S in grass island Page 1 of 2

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Grass 0–2". SAND & SILT: vf–f, dark yellow brown, little m–c sand, moist, loose, tr f gravel.	FILL
8	2–3–3–2	0	1	13"	SAND: dk yel br, vf–f and silt, tr m–c sand, tr SA gravel, loose, crumbly, moist, well graded. : change to pred. mod yel brown, m–c S, some silt, and vf–f sand, loose, moist.	FILL*
10	1/24"**	0	2	1"	: SAA, tr f gravel, moist to wet (outside of spoon was wet).	
12	2–1–2–6	0	3	18"	SAND: dk yel brown, f–m, some vf sand & silt, tr c–vc S, tr f SA–SR gravel, wet, crumbly, well graded; SILT layer (2" thick) at 12", brownish–gray, dense, plastic, hor. silt layer frag. at 7", shale frags at bottom.	
14	1–1–2–4	0	4	6"	: SAA, w/numerous siltstone frags, SA–A, saturated, tr stem fragments.	
16	5–2–2–4	0	5	17"	SAND: dk yel br, vf–m, some vc sand, gravel w/silt, loose, wet, well graded, v gravelly 4–9", A–SA siltstone frags, hor. organic–rich lams below 9", dusky yel br, pred. loose, f–m sand and vf sand and silt.	SW
18	3–4–4–4	0	6	21"	SAND: dk yel br, f–m, some vf, tr c, occ. mod yel br silt masses 8–11", well graded, loose, wet; SILT: mod yel br, dense, plastic, hor. 11–13"; SAND: dk yel br, vf–f, some silt 13–17", wet, loose, poorly graded, SILT: 17"–18"; SAND: vf–f, some silt below 18", wet. : SAA top 5".	SP–SM
20	3–1–1–1	0	7	24"	SILT: varved, hor., top surface sloped & sharp top contact, mod yel br to lt pink, grades to pred. brownish–gray w/pale red laminae, some clay–rich laminations.	MH



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9–20–93
Drilling Completed: 9–20–93
Well Construction: 9–20–93
Well Developed: 9–23–93
Well Coords.: N717552.547
E590613.981

Notes:

Hand augered to 6.0'.

*Storm sewer invert is 15' below grade. All soil in boring to that depth may be fill.

WL at 11' when hole at 16'; WL at 14.6' when hole at 22'; storm pipe ~11'–15', a few inches of flowing water in pipe.

**Possible void from 8'–10'.

SWL 9.99' (9/21/93; from grade).

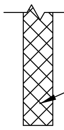
GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–173S

Revised 8/12/94

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW-173S TOC Elev. 179.83'
Location 10' off W side Neighborhood Rd.
N of MW-609S in grass island Page 2 of 2

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20–22	2-1-2-2	0	8	18"	SILT: weathered top 12-14", color changes grad. to br-gray in lower portion of spoon, dense, plastic, moist to wet. : SAA, br-gray, clay-rich, v plastic, moist, dense.	MH MH-CH		20–22	Collapsed/swelled formation
22					Total Depth: 22.0'.			22	
24								24	
26								26	
28								28	
30								30	
32								32	
34								34	
36								36	
38								38	
40								40	

Notes:

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-173S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

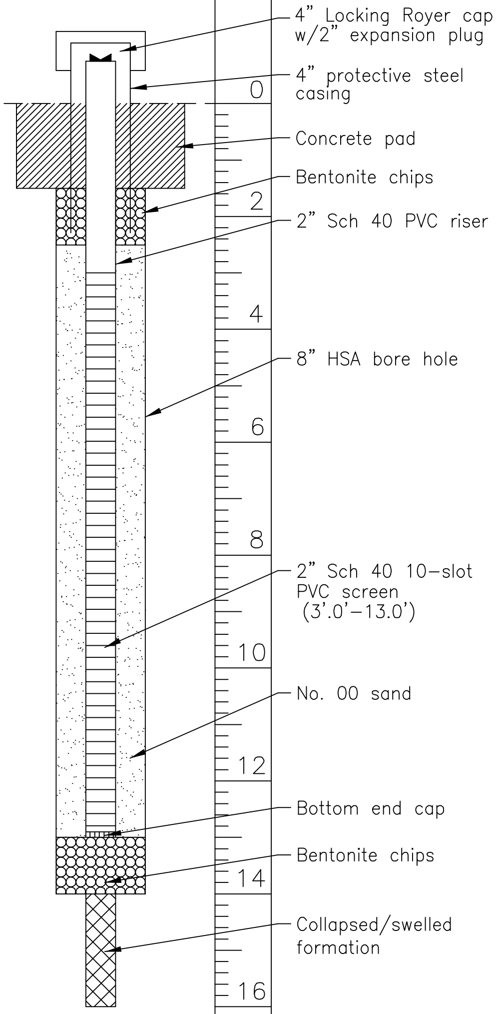
Boring No. MW–174S
Location S of MW–173

TOC Elev. 179.89'

Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Grass. SAND & SILT: dk yel brown, vf–f S, lit m–c sand, tr f SA–SR gravel, moist, loose.	FILL
6–8	9–6–4–2	0	1	12"	SAND: dk yel br, vf–f sand & silt, lit med sand, tr c S, loose, crumbly, moist, well graded, occ. rootlet, siltstone frag 3–4", tr f SR gravel, tr silt layer fragments.	
8–10	2/24"	0	2	24"	SAND: dk yel br, vf–m sand & silt, tr c–vc sand, tr f gravel, weathered mod br silt mass at 6", brown–gray silt mass at 23", very loose, wet below 6", well graded.	
10–12	1/24"	0	3	24"	: SAA, wet 0–9" and 19–24", saturated, sl flowing 9–19", occ. wthrd. silt masses 8"–22"; some dark brown organic–rich zones below 19", well graded.	
12–14	1–1–1–2	0	4	24"	SAND: f–m and vf, w/silt–rich zones, occ. dk brown organic–rich zone, silty layers are mod yellow brown, wet, loose. SILT: varved, some clay, br–gray w/pale red and lt. bluish–gray laminae, dense, plastic, top 7" appears to be weathered, mod. yel br, all br–gray w/tint of purple below, wet.	SM MH–CH
14–16	1–1–2–2	0	5	11"	SILT: w/clay, varved, brownish gray, occ. pale red and lt bluish–gray laminae, very plastic, dense, wet.	MH–CH
16–20					Total Depth: 16.0'.	

Well Construction Graphic — Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9–20–93
Drilling Completed: 9–20–93
Well Construction: 9–20–93
Well Developed: 9–23–93
Well Coords.: N717533.633
E590605.380

Notes:

Hand augered to 6.0'.

Very soft formation 8'–12'.

SWL 10.02' (9/21/93; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–174S

Revised 12/15/94

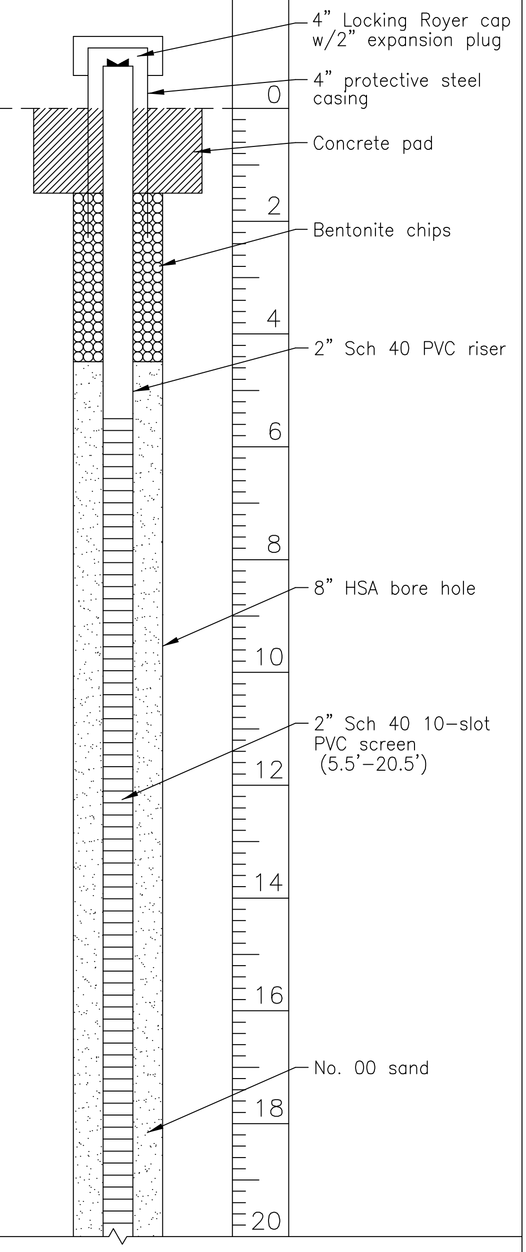
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–175S
TOC Elev. 179.99'
Location E side Neighborhood Rd.
S of MW–610S
Page 1 of 2

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2	HAND AUGERED				Grass and soil with roots, 0–5". SAND: f–m, some c, lit vf, tr silt, some vc sand and occ. f SA–SR gravel, loose, dry to moist, limestone rock frags. at 1.5'. : v loose, salt & pepper textured, dry to moist, m–c sand below 3', some variation in color, brown to lt gray throughout, well graded.	FILL
4						
6						
8	4–3–2–3	0	1	18"	SAND: dk yel br, f, tr vf sand & silt, some faint mottling (med gray), occ dk br organic masses top 2", faint hor. banding, loose, dry; SILT & SAND: at 15", mod yel br, silt w/vf sand, hor. laminated, wet, more cohesive, poorly graded.	SM
10	3–3–1–2	0	2	8"	SAND: dk yel br, m sand w/f sand, lit–tr vf sand & silt, occ. lt br silt masses and lam., lit c sand near bottom, loose, wet, well graded.	SW
12	1/12"–1–2	0	3	13"	SAND: m–c dk yel br, some–lit f, tr vf sand & silt, occ silt masses, loose, wet, grading to f–m S, thin lam. of vc sand at 7.5', 1" thick laminated silt layer at 10", sharp contacts top & bottom, c sand below 10", grading to f–m sand at bottom, coarsening upward seqs.	SW–SM
14	3–5–6–6	0	4	22"	SAND: dk yel br, m–c w/f sand, lit–some vf sand and lit–tr silt, tr silt masses, loose, wet, well graded, homogenous.	SW
16	2–2–3–7	0	5	21"	SAND: dk yel br, m–c, some f, lit–tr vf, tr silt, loose, wet, homogenous, grading to pred. vf–f sand, tr m sand, some silt, silt content increases w/depth, loose, wet, tr silt masses, well graded to poorly graded at bottom.	SW–SP
18	3–5–11–13	0	6	20"	: SAA top 12", grading to med gray to olive gray vf–f sand w/silt, tr m S, tr organic frags, loose, wet, sl flowing, poorly graded.	SP
20	2–2–2–2	0	7	10"	: SAA, olive gray, vf–f sand, coarsening to f–m sand below 8", some silt, loose, wet, poorly graded.	

Well Construction Graphic | Depth Feet | Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9–2–93
Drilling Completed: 9–2–93
Well Construction: 9–3–93
Well Developed: 9–14–93
Well Coords.: N717508.516
E590763.633

Notes:

Hand augered to 6.0'.

Sample no. 3 includes organic carbon and physical sedimentary analysis.

SWL 11.75' (9/14/93, 18:09; from grade).

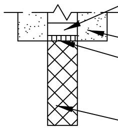
GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–175S

Revised 8/12/94

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–175S
TOC Elev. 179.99'
Location E side Neighborhood Rd.
S of MW–610S
Page 2 of 2

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20	Ground Surface							20	2" Sch 40 10-slot PVC screen (5.5'–20.5')
	2–2–3–2	0	8	13"	: SAA top 5". SILT: brownish gray, varved w/pale red lams., occ. blk organic lam., pred silty vf sand layer 7–9", cohesive, v wet, flows slightly, silt is very dense and plastic.	SP MH			No. 00 sand Bottom end cap
22					Total Depth: 22.0'.			22	Collapsed/swelled formation
24								24	
26								26	
28								28	
30								30	
32								32	
34								34	
36								36	
38								38	
40								40	

Notes:

GROUNDWATER SCIENCES CORPORATION

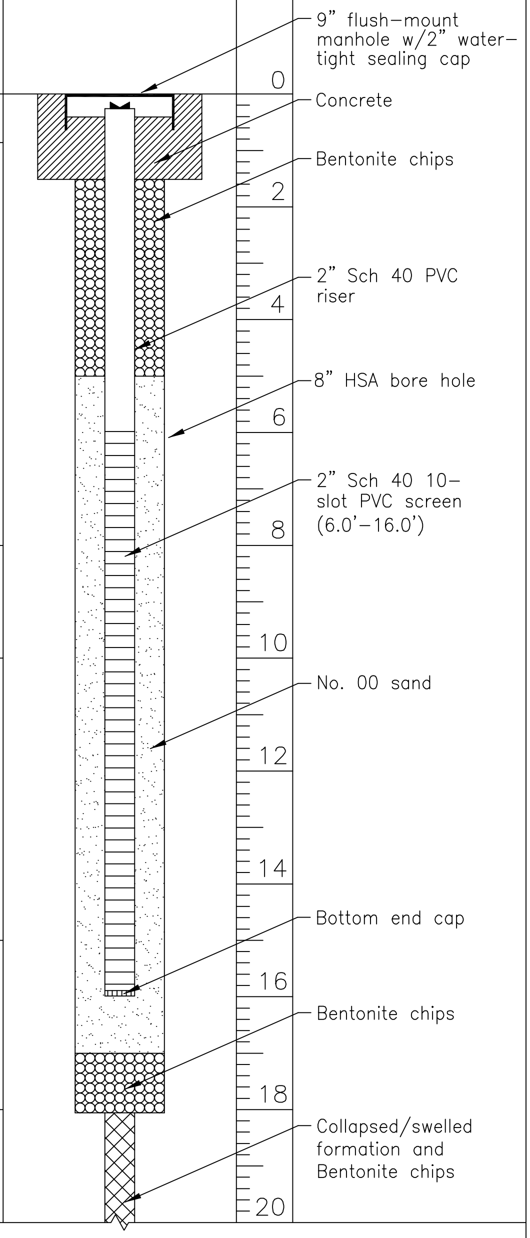
Geologic Log: MW–175S

Revised 8/12/94

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–176S
TOC Elev. 177.55'
Location Parking Lot W of B025
Page 1 of 2

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Asphalt, 0–3", c gravel pavement base to 9". SAND: f–m, some c, lit vc sand, tr f SA–SR gravel, mod br to dk yellow brown, moist, loose, f gravel absent below 1'.	FILL SW
8	2–2–1–2	0	1	18"	SAND: dk yel br, f–m sand, some vf sand, tr c sand, occ. vc sand, SR gravel, occ. v thin gray zone w/more vf sand (<1"), loose, moist, v faint color banding visible, well graded.	SW
10	2–2–1–2	0	2	10"	: SAA top 5", grades to vf–f sand w/silt, tr m S, occ v thin faint silt lam. betw 5" & 8", turning wet at 8", most dense and cohesive in vf sand zone, poorly graded, f sand interval is pale yel–br.	SW–SP
12	1–1–1–1	0	3	4"	SAND: silty vf–f sand, little m sand, tr c sand, grains loose, wet and well graded.	SW
14	1–1–2–4	0	4	20"	: SAA top 10" w/incr m–c S, occ m yel–br silt mass, loose, wet, well graded, quickly grades into unit below; SAND: m gray to br gray, vf–f, tr m S w/silt, more dense & cohesive, top 1" oxidized lt br–yel orng, wet.	SW
16	2–1–3–3	0	5	7"	: SAA, w/thin (0.25") silt layer at 3", lam., dense, plastic, wet, poorly graded, grading into dk yel br, f–m sand, some vf sand, tr c sand, loose, wet.	SW SP–SM
18	2–4–2–3	0	6	15"	SAND: br–gray to med gray, vf sand w/silt, lit–tr f sand, several black organic–rich laminae between 1" and 5", wet, slightly cohesive, flows slightly.	SP–SM
20	3–3–3–3	0	7	12"	: SAA, with increase in silt. SILT: br–gray, varved, w/pale red lams. from 5"–8", tr clay, plastic, dense, wet, grading to f sand w/vf sand below 8", varved silt at bottom of interval.	MH



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9–1–93
Drilling Completed: 9–2–93
Well Construction: 9–2–93
Well Developed: 9–14–93
Well Coords.: N717343.916
E590841.554

Notes:

Hand augered to 6.0'.

Water level measured at drilled depth of 16.0'.

SWL 9.8' (9/2/93, 08:00; from grade).

GROUNDWATER SCIENCES CORPORATION

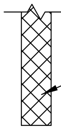
Geologic Log: MW–176S

Revised 8/12/94

Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW-176S TOC Elev. 177.55'
Location Parking Lot W of B025

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20								20	
22	2-3-3-3	0	8	23"	SAND & SILT: vf S w/silt, tr f S, br-gray to m gray, wet, cohesive, grades to varved silt w/tr clay, pale red laminae betw 7-12", plastic, grades quickly back into vf S w/ occ. faint silt laminae.	SM-MH		22	Collapsed/swelled formation and Bentonite chips
					Total Depth: 22.0'.				
24								24	
26								26	
28								28	
30								30	
32								32	
34								34	
36								36	
38								38	
40								40	

Notes:

GROUNDWATER SCIENCES CORPORATION

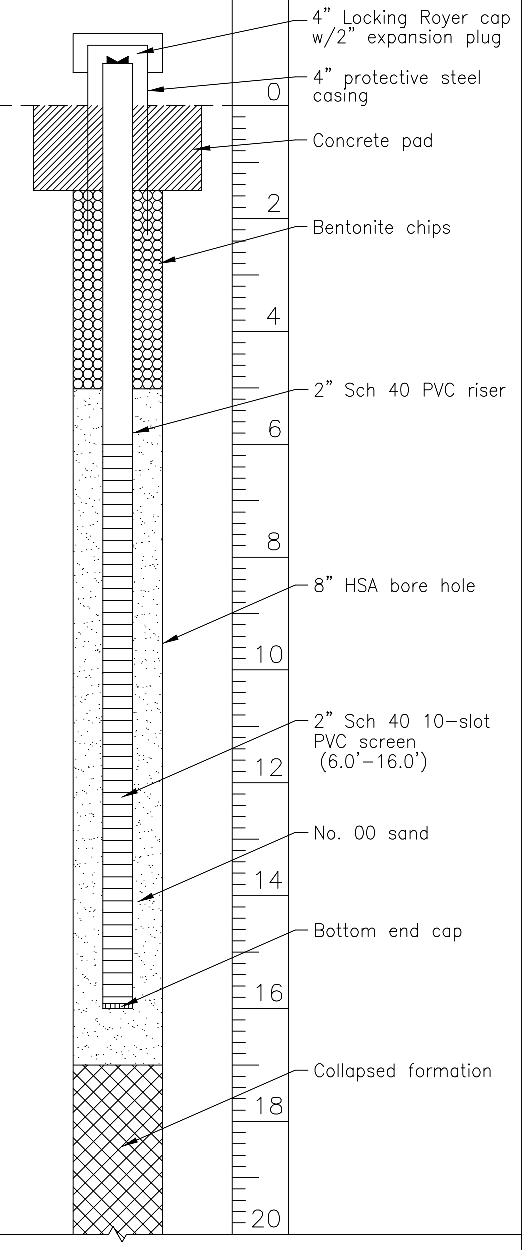
Geologic Log: MW-176S

Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–177S
TOC Elev. 179.30'
Location Parking Lot W of B025, S of MW–176S

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Grass and soil with roots, top 4". SAND: dk yel br to mod br, m–f, some vf, lit–tr c sand, tr vc sand, loose, moist, well graded, occ. SA–SR m siltstone gravel.	SW
6	3–3–3–5	0	1	16"	SILT: top 2", mod–dk yel br, dense, sl lam., w/vf sand, some color lamination. SAND: dk yel br, f–m, some vf, tr c, occ. sl coarser zones, scattered white quartz sand grains, tr organic masses at 7", loose, moist to dry, well graded, tr silt.	ML SW
8	4–4–3–4	0	2	14"	: SAA, sl more vf sand & silt 2–5", turning wet at 10", mod yel br silt mass at 12", loose, homogeneous appearance, well graded.	SM–SW
10	2–1–2–3	0	3	19"	: SAA, f–m sand w/ incr vf sand and sl incr in silt, homogenous, faint silt lams at 9–13", loose, saturated, well graded, flowing slightly, pred f–vf sand below 9".	
12	2–3–2–3	0	4	15"	SAND: pred f–m dk yel br, some vf, tr c top 6", fines to pred f sand w/vf sand & some silt, sl cohesive, color lam. lt–mod br & occ. dkr br lams, saturated, faint silt lams, quickly changing to med gray to br–gray, vf–f S at 11", saturated, sl flowing, silty throughout.	SP
14	3–3–2–1	0	5	9"	SAND: vf–f, med gray to brownish gray w/ silt throughout, homogeneous, w/v thin pale yellow brown silt lamination at 8", slightly cohesive, saturated.	SP–SM
16	3–5–6–7	0	6	11"	: SAA top 1", turns to f–m dk yel br S, sl coarsening to pred m S, tr c S, some–lit vf–f S, tr silt, loose, sat, 1/4" thick lt br to yel orange silty vf–f S layer at top of br sand, appears oxidized, silt lamination at 8". : SAA top 8", turns dk br 7–8", tr silt masses silt masses (lt brown), tr c sand	
18	2–4–4–6	0	7	21"	SILT: varved, br–gray w/pale red lam., top 1" wthrd,, mod yel br, top contact sharp, dense, cohesive, wet, lit clay, plastic. SILT w/vf SAND: pred. below 16", loose, dense, less plastic, sl. flowing, saturated.	MH–SM
20						



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9–1–93
Drilling Completed: 9–1–93
Well Construction: 9–1–93
Well Developed: 9–14–93
Well Coords.: N717297.219
E590840.937

Notes:

Hand augered to 6.0'.

Exposed deposit surface at 16'.

SWL 11.52' (9/14/93, 16:49; from grade).

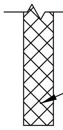
GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–177S

Revised 8/12/94

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW-177S
TOC Elev. 179.30'
Location Parking Lot W of B025, S of MW-176S
Page 2 of 2

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20–22	2-3-4-5	0	8	7"	SILT & SAND: brownish gray silt w/vf sand, tr f sand, loose, dense, sl plastic, sl flowing, same as 16-21" in above spoon.	SM		20–22	Collapsed/swelled formation
22					Total Depth: 22.0'.			22	

Notes:

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-177S

Soil Augering Log

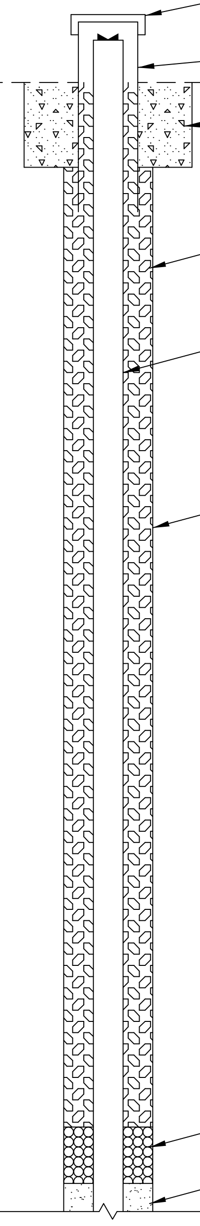
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-178M
Location ~40' N of B025, E of MW-178S

TOC Elev. 180.17'
GS Elev. 177.72'
Page 1 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				SAND: brown, m-c w/some vc, gravel and cobbles, dry.	SW
6–8	1-1-1-1	0 / –	1	17"	SAND: brown, m-c, loosely packed, moist at top, saturated at base.	SP/SM
8–16	AUGERED					
16–18	2-3-2-2	0 / 0.2	2	24"	SAND: top 20", brownish gray, m-c, SR-SA, loose, w/1" silty clay lam & some organics, saturated SILTY SAND: 20-23", brownish gray, mostly silt w/some f sand, faintly laminated w/occ. silty clay interlayer. SAND: 23-24", brownish gray, f-m, loose, saturated.	SM
18–20	5-5-9-11	0 / 0.1	3	22"	SAND: brownish gray, m-c, SR-SA, loose w/occ. silty clay laminations (1/4"-1" thick), clay rip-up clasts and organic frag, saturated.	SP/SM

Well Construction Graphic



Well Construction Details

- 4" Locking Royer cap w/2" expansion plug
- 4" protective steel casing
- Concrete pad
- Hydrated bentonite chips
- 2" Sch 40 PVC riser
- 8" HSA borehole
- Bentonite chips
- No. 00N sand

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-24-96
Drilling Completed: 7-24-96
Well Construction: 7-24-96
Well Developed: 8-3-96
Well Coords.: N717303.356
E591372.645

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 33.9'.

SWL 9.23' (8/3/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

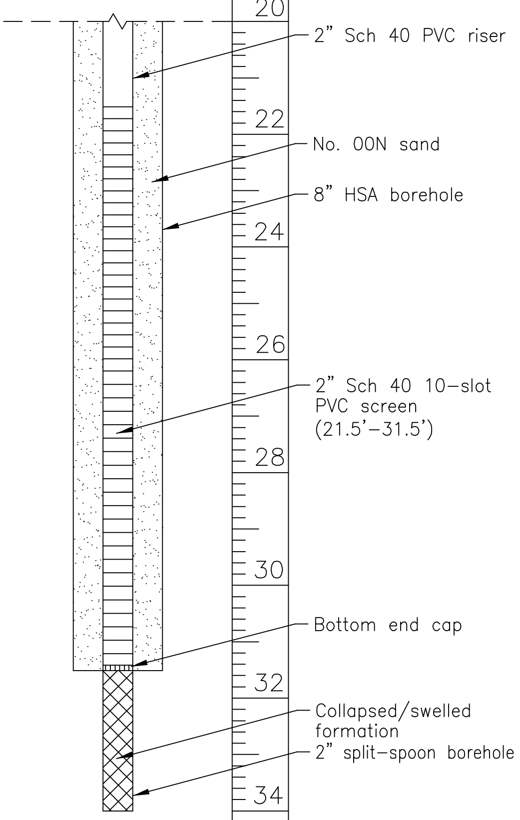
Well Log: MW-178M

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-178M
Location ~40' N of B025, E of MW-178S

TOC Elev. 180.17'
GS Elev. 177.72'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	4-4-4-4	0 / 0.2	4	24"	SAND: brownish gray, m w/some yellowish orange vertical streaking, SR/SA, loose, saturated; 1/2" thick yellow orange-gray silty clay lam near base.	SP/SM
22–24	8-11-8-4	0 / –	5	23"	SAND: brownish gray, m, loose, saturated; occ brown clay rip-up clast.	SP
24–26	10-10-9-10	0 / 0.4	6	19"	SAND: brownish gray, m, loose, saturated at top, grading to grayish brown, f-m, loose, saturated at base.	
26–28	5-4-5-7	0 / 0.2	7	19"	SAND: grayish brown, f-m, loose to v loose, saturated.	
28–30	10-7-7-8	0 / 1	8	17"	SAND: grayish brown, f-m, loose, saturated, w/occ brownish gray, m-c layers (1/2 to 1-1/2" thick) w/clay rip-up clasts.	
30–32	2-1-2-2	0 / 0.1	9	12"	SAND: top 5", grayish brown, f-m, saturated, loose; transitions to gray sand near bottom. SILTY CLAY: 5-12", gray brown, laminated, med-stiff.	ML/CL
32–34	4-3-4-4	0 / 0.2	10	13"	SILTY CLAY: grayish brown w/pink laminations, med-stiff.	
34–40					Total Depth: 34.0'.	



GROUNDWATER SCIENCES CORPORATION

Well Log: MW-178M

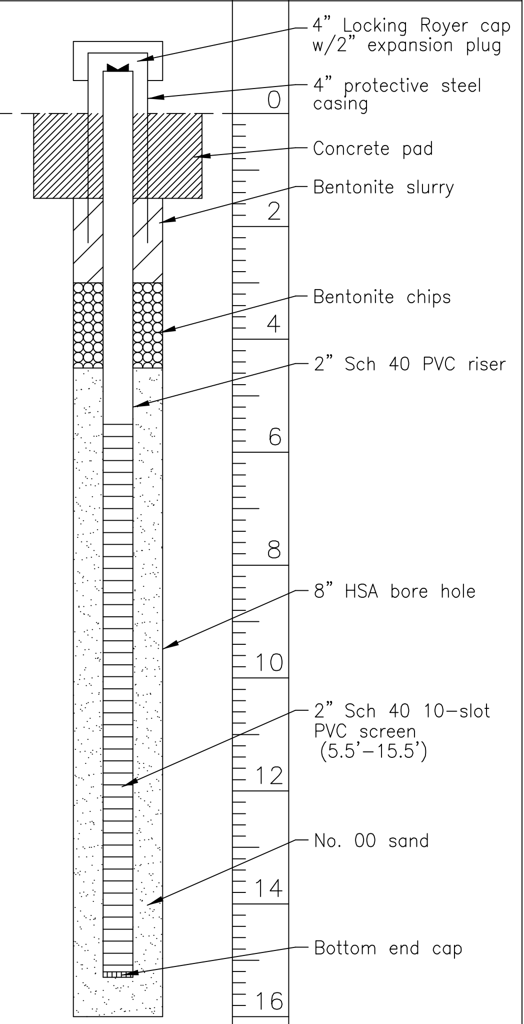
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–178S
TOC Elev. 179.29'
Location Grass area N of B025
Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Grass and roots, top 4". SAND: dk yellow brown, f–m, some vf–f, lit c, tr vc, occ A–SA f–c gravel, well graded, loose, moist, occ. asphalt chunk.	FILL
8	2–1–2–2	0	1	18"	SAND: dk yel br, m–c, some f, lit vf, well graded, loose, moist, turning wet at 6.5', some variation in color at 6.5'–7.0', fining lower 3–4" to pred. f sand w/lit vf sand, tr m and c sand, tr silt.	SW
10	2–2–3–3	0	2	19"	SAND: pred f–vf top 10", sharp change to m–c at 10", some f, lit vf , tr vc S lower 3", loose, wet, well graded, mod yel br, thin clay/silt stringer at 18", trace interstitial silt.	
12	1–1–2–4	0.2	3	15"	SAND: dk yel br, well graded, m–f, lit c, tr vc, lit vf sand, loose, wet, thin silt stringer at 13", sl coarsening with depth to m–c sand, tr silt.	ML–SM
14	2–4–3–2	0	4	13"	SILT: top 4" lam'd., pred. mod yel br w/pale red & gray lams., dense, plastic, horizontal. SAND: dk yel br, pred m sand w/f sand, lit vf, tr c, homogeneous, loose, wet, mod. well graded, tr silt.	SW
16	2–2–2–3	0	5	12"	: SAA, top 8", then pred. vf sand 8–10.5", mod. yel br silt stringer at 10.5", m–f sand below 10.5", loose, wet, lit–tr vf S below silt, sl gray coloration in vf sand layer poorly graded, tr silt.	SP
18 20					Total Depth: 16.0'.	

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 8–31–93
Drilling Completed: 8–31–93
Well Construction: 9–1–93
Well Developed: 9–14–93
Well Coords.: N717303.789
E591365.26

Notes:

Hand augered to 6.0'.

Water level 7.5', when hole at total total depth of 16' for ~0.25 hr.

SWL 8.20' (9/1/93, 07:00; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–178S

Revised 8/12/94

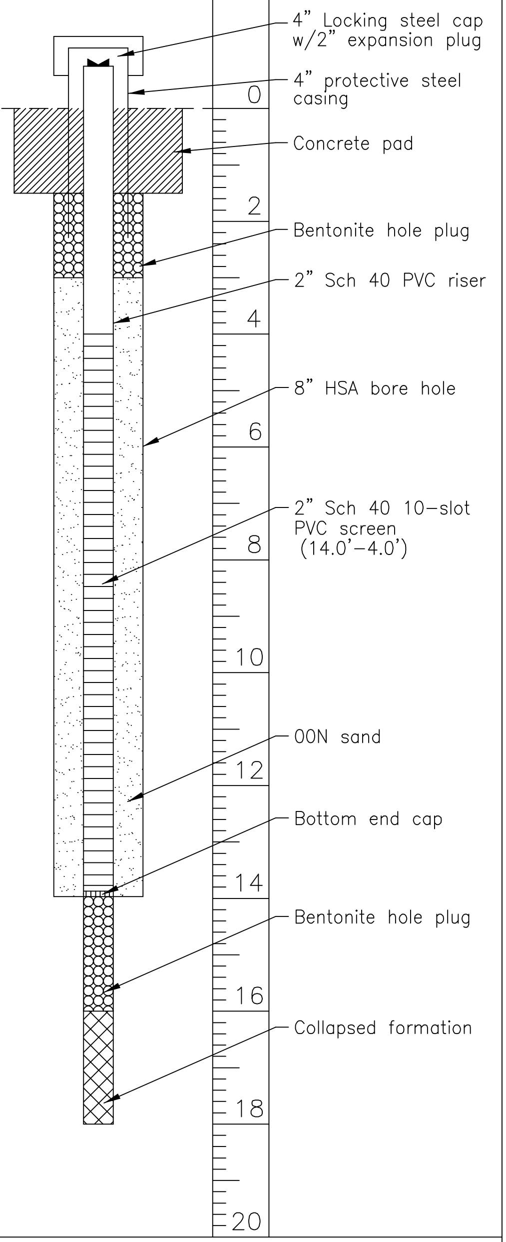
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–179S
TOC Elev. 184.33'
Location W end B038, E of B031
Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Grass with soil and roots, 0–5". SAND: dark yellow brown f–m, some c, lt vf. : concrete mass in wall of boring at 4'. : silt lamination at ~5'.	FILL
6–8	2–2–2–3	0	1	14"	SAND: dk yel br, m–c, some vf–f sand & silt, lit vc sand, silt lamination and round masses below 10", f SR pebble at 11", finer below 12", loose, wet, tr organic masses 5–10".	SW
8–10	2–2–3–3	0	2	16"	SAND: dk yel br, f–v, some vf sand & silt, tr silt masses (pale yel br) and dk brown–black organic masses, loose, wet, homogeneous, poorly graded.	SP
10–12	2–1–3–2	0	3	18"	: SAA, tr c sand, very homogeneous, poorly graded, wet.	
12–14	3–5–6–7	0	4	24"	: SAA, tr c sand, v thin mod yel br silt lamination at 21", bottom 1" is a mod yel br varved silt, dense, cohesive, sand is loose, wet.	SP–SM
14–16	3–5–8–9	0	5	8"	SILT: varved, mod yel brown, lit clay, dense, stiff, plastic, wet, changing to brownish–gray silt, lit–tr clay, varved, occasional pale red laminae, dense, stiff, plastic, wet, 3" of oxidized weathered silt at top.	MH–CH
16–18	6–5–6–9		6	12"	: SAA, brownish–gray silt, varved, with vf sand below 4", sand absent below 9".	MH
18–20					Total Depth: 18.0'.	

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 9–2–93
Drilling Completed: 9–2–93
Well Construction: 9–3–93
Well Developed: 9–14–93
Well Coords.: N717217.095
E592374.110

Notes:

Hand augered to 6.0'.

SWL 8.2' (9/3/93, 08:00; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–179S

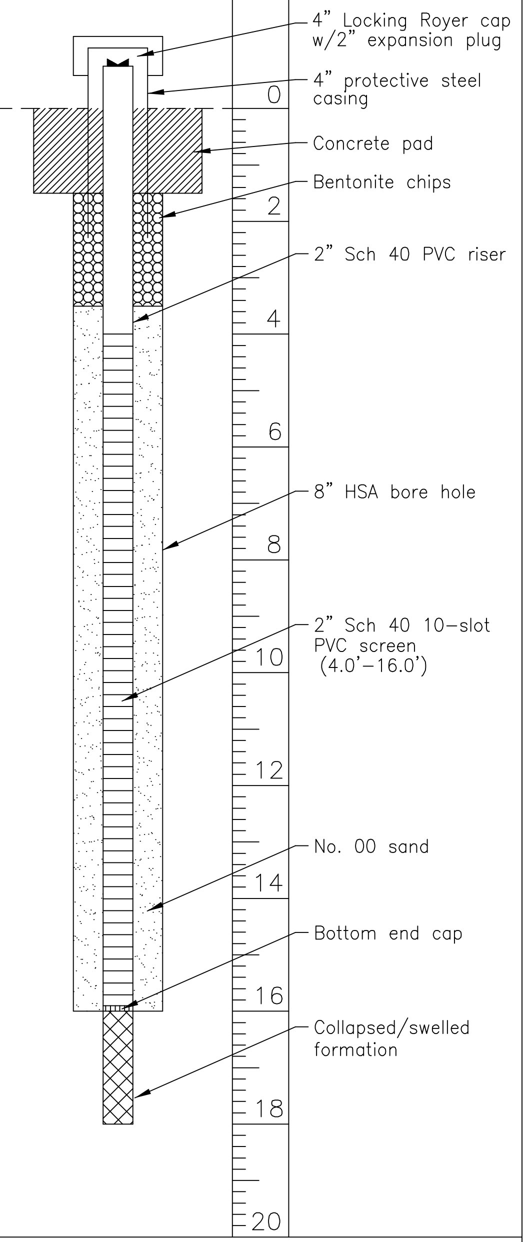
Revised 8/12/94

Soil Augering Log
Client: IBM Mid−Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW−180S TOC Elev. 179.45’
Location W of B031, S of B005
Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Asphalt and gravel base to 0.5’. SAND: v loose, dk yel br and lt olive gray, vf−m, lit−tr silt, tr c sand, salt & pepper appearance, moist to dry, tr dk br organic matter, well graded. : visible water surface at 5.5’.	SW
8	1−2−4−5	0	1	18”	SAND: dk yel br, f−m, lit vf, tr silt, occ. brownish−blk R organic masses 4−16”, thin silt lam at 2”, mod yel br, wet v loose, moderately graded, occ silt mass, SR.	
10	2−2−4−6	0	2	24”	: SAA, tr organic masses in top 5”, tr silt masses top 3”, absent below, v homogeneous below 5”, incr in f−vf sand w/ depth, one silt mass at 15”.	SP−SM
12	2−2−4−3	0	3	21”	: SAA, top 14”, occ organic mass, grades to f−vf S w/incr silt, more dense, sl plastic, wet, grades to pred. vf S & silt at 19−20”, dk yel orng color change at 20” to br−gray, pred vf S & silt, contact at 14” gradational but rapid.	
14	WOR/12”−WOH−1	0	4	6”	SAND & SILT: brownish−gray, vf sand & silt, wet, dense, sl plastic, top 1” dk brownish orange horizontal layer, tr silt laminations at bottom.	SM
16	3−6−5−6	0	5	12”	: SAA, increase in number of silt laminations, very silty throughout, slightly more dense and more plastic, wet.	
18	4−8−7−7	0	6	15”	SILT: brownish gray, varved, very dense, plastic, wet.	MH
20					Total Depth: 18.0’.	

Well Construction Graphic



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 12−14−93
Drilling Completed: 12−14−93
Well Construction: 12−14−93
Well Developed: 12−27−93
Well Coords.: N717244.750
E592040.537

Notes:

Hand augered to 6.0’.

WOR = Weight of Rods
WOH = Weight of Hammer

SWL 5.25’ (12/16/93, 12:05; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW−180S

Revised 8/12/94

Soil Augering Log

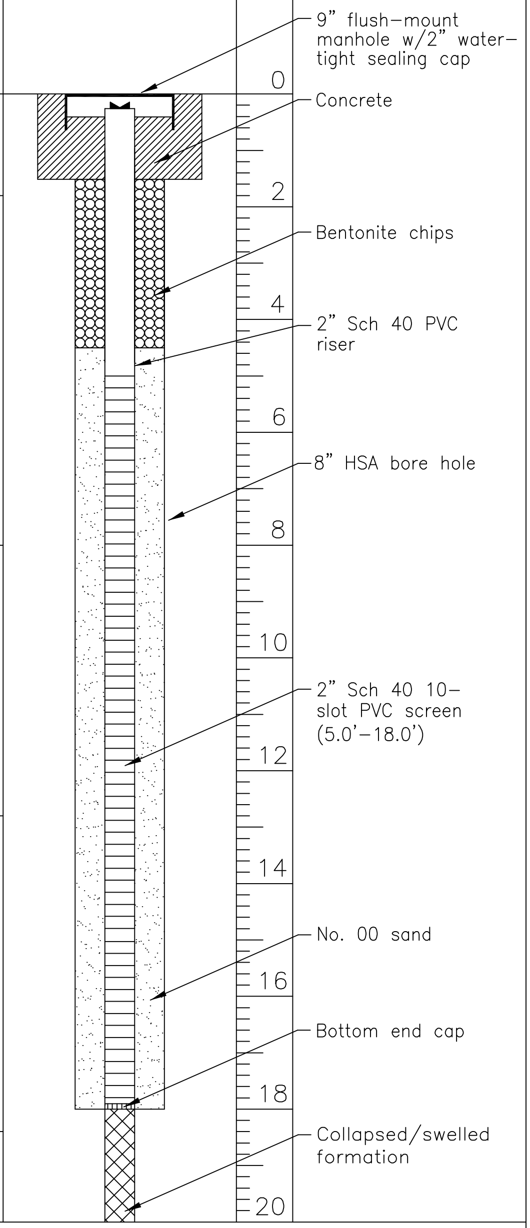
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–181S TOC Elev. 177.44'
Location N of B025 in parking lot
Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Asphalt pavement and gravel base to 0.5'. SAND & GRAVEL: yellow brown to gray, f–c, w/occ. SA–SR f–m gravel, moist. SAND: mod yel brown, f–c, tr finer sand & silt, tr vc sand and f SA–SR gravel, loose, moist, well graded. : turning sl more gray w/a salt & pepper appearance (quartz and rock grains), moist, change at 5'.	FILL SW
6–8	6–7–6–7	0	1	16"	SAND: mottled dk–mod yel br & lt olive gray, occ. dusky yel br zone, f–c, lit vf, tr silt and vc sand, occ. small silt mass, organic blotches, moist, turning wet below 11", well graded.	SW
8–10	2–2–3–4	0	2	18"	SAND: more coarse top 10" (pred m–c), fining to pred. f–m below 10", gradational, some vf sand, lit silt, occ. silt mass, saturated, loose, tr vc sand top 8".	SW–SP
10–12	4–4–7–10	0	3	21"	SAND: pred. f–m, lit vf sand and silt, wet, loose, some dusky yel br and mod yel br color banding in lower 4", lt br (5YR5/6), silty vf sand at base.	SW–SP
12–14	4–5–6–6	0	4	20"	: SAA top 11", increase in silt with depth. SILT & SAND: mod yel br, pred m w/finer sands & silt, occ silt stringer, wthrd appearance, wet, loose, sl cohesive, less silt & f sands below 14", grad. turns to med dk gray to br–gray m sand w/some silt & finer S, sharp change to br gray, vf–f sand and silt below 17", all wet.	SM
14–16	4–2–4–4	0	5	10"	SAND & SILT: br gray, tr m dk gray vf–f sand w/interstitial silt and occ. silt lam, horizontal sl color banding lower 4", wet, poorly graded.	SM
16–18	1–2–6–8	0	6	12"	SAND & SILT: vf–f sand w/silt, sl incr silt lower 2", poorly graded, tr plant frags 5–7", occ dk colored, organic–rich zone and silt lamination.	SM
18–20	3–4–8–6	0	7	22"	: SAA top 6". SILT: brownish gray, occ. pale red lam., hor. to 30° angle, lit–some vf sand, dense, plastic, wet, v silty, tr clay 6–10".	MH

Total Depth: 20.0'.

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 12–15–93
Drilling Completed: 12–15–93
Well Construction: 12–15–93
Well Developed: 12–27–93
Well Coords.: N717298.308
E591271.123

Notes:

Hand augered to 6.0'.

SWL 7.9' (12/16/93, from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–181S

Revised 8/12/94

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

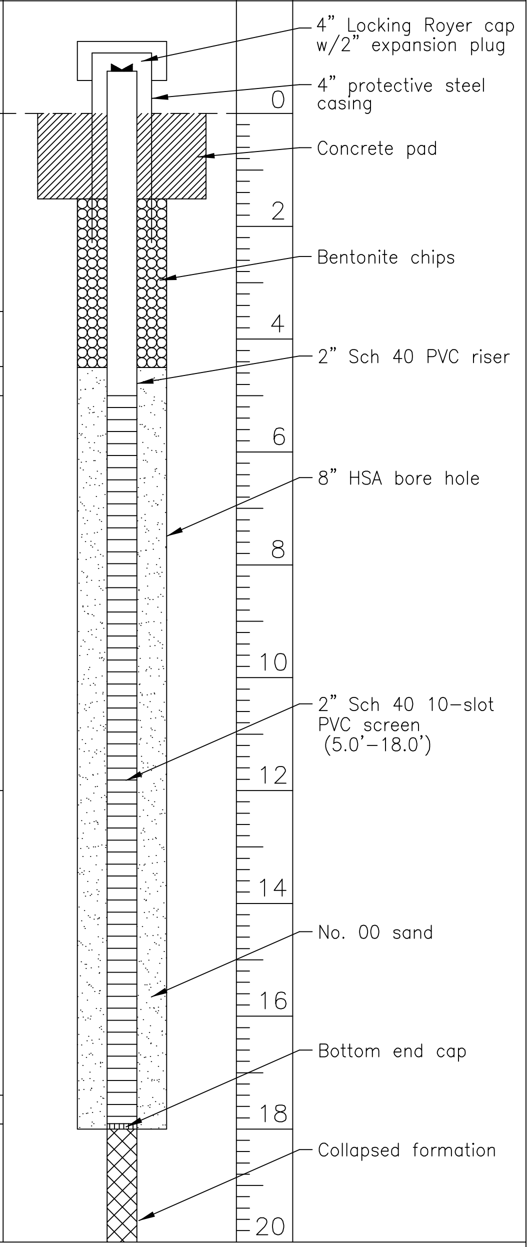
Boring No. MW–182S
Location N of B025, E of glass causeway

TOC Elev. 180.09'

Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Grass and soil with roots to 4"; cobbles and pebbles mixed w/silty sand below 4". SAND: m–vc, dk yel br w/some black coatings (appears to be old oil or tar, some induration, moist to dry, mottled, f–m sand, tr vf sand and silt, moist, lt olive gray to mod yel brown. SILT: 4.5–5', weathered, laminated, tr vf sand, lt gray, pale red and mod yel brown, moist. : same as above.	FILL SW ML SP
8	4–6–5–5	0	1	22"	SAND: dk yel br, vf–f, tr silt top 12", occ. silt lam., color banding 8–12", loose, moist, grades to pred m sand, lit f sand, tr finer sand & silt, turning wet, loose, mod graded.	SP
10	3–3–4–5	0	2	21"	: SAA, pred m sand w/some c, tr vf, some–lit finer sands, tr silt, occ. silt masses lower 5", loose saturated, poorly graded, occ. organic blotch.	SP
12	2–3–5–7	0	3	24"	SAND: dk yel br, m–c, tr f, occ silt lam to ~14", grades to med s and pred f–vf silty sand lower 7", fines downward seq., some color banding below 15", poor–mod graded, loose 5', cohesive w/depth, silt layer at bottom, saturated.	SP
14	6–2–4–5	0	4	20"	: SAA, top 8" SAND: mod yel br to lt br, wthrd, f–m w/vf, lit silt, silt mass at 9", silt lam at 11", color change to dusky yel br at 15", then to dk yel br below, incr silt & vf S lower 2", wet, loose, poorly–mod graded.	SP–SM
16	1–1–2–1	0	5	24"	: SAA, slight fining with depth, wet, loose.	SP–SM
18	2–4–6–8	0	6	22"	: SAA, top 19". SILT: top contact angled 10–20° and desiccated(?), v dense, plastic, horiz. lams. and faint color banding, pale red to mod yel br, vf sand at bottom.	SP–SM MH
20	3–3–6–4	0	7	24"	SAND: dk yel br, pred f, lit m, some vf, tr silt, occ. silt masses, loose, massive, wet, poorly–mod graded.	SP–SM

Well Construction Graphic / Well Construction Details



Total Depth: 20.0'.

Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 12–15–93
Drilling Completed: 12–15–93
Well Construction: 12–15–93
Well Developed: 12–27–93
Well Coords.: N717210.014
E591046.334

Notes:

Hand augered to 6.0'.

SWL 8.3' (12/16/93; 13:30; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–182S

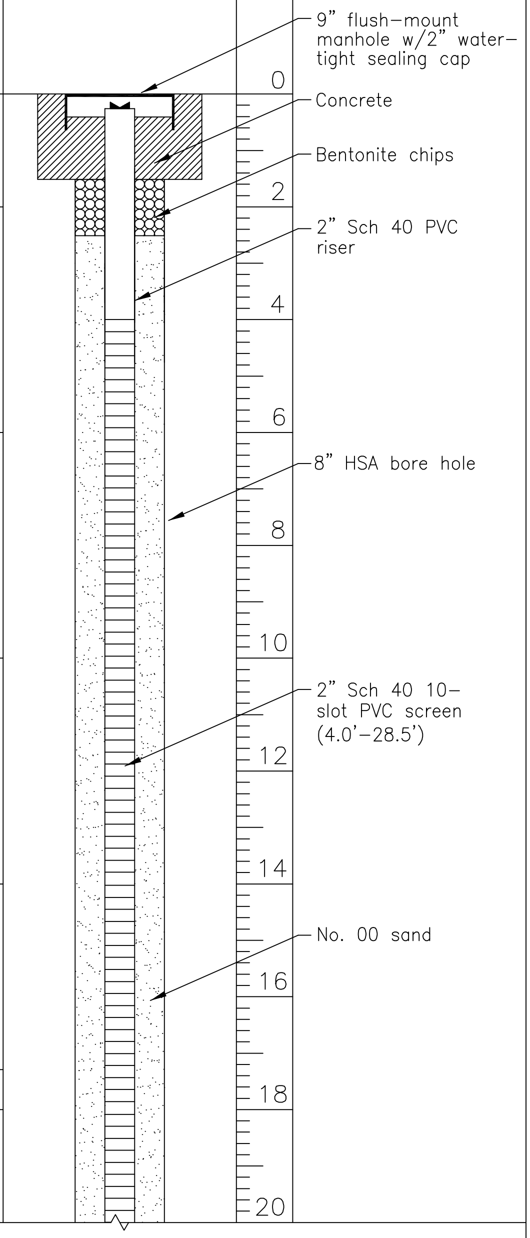
Revised 8/12/94

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW-183S
Location E of B025, in loading dock area
TOC Elev. 174.59'
Page 1 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2					Asphalt pavement and gravel base to 0.5'. SAND & GRAVEL.	FILL
4	HAND AUGERED				SAND: mod. yellow brown, f-m, loose, moist, tr-lit vf sand and silt, tr c sand.	SW
6						
8	5-6-6-8	0	1	21"	SAND: dk yel br, f-m, some vf, tr silt, sl increase silt in lower 5", occ. dusky yellow brown organic blotches lower 5", loose, wet, moderately graded.	SW-SP
10	3-5-6-5	0	2	18"	SAND: tr v small silt masses 8-15", sl finer, incr f-vf sand w/depth, loose, wet, mod. graded, massive, homogeneous appearance.	
12	4-5-7-7	0	3	24"	SAND: pred. f-m top 16", grades quickly to pred. f, some vf, tr silt at 17", sl mod. yel br coloration below 17", color turns to lt olive gray lower 6", poorly-mod. graded, sl cohesive, wet.	SP
14	4-5-8-8	0	4	24"	SAND: lt. olive gray to dk yel br, pred f-m at top, grades to pred. vf-f, wet, poorly-moderately graded, fining downward, incr vf sand and silt.	
16	2-3-4-6	0	5	19"	SAND: some mod yel br color banding, faint horizontal laminations, wet, sl cohesive, pred. f-vf silty sand in lower 3".	SP-SM
18	8-4-3-6	0	6	24"	SAND: dk yel br, f-vf at top, grades to f-m, wet, loose, mod. graded, at 17" changing to brownish gray vf sand, w/interstitial silt and a few hor. silt stringers, wet, cohesive.	SM
20	2-4-4-6	0	7	24"	SAND: dk yel br, f-m, some vf, lit silt, sl incr grain size w/depth, sl color variation, wthrd mod yel br and dusky yel br lam. at 19", loose, wet, poorly graded.	SP

Well Construction Graphic



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 12-15-93
Drilling Completed: 12-16-93
Well Construction: 12-16-93
Well Developed: 12-27-93
Well Coords.: N719369.532
E591438.218

Notes:

Hand augered to 6.0'.

SWL 4.7' (12/17/93, from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-183S

Revised 8/12/94

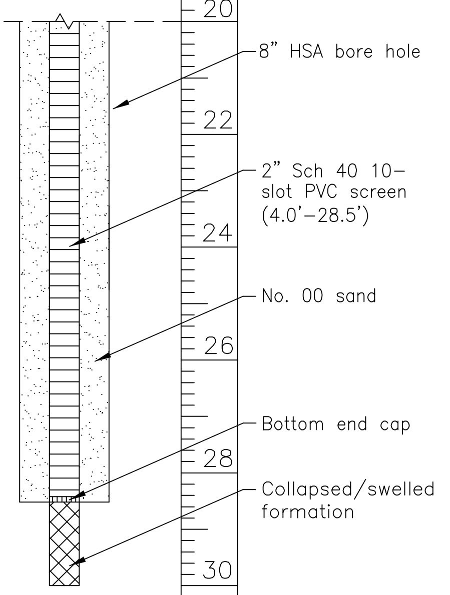
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–183S
Location E of B025, in loading dock area
TOC Elev. 174.59'
Page 2 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20						
22	8–8–9–13	0	8	24"	SAND: dk yel br, f–m, lit vf and lit–tr silt, sl fining downward and incr in silt, loose, mod. graded, wet, occ. silt masses and silt–rich zones, faint horizontal layering.	SP
24	8–10–13–15	0	9	15"	SAND: sl incr in finer sands and silt, pred. vf–f sand, approx. 4" to 12" saturated and flowing, wet elsewhere, loose, moderate–well graded.	SW
26	2–1–3–4	0	10	12"	SAND: dk yel br, pred f–m w/c sand, some vf sand, tr silt, loose, wet, well graded, homogeneous.	
28	2–4–13–19	0	11	21"	SAND: homogeneous, massive, wet, well graded. : SAA top 4", sl incr in c sand, lit vc sand, more gray in color, wet.	
30	5–6–5–5	0	12	20"	SILT: brownish gray, varved beginning at 4", top contact sloped ~10°–15°, interlaminated silt & vf sand 4–6", silt w/vf sand 6–10", all silt, tr clay below 10", freq. pale red laminae, dense, plastic, wet to moist.	MH
32					Total Depth: 30.0'.	
34						
36						
38						
40						

Well Construction Graphic



GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–183S

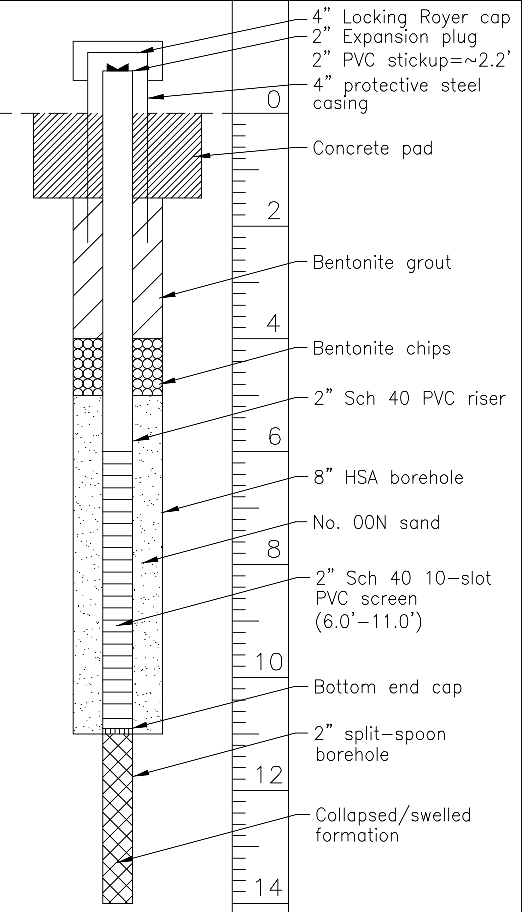
Revised 8/12/94

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93002.05

Boring No. MW–184SA
TOC Elev. 171.30'
Location N side of GWCS
between MH6 and MH7
Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Sod 0–3". SAND: dk yel br, f–m w/vf, lit silt, tr c, occ silt mass, loose, moist. : thin, med yel br silt layer at ~3.5', horiz. laminated, dense, plastic, est. ~3–4" thick.	SW
6–8	2–5–4–5	0	1	17"	SAND: dk yel br, f–m w/vf, tr c, tr–lit silt, occ gray silt masses, sl cohesive, moist. SAND: at 4", dk yel br, f–m w/vf, tr silt, homogeneous, loose to sl cohesive, moist.	SP
8–10	3–3–4–4	0	2	18"	: SAA, more organic–rich dusky to dk yel br, noteable organic zone at 7", loose to sl cohesive, moist to wet, wet below 4", slight mottling throughout.	SP
10–12	3–2–3–4	0	3	17"	: SAA top 9" w/organic–rich dusky br lam. at bottom cont., loose, sl flowing, homogen., v wet. SILT: at 9", mod yel br w/pale red lams. (varved), v dense, stiff, plastic, some clay, changes to brown gray, clay–rich silt w/pale red varves at 13" (top 4" of silt & clay is oxidized), wet.	ML
12–14	2–2–3–2	0	4	14"	SILT w/CLAY: br gray, varved, plastic, dense, wet.	MH/CH
14–20					Total Depth: 14.0'.	

Well Construction Graphic



Driller: North Star Drilling
Logged by: S. Fisher, GSC
Drilling Started: 11–29–95
Drilling Completed: 11–29–95
Well Construction: 11–29–95
Well Developed: 12–5–95
Well Coords.: N719466.50
E591081.91

Notes:

SAA = Same As Above
Measured DTB 13.36' (from TOC).
SWL 10.63' (11/30/95, 11:33; from TOC).

GROUNDWATER SCIENCES CORPORATION

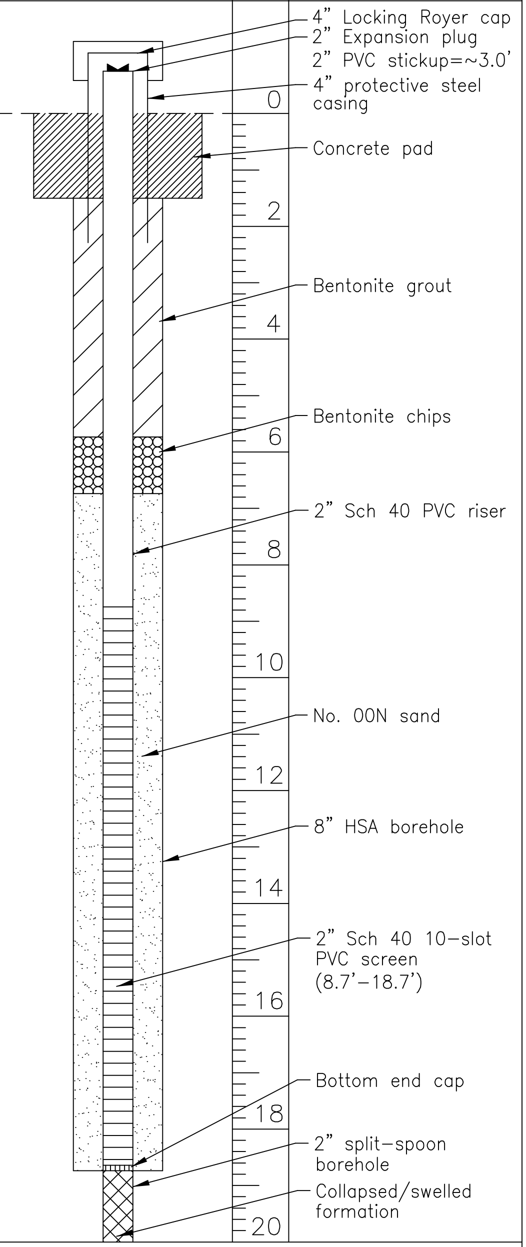
Geologic Log: MW–184SA

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93002.05

Boring No. MW–185SA
TOC Elev. 176.88'
Location N side of GWCS
between MHE and MH6
Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Sod 0–3". SAND: dk yel br, f–m w/vf, homogeneous, loose, moist to dry.	SW
6–8	1–1–2–1	0	1	16"	SAND: dk yel br, f–m w/vf, tr c, lit silt, loose, homogeneous, occ tr clay/silt (mod yel br), silty masses, tr grayish br silt masses & silt lam. at 4", fining sl toward bottom of section, moist.	SW
8–10	3–2–3–3	0	2	20"	: SAA top 7" w/sl more vf sand, more cohesive, pred homogeneous f–m, some vf below 7", some faint dk yel orange mottling, moist.	SW SP
10–12	WOR–1–2–1	0	3	13"	SAND: dk yel br, vf–m, lit silt, mod cohesive, moist top 2" then pred f–m, tr silt masses, homogeneous w/qtz grains (salt & pepper appearance). SILT: at 10–12", mod yel br to pale red, varved, oxidized, clayey, horiz. lam., sl plastic, moist.	SP ML SP
12–14	3–4–4–4	0	4	19"	SAND: (as above), lam. silt zone 3–5", then pred vf–f w/m sand, tr silt 5–10", then pred f–m w/vf, loose, homogeneous below 10", moist.	SP ML SP/SM
14–16	1–2–2–2	0	5	19"	SAND: dk yel br, f–m w/vf, tr silt, tr c, horiz. silt lam. at 4", homogeneous, moist top 5", then wet.	SP/SM
16–18	1–2–2–3	0 0.2 0	6	19"	: SAA top 12", sl flowing, wet. SILT: 12–16.5', mod yel br w/dk yel orng & pale red varves, horiz. lam., tr clay, dense, plastic, moist to wet. SAND: below 16.5", silty, f–m w/vf, sl flowing, v wet.	SP/SM ML SM
18–20	WOH–2–2–3	0	7	15"	SILTY SAND: mod yel br, vf–f w/m, silty w/occ thin silty clay lam., wet, 0–7". SILT: at 7", br gray w/pale red lams. (varved), dense, lit–tr clay, occ dk gray organic–rich lams., plastic, tr vf sand below 3", wet.	SM MH/CH

Well Construction Graphic / Well Construction Details



Total Depth: 20.0'.

Driller: North Star Drilling
Logged by: S. Fisher, GSC
Drilling Started: 11–29–95
Drilling Completed: 11–29–95
Well Construction: 11–29–95
Well Developed: 12–5–95
Well Coords.: N719429.34
E590992.84

Notes:

WOR = Weight of Rods
WOH = Weight of Hammer
SAA = Same As Above

Measured DTB 21.60' (from TOC).

SWL 18.21' (11/30/95, 11:30; from TOC).

GROUNDWATER SCIENCES CORPORATION

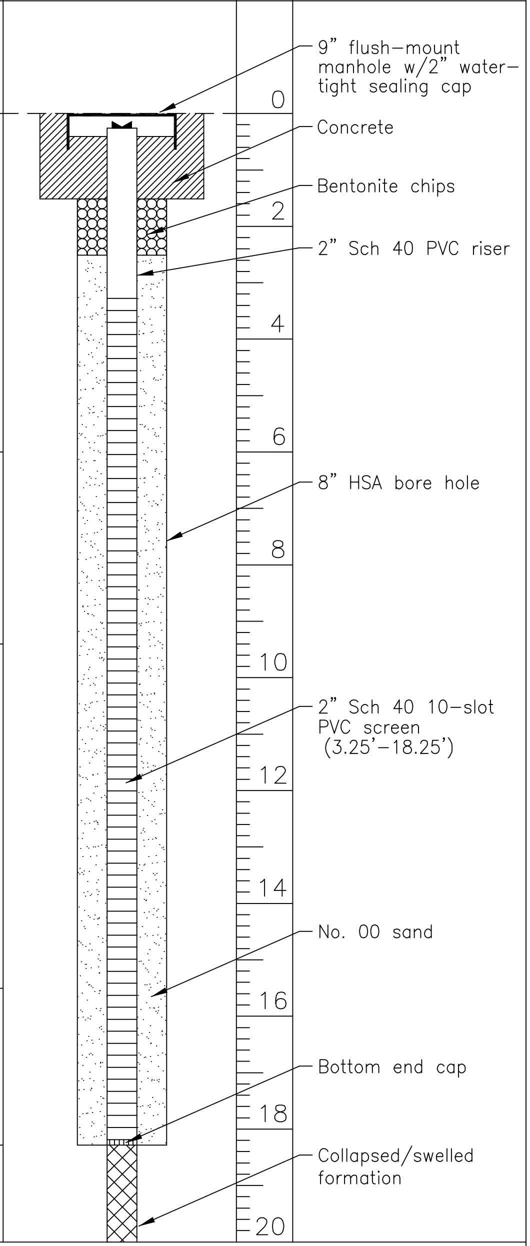
Geologic Log: MW–185SA

Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–186S TOC Elev. 172.70'
Location East of helipad,
North Parking Lot Area
Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2	HAND AUGERED				Asphalt pavement and base gravel to 0.5'. SAND & GRAVEL: dk yel br, vf–c, some silt, tr–lit vc sand w/f–m A–SR gravel, loose, moist, occ. boulder or cobble.	FILL
4						
6					: pred. sand below 5', occ. red clay pipe frags, tr f–m gravel, turning wet at ~5.5'.	
8	4–5–7–10	0	1	20"	SAND: dk yel br, f–m w/c, some vf sand, tr silt, loose, wet, well graded, brownish–gray silt mass at 6", faint mottling throughout.	SW
10	3–2–4–4	0	2	22"	: SAA, f–m, loose, wet, mod graded, faint organic–rich masses, dk br in color. : pred f–vf sand, some–lit silt below 15", loose, wet, poorly graded, faint horizontal color banding.	
12	4–3–2–7	0	3	24"	: SAA: pred vf sand w/silt, mod yel br to dk yel br, faint hor. lams, wet, sl plastic, mod. dense, poorly graded.	SP
14	3–4–5–7	0	4	15"	SAND: dk yel br to dusky yel br, layered, m–c 0–4", silty vf S 4–7", f–m 7–11", w/organic mat., dk br color 9–11", pred vf S & silt lower 4", loose, sl plastic in finer layers, saturated, some mod yel br in silty zones, faint hor. lams.	
16	1–3–4–10	0	5	24"	SAND: dk yel br, f–m sand w/vf sand, lit silt, loose masses, wet. : turning v silty, moderate brown, appears weathered 13–14".	
18	5–10–15–11	0	6	10"	SAND & SILT: vf S and silt at 14", br gray masses, no lam., top contact rapid but graditional, sl plastic, more dense and cohesive, poorly graded. : SAA, incr silt content, occ. hor. silt lam.	SM
20	WOR–WOH–3–3	0	7	8"	: SAA top 8" grading into silt rapidly. SILT: brownish gray, tr vf sand, tr clay, varved, occ pale red laminae, dense, plastic, wet.	MH



Total Depth: 20.0'.

Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 12–13–93
Drilling Completed: 12–14–93
Well Construction: 12–14–93
Well Developed: 12–31–93
Well Coords.: N719020.52
E591588.093

Notes:

Hand augered to 6.0'.

WOR = Weight of Rods
WOH = Weight of Hammer

SWL 4.5' (12/14/93; 13:46; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–186S

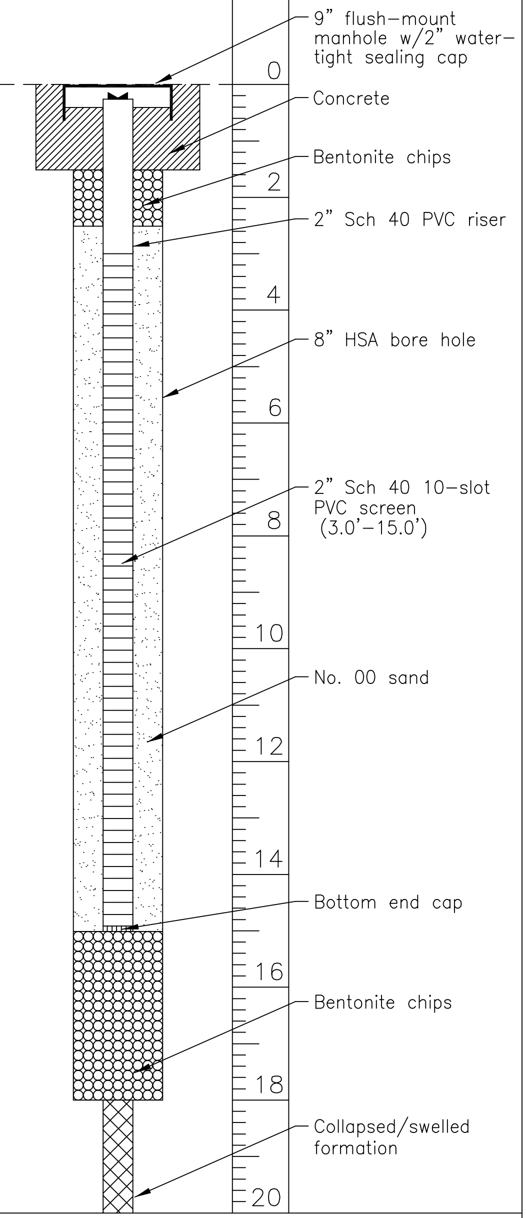
Revised 12/15/94

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–187S
TOC Elev. 170.92'
Location W of B059, North Parking Lot Area
Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Asphalt and gravel base to 0.5'. SAND & GRAVEL: dk yel br, f–c, w/silt and frequent f gravel, moist. SAND: dk yel br to dusky yel brown, f–m, some c, silty, wood frags, leaf fragments, organic silt throughout, moist, sl cohesive, well graded, occ. mottled, tr f SA–SR gravel and very coarse sand. : turning wet below 4'–5' (?), pred. dark yellow brown, vf–m sand, silty.	FILL SM–OL SW
8	10–9–8–11	0	1	12"	: SAA top 3". SAND: light olive gray, f–m, w/occ mod br organic fibers (rootlets), homogeneous appearance, loose, slightly silty, wet.	SP
10	4–4–6–7	0	2	18"	: SAA: coarsens to pred m–c S, saturated, loose, poorly graded, turns dk yel br & fines to f–m S w/some vf S & silt at 11", color changes to lt olive gray at 12", incr silt w/ depth, loose, organic mat. throughout, color banding 11–15", several lt gray silt masses 4–5" (rounded), sharp contact at 11".	
12	3–6–8–9	0	3	12"	SAND & SILT: brownish gray, vf, w/silt, dense, tr horizontal lamination, homogeneous, wet, sl plastic, mod dense, very silty lower 2".	SM–ML
14	13–10–10–6	0	4	13"	: SAA, tr f sand, sl incr in density, wet.	
16	5–4–9–14	0	5	16"	SILT & SAND: pred. silty vf sand, brownish gray, pred varved silt 7–10" and 12–14", w/pale red laminae, sand horizontally bedded, dense throughout, wet.	
18	5–10–8–7	0	6	15"	: SAA, varved silt zones at 2–5" & 9–12", sl increase in silt, overall wet.	
20	WOR–WOH–3–3	0	7	24"	: SAA, top 4". SILT: brownish gray, varved, w/pale red lams, tr clay, v dense, v plastic, wet.	MH

Well Construction Graphic / Depth Feet / Well Construction Details



Total Depth: 20.0'.

Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 12–14–93
Drilling Completed: 12–14–93
Well Construction: 12–14–93
Well Developed: 12–31–93
Well Coords.: N719012.878
E591822.009

Notes:

Hand augered to 6.0'.

Original ground surface at 2.0'.

Occasional varves below 14.0'.

WOR = Weight of Rods
WOH = Weight of Hammer

SWL 3.1' (12/16/93; 11:43; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–187S

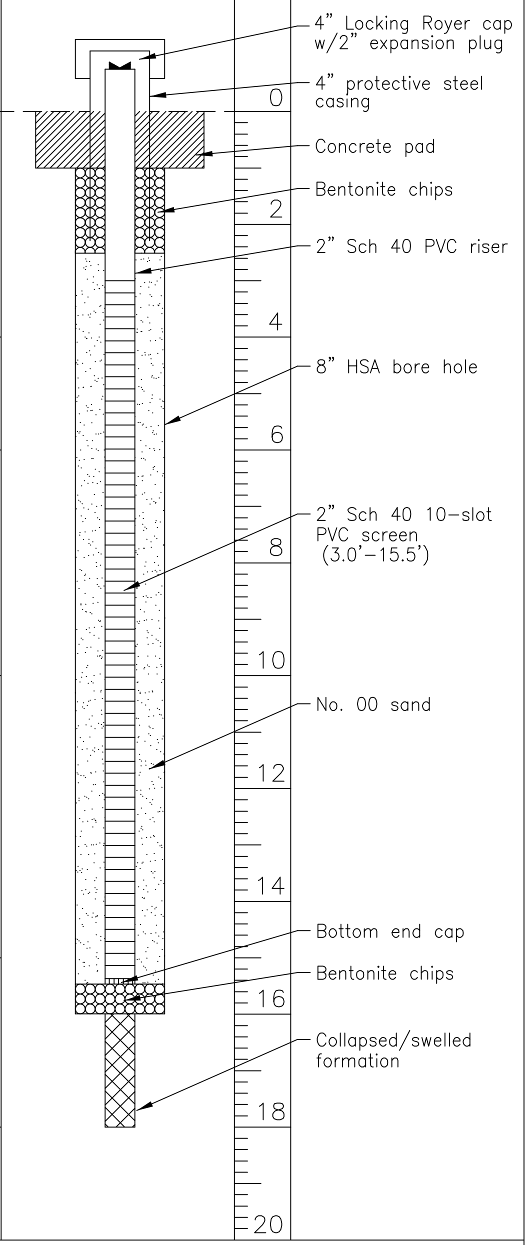
Revised 12/15/94

Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW–188S TOC Elev. 174.59'
Location Grassy field N of helipad,
North Parking Lot Area
Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2	HAND AUGERED				Grass and soil with roots to .5'. SAND & GRAVEL: dk yel br, f–c, f–m gravel, occ. asphalt fragment and clay tile frag., moist to wet.	FILL
4						
6					SAND: brownish gray, f–c, w/silt & numerous wood and plant fragments, loose, crumbly, moist.	SW–PT
8	10–9–11–13	0	1	20"	SAND & SILT: brownish–gray, vf–f, w/silt, some m sand, tr c, freq. wood fragments and plant rootlets, cohesive, crumbly, moist, organic–rich throughout.	SW–SM
10	6–8–7–15	0	2	4"	: SAA, turning wet, tr f SA–SR gravel, sl more dark yellow brown.	
12	9–13–15–19	0	3	16"	SAND: olive gray, grades to dk yel brown at ~7–9", f–m w/vf sand and silt, tr c sand, sl cohesive, tr organic frags top 9", wet, v wet below 11", well graded.	SW
14	11–13–13–7	0	4	20"	: SAA top 4", grades to vf sand & silt, tr f S, faint hor. lam., freq. organic blotches, mottled, gray–orange to yel–gray, tr mod yel br color, v silty, tr clay 11–14". SAND: at 14", dk yel br, m–c, tr f sand & silt, wet, loose, moderately graded.	
16	3–3–4–4	0	5	24"	SILT: (SAA top 13"), gray–orng w/dk yel orng lams, varved, tr vf S, tr clay, sl incr vf S 16–18", wet, top cont. sharp, appears wthrd. SILT: br–gray, varved, w/pale red horiz. lam, v dense, plastic, tr clay, tr vf sand, wet.	
18	2–3–4–4	0	6	11"	: SAA, tr vf sand 3–7", v plastic, tr clay 8–11", wet, very dense.	MH
20					Total Depth: 18.0'.	



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 12–16–93
Drilling Completed: 12–16–93
Well Construction: 12–16–93
Well Developed: 12–27–93
Well Coords.: N719369.532
E591438.218

Notes:

Hand augered to 6.0'.

Original ground surface at 4.0'.

SWL 5.25' (12/17/93; 10:25; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–188S

Revised 8/12/94

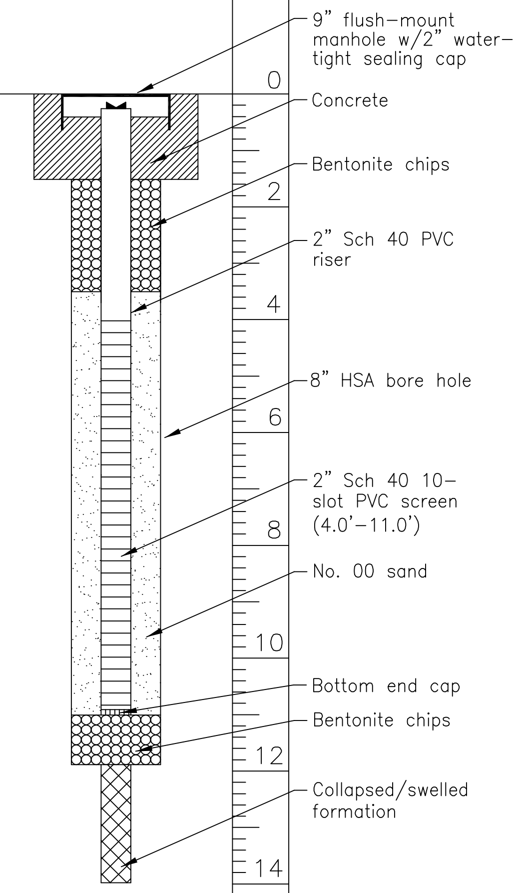
Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 93021

Boring No. MW-189S
TOC Elev. 175.32'
Location ~100' S of SE corner of B201
Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4	HAND AUGERED				Asphalt w/gravel base to 0.5'. SAND: dk to med yellow brown, f-m, lit vf, tr silt and c sand, occ. f SA-SR gravel.	SW
		–	1	–	SILT: lt br to pale yel br, tr pale red, varved, wthrd, moist to dry, tr vf sand 4.5–4.75'. SAND: f-m, lit-tr vf sand & silt, no gravel.	ML SW
6	8-7-3-6	0	2	22"	SAND: dk yel br, pred f w/vf, some m, tr silt, faint silty lam & color banding, horiz., moist 0-15", mod graded. SILT: mod yel br to lt br, tr pale red, wthrd, varved, moist to wet, dense, plastic, grades to silty vf sand in lower 3", wet.	SW ML
8	2-1-2-4	0	3	23"	SAND & SILT: dk yel br, f-vf, tr-lit silt top 3", silt 3-5", dense, plastic, varved, pred vf sand & silt w/occ horiz. silt stringers 5", v wet, sl plastic, color varies, mod yel br to lt olive gray occ dk yel br to lt orng, wthrd lam., possible wthrd surf 9" & 12", pred silt w/vf S lower 3"	SP
10	5-3-2-3	0	4	17"	SAND & SILT: SAA top 8-9", incr silt, gradual texture & color change to underlying unit. SILT: br-gray w/pale red & pale blue varves, v dense, plastic, wet, tr clay.	SM
12	WOR-WOH-2-3	0	5	19"	SILT: SAA, very dense, very plastic, tr clay.	MH
14 16 18 20					Total Depth: 14.0'.	

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 12-15-93
Drilling Completed: 12-15-93
Well Construction: 12-15-93
Well Developed: 12-31-93
Well Coords.: N717647.456
E590532.331

Notes:
Hand augered to 6.0'.

Sample no. 1 collected at 4.5' from hand auger.

WOR = Weight of Rods
WOH = Weight of Hammer

SWL 7.75' (12/16/93, from grade).

Screen & riser removed 4/6/94, borehole reamed. Bottom end cap replaced.
Well reconstructed 4/6/94.

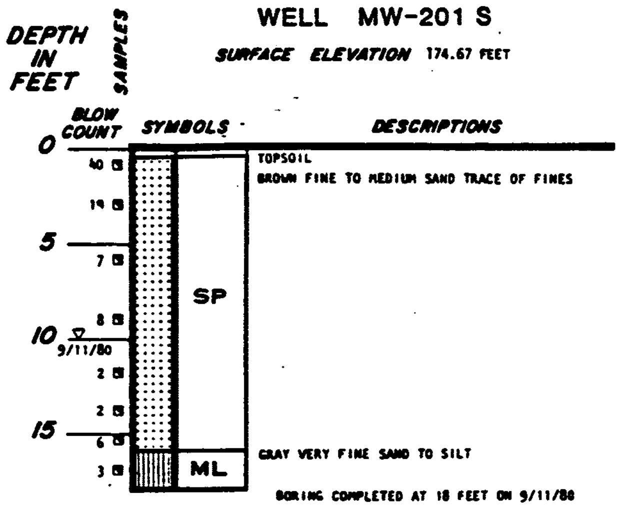
GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-189S

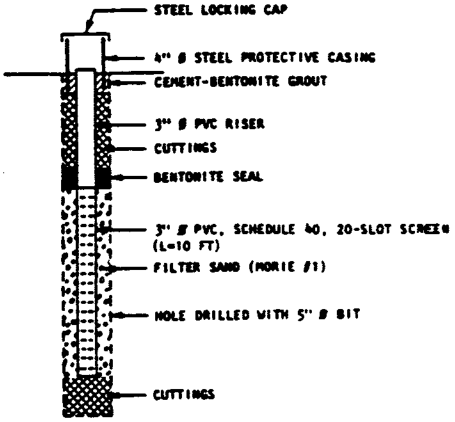
Revised 8/12/94

MONITORING WELL MW-201S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 9-11-80
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 176.84'
- Top of screen elevation at date of installation from IBM Datum: 168.67'
- Bottom of screen elevation at date of installation from IBM Datum: 158.67'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

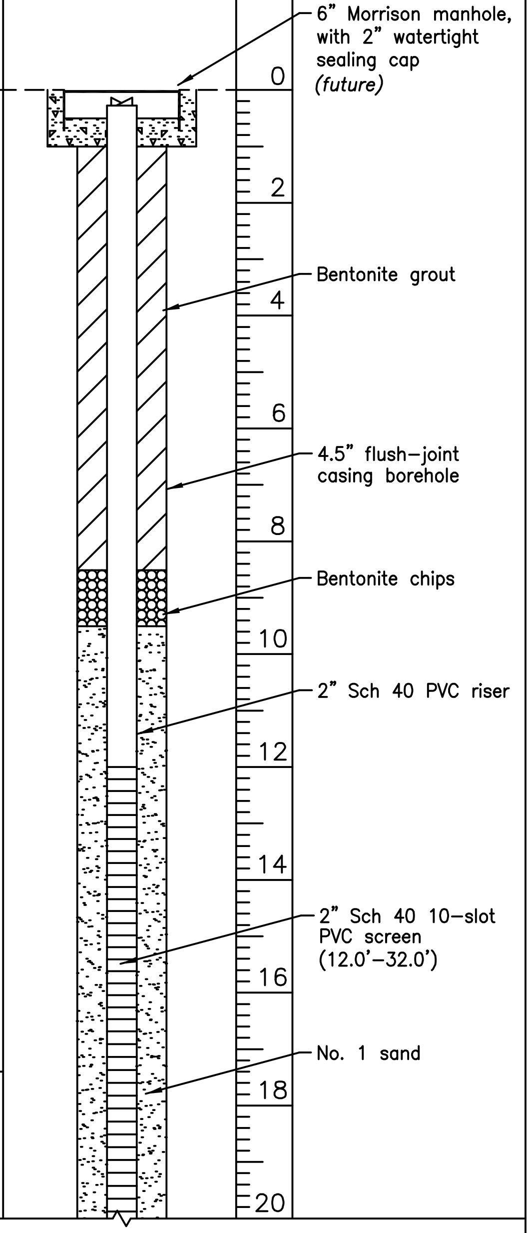
IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

Soil Augering Log
Client: IBM Hudson Valley, Kingston Site
Project No. 93002.07

Boring No. 202–1R/S
TOC Elev. 176.43'
Location B202, approx. 10' south of Column E6
Page 1 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Floor Surface	0.3				
2 4	AUGERED				CONCRETE: to 5".	
6	25–35–20–24	0	1	22"	SAND: 0–19", v fine, dry. CLAY: 19–22", med brown, varved.	
8	28–31–32–24	0.3	2	18"	SILT & CLAY: brown and gray, varved, sl moist.	
10	10–11–14–14	0	3	23"	SILT & CLAY: dark brown and blue gray w/pink laminations, varved, stiff, moist.	
12	18–23–22–21	0	4	18"	: SAA.	
14	8–11–12–14	0	5	24"	: SAA.	
16	4–6–6–10	0.3	6	24"	: SAA: note: two lenses of silt to f sand at 6–9.5" and 20–24" w/strong petrochemical odor, visibly darker (gray–black), moist.	
	11–200/4"	0	7	8"	: SAA; note: lens of silt to f sand at 2.5–3.5" w/petrochemical odor, visibly darker (gray–black) and moist; 3.5–8.5" varved silt and clay mixed w/shale chips.	
18 20	HWG Double–tube Core	2.3'/2.3' (100%)			SHALE BEDROCK.	



Driller: SoilTesting
Logged by: D. Muriceak, GSC
Drilling Started: 6–27–96
Drilling Completed: 6–28–96
Well Construction: 6–28–96
Well Developed: 7–1–96

Notes:

SAA = Same As Above

Split spoon refusal at 17.7'.

Core from 17.7' to 32.0'.

Measured DTB 32.0' (from floor).

SWL 11.23' (7/1/96, 14:25; from TOC).

GROUNDWATER SCIENCES CORPORATION

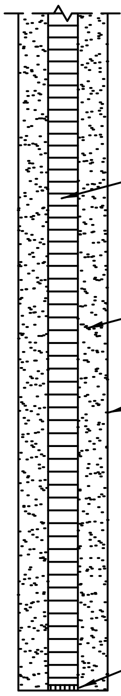
Geologic Log: 202–1R/S

Soil Augering Log
Client: IBM Hudson Valley, Kingston Site
Project No. 93002.07

Boring No. 202–1R/S
Location B202, approx. 10' south of Column E6
TOC Elev. 176.43'
Page 2 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	HWG Double–tube Core	2'/2' (100%)			SHALE BEDROCK.	
22–27	HWG Double–tube Core	5'/5' (100%)				
27–32	HWG Double–tube Core	5'/5' (100%)				
32					Total Depth: 32.0'.	

Well Construction Graphic



Well Construction Details

2" Sch 40 10–slot PVC screen (12.0'–32.0')

No. 1 sand

4" core hole

Bottom end cap

GROUNDWATER SCIENCES CORPORATION

Geologic Log: 202–1R/S

MONITORING WELL MW-201S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Installation of water tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-11-80	Brinnier & Larios	176.84'	---
10-2-92	Brinnier & Larios	177.11'	175.88'

MONITORING WELL MW-201S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None
  - Total well depth at date of installation:
  - Depth prior to development: Depth after development:
  - Difference in depth from installation: Difference in depth from installation:

Change in depth (in feet):

- Redevelopment method:
- Performed by:

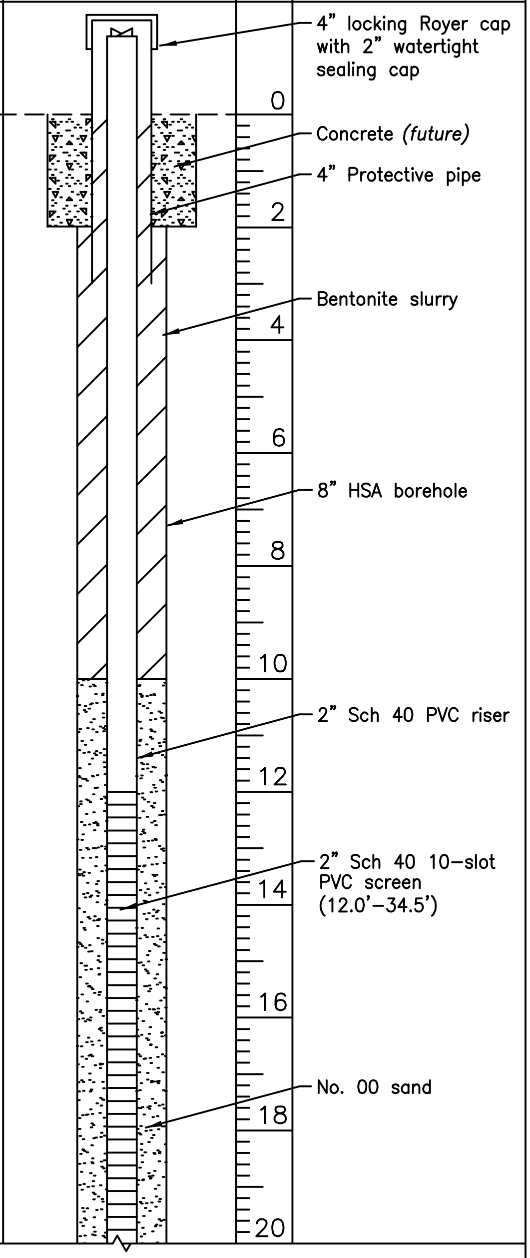
Soil Augering Log

Client: IBM Hudson Valley, Kingston Site
Project No. 93002.07

Boring No. 202-2S
TOC Elev. 175.51'
Location 8'W of B202,
108'N of B203
Page 1 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Sod 0-3". SILT, SAND & GRAVEL: dark yellow brown (fill).	
8	3-4-5-5	0	1	21"	FILL: top 6", silt & sand w/organics, tr gravel. SAND: at 6", pale yel br to dusky yellow, vf-f, some silt, mottled w/occ rootlets, moist, crumbly, coarsening lower 1" to pred m sand.	
10	5-5-5-6	0	2	12"	SAND: dk yel br to mod yel br, pred m sand w/ some vf to f, tr silt, loose, moist to dry, crumbly, silty 9.5" to 10.5". SILT & CLAY: at 10.5", mod yel brown, weathered, varved, dense, plastic, moist.	
12	3-2-2-2	0	3	18"	SILT & CLAY: varved, brownish gray w/occ pale red and dusky brown occ organic frags, moist, mod plastic, occ vf sand lams.	
14	2-2-2-2	0	4	13"	: SAA, turning wet, more plastic below, dense above, some dusky yel lams, wet.	
16	1-2-1-1	0	5	17"	: SAA top 10" w/tr vf sand lams and dusky yellow color, all brownish gray w/incr red lams below 10", wet.	
18	2-1-2-1	0	6	16"	: SAA top 8", then occ silty vf sandy lams up to 0.5" thick, typically 2-3mm, wet, plastic.	
20	WOH/1.5'-1	0	7	21"	: SAA, occ dusky yellow vf sandy lams top 7", v plastic, wet.	

Well Construction Graphic — Depth Feet — Well Construction Details



Driller: North Star Drilling Co.
Logged by: S. Fisher, GSC
Drilling Started: 7-10-96
Drilling Completed: 7-10-96
Well Construction: 7-10-96
Well Developed: 7-11-96

Notes:

SAA = Same As Above
WOH = Weight of Hammer

Split spoon refusal at 34.6'.

Measured DTB 34.6' (from ground surface).

SWL 13.13' (7/18/96, from TOC).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: 202-2S

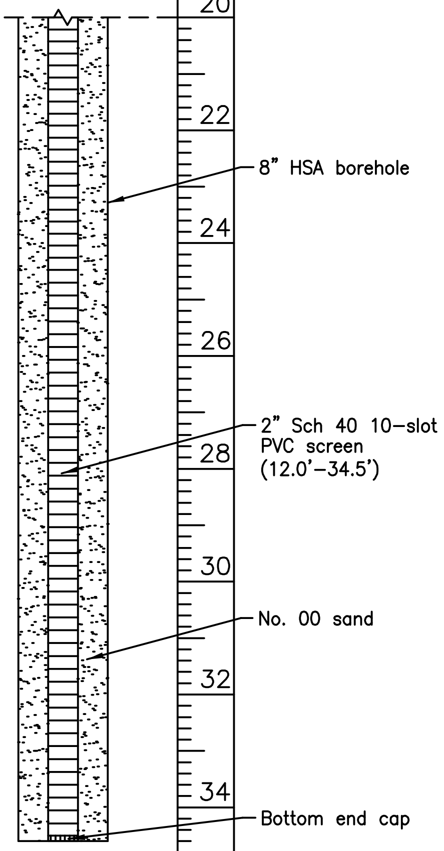
Soil Augering Log
Client: IBM Hudson Valley, Kingston Site
Project No. 93002.07

Boring No. 202-2S
Location 8'W of B202,
108'N of B203

TOC Elev. 175.51'

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20						
20	WOH/2'	0	8	18"	: SAA, all brownish gray w/pale red vf sand laminations, wet.	
22	WOH/2'	0	9	24"	: SAA, v clay-rich.	
24	WOH/2'	0	10	23"	: SAA w/occ pred silt layer, moist, thick, inter-bedded with clay and silt or clay layers, v plastic, wet.	
26	WOH/1'-1-2	0	11	24"	: SAA w/occ dark gray silty vf sand laminations below 6" and 13", very plastic throughout, wet.	
28	WOH/2'	0	12	13"	: SAA 0-8", pred dark gray silty vf, flowing sand 8-12", v wet, pred silty f sand lower 1" w/some vf sand, wet.	
30	WOH/2'	0	13	12"	: SAA w/frequent dk gray silty vf sand zones, flowing sand layer 5-7", pred silty vf sand w/ freq silty/clay laminations, wet.	
32	WOH-2-2-3	0	14	24"	SAND & SILT: dk gray silty vf sand w/occ silt/clay lamins, flowing, v wet top 8". SILT & CLAY: plastic, 8-18". SILT & SAND: lower 6", silt and vf sand, sl flowing w/occ clay laminations, wet.	
34	2-50/1'	0	15	9"	SILT & CLAY: as above w/1" oblate SA shale frags at 2-3" & 7-8" w/occ vf sandy lams, wet, v plastic.	
					BEDROCK: at 34.6'. Total Depth: 34.6'.	
36						
38						
40						

Well Construction Graphic / Depth Feet / Well Construction Details



GROUNDWATER SCIENCES CORPORATION

Geologic Log: 202-2S

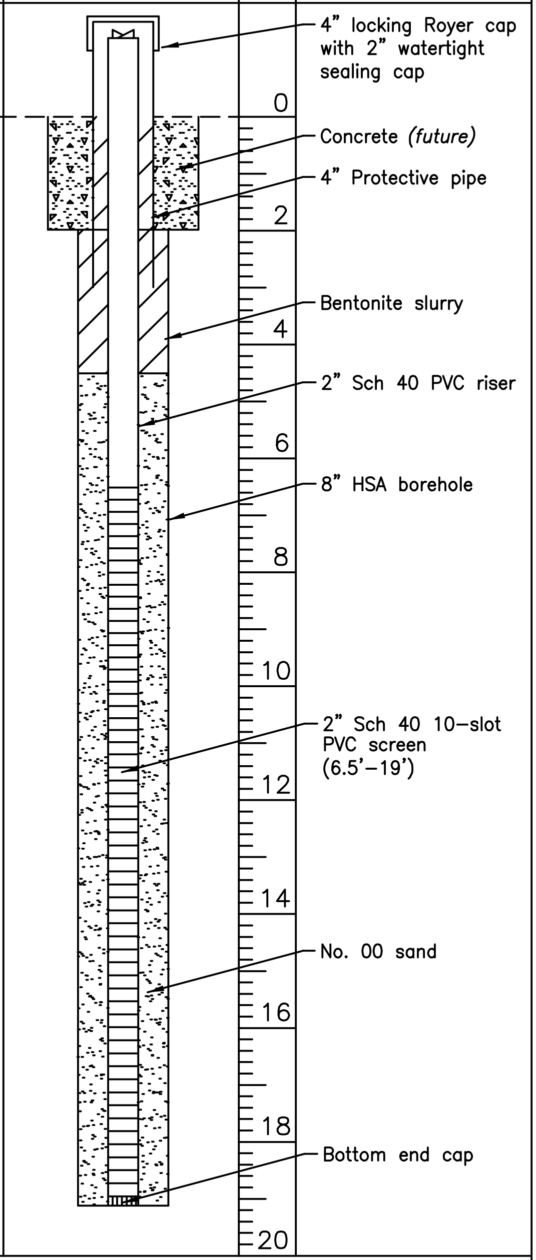
Soil Augering Log

Client: IBM Hudson Valley, Kingston Site
Project No. 93002.07

Boring No. 202–3S
TOC Elev. 175.42'
Location 6'N/56'E Northwest Corner of Building 202
Page 1 of 1

Depth Feet	Blow Counts	HNu (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Sod 0–3", dk br silt & sand soil (fill), clear plastic sheeting at 1'. SAND: dk yel br, f–m w/vf sand, tr c, some silt, loose, moist. SAND & GRAVEL: mod yel br, f–vf w/silt, some c–m, lit vc, some f–m SA–SR gravel, cohesive, moist. : cobble/boulder at 2.6'. : asphalt layer at 3.2'. : olive gray to grayish brown sand & gravel w/ silt 3.2–5.5' (fill?). : softer form at 5.5'	
8	4–5–5–7	10	1	13"	SILT: mottled, mod yel br to pale yel br, tr pale red lams, occ vf sand lams & near vertical sand/silt–filled wthrd fracts, cohesive, dense, moist, occ filled root trace.	
10	6–6–6–6	–	2	NR		
12	2–2–3–3	0	3	22"	SILT & CLAY: mod yel br w/occ pale red to mod pink lams (varves), widely–spaced (~1.25–3") clay–rich in red/pink zones, dense throughout, plastic, moist–wet, horiz. lam, occ. vf sand lams.	
14	2–2–1–3	0	4	20"	: SAA top 7". SILT & CLAY: br gray w/occ pale red lam, v plastic, incr clay content, turning mod olive br below 14" w/ occ vf–f sand lams, vc sand lam at 18", brown gray color bottom 2", dense, plastic, wet.	
16	1–1–2–2	0	5	12"	: SAA top 5". SAND: lt olive br, vf w/f, some silt, occ silt/clay horizontal lam, sl flowing, pred f lower 1", sl cohesive to loose, v wet.	
18	WOR/1'–2–2	0	6	15"	SILT/CLAY: top 11" w/f–vf sand layer 5–7", plastic, dense, wet. SILT & GRAVEL: at 11", brownish–black w/f–m SA–SR gravel, v dense, plastic, some clay, wet.	
	WOH–50/1'	0	7	2"	: SAA, lg shale rock frag top 1", wthrd, dk gray.	
	— AUGERED —					
20					Total Depth: 19.1'.	

Well Construction Graphic / Well Construction Details



Driller: North Star Drilling Co.
Logged by: S. Fisher, GSC
Drilling Started: 7–8–96
Drilling Completed: 7–8–96
Well Construction: 7–8–96
Well Developed: 7–11–96

Notes:

SAA = Same As Above
WOR = Weight of Rods
WOH = Weight of Hammer
NR = No Recovery

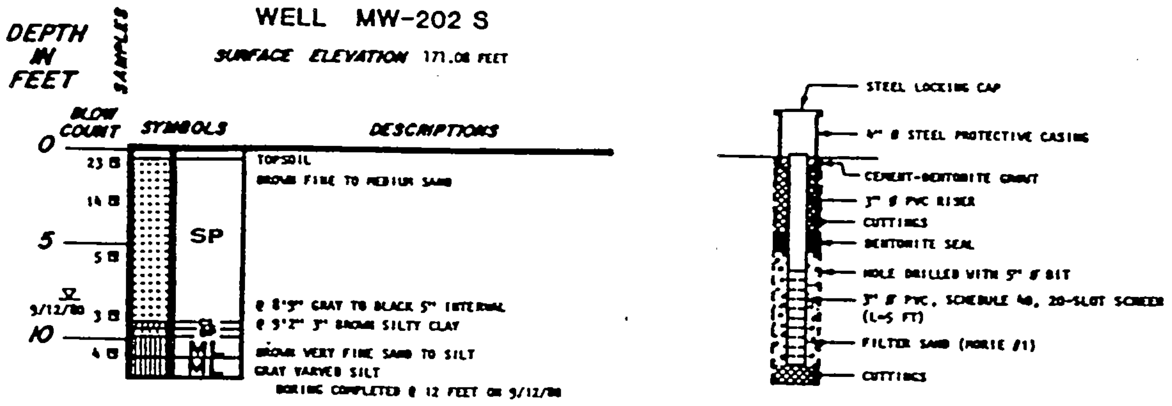
Split spoon refusal at 18.6'.

Measured DTB 19.1' (from ground surface).
Measured DTB 21.05' (from TOC).

SWL 13.37' (7/9/96, 20:05; from TOC).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: 202–3S



LOG AND MONITORING WELL DETAILS

NOTES:

1. THE FIGURES IN THE COLUMN LABELED "BLOW COUNT" REFER TO THE NUMBER OF BLOWS REQUIRED TO DRIVE A SPLIT-SPOON SAMPLER A DISTANCE OF ONE FOOT USING A 300 POUND DRIVE WEIGHT FALLING 30 INCHES. THE UTILIZED SPLIT-SPOON SAMPLERS WERE FROM 2 TO 3½ INCHES O.D.

2. BECAUSE IN A STANDARD PENETRATION TEST ONLY A 2-INCH DIAMETER SPLIT-SPOON AND A 140-POUND HAMMER ARE USED, ALL BLOW COUNTS OBTAINED DURING THIS STUDY BY DRIVING 2 TO 3½-INCH DIAMETER SPLIT-SPOONS WITH A 300-POUND HAMMER FALLING 30-INCHES ARE NOT VALID FOR COMPARISON WITH STANDARD PENETRATION TEST BLOW COUNTS VALUES OBTAINED IN PREVIOUS INVESTIGATIONS.

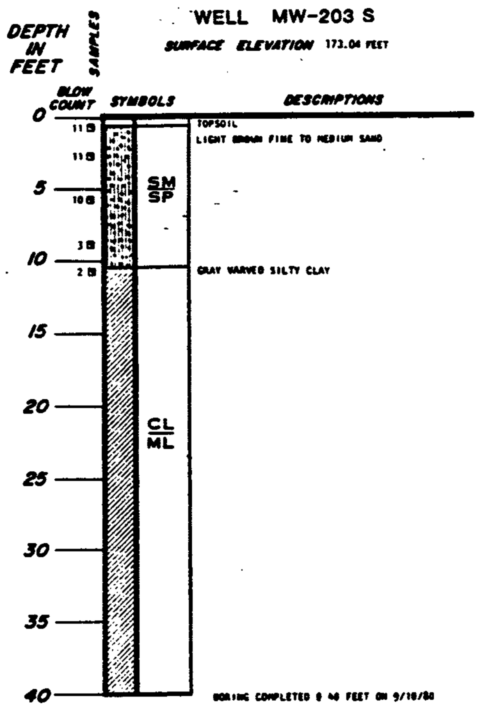
3. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM.

4. THE DISCUSSION IN THE TEXT OF THE REPORT IS NECESSARY FOR A PROPER UNDERSTANDING OF THE NATURE OF THE SUBSURFACE MATERIALS.

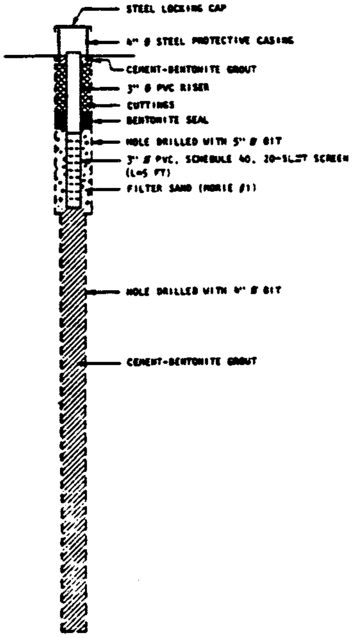
DAMES & MOORE

MONITORING WELL MW-203S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 9-10-80
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 175.04'
- Top of screen elevation at date of installation from IBM Datum: 167.29'
- Bottom of screen elevation at date of installation from IBM Datum: 162.29'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-203S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-10-80	Brinnier & Larios	175.04'	---
10-2-92	Brinnier & Larios	175.28'	174.36'

MONITORING WELL MW-203S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

- Total well depth at date of installation:____________

- Depth prior to development:____________ Depth after development:____________
- Difference in depth from installation:____________ Difference in depth from installation:____________

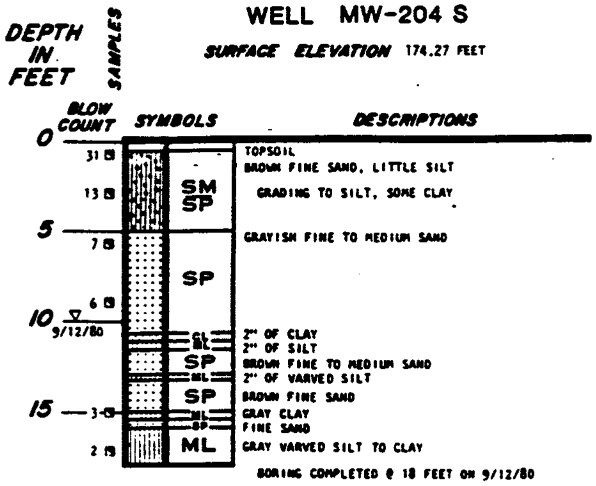
Change in depth (in feet):____________

- Redevelopment method:____________

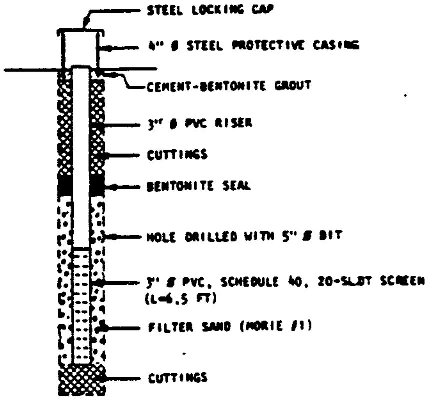
- Performed by:____________

MONITORING WELL MW-204S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 9-12-80
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 176.35'
- Top of screen elevation at date of installation from IBM Datum: 164.27'
- Bottom of screen elevation at date of installation from IBM Datum: 157.77'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010
- Sampling Frequency: Annually
- Analytical Parameters: Inorganic compounds:
  - arsenic
  - chloride
  - chromium (hexavalent)
  - lead

MONITORING WELL MW-204S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Extension of PVC casing (1.50'), installation of water tight cap and curbbox seal

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-12-80	Brinnier & Larios	176.35'	---
10-2-92	Brinnier & Larios	173.91'	173.48'

MONITORING WELL MW-204S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

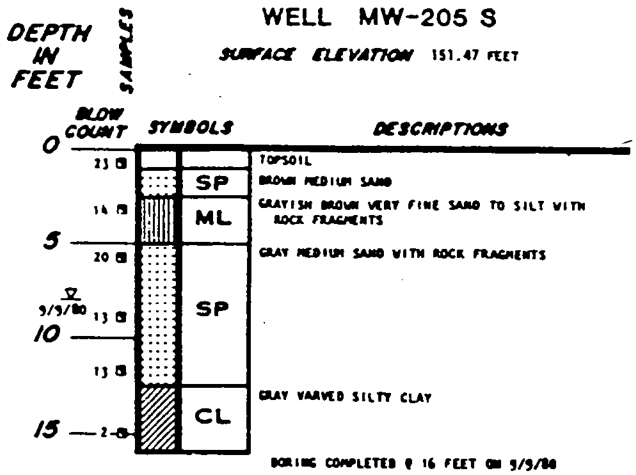
  - Total well depth at date of installation: 157.77'

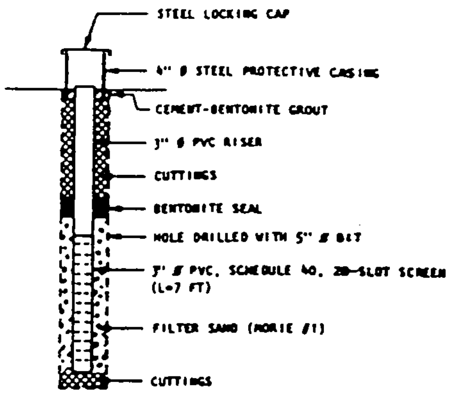
  - Depth prior to development: 158.47' Depth after development: 158.24'
  - Difference in depth from installation: 0.70' Difference in depth from installation: 0.47'

    Change in depth (in feet): 0.23'

  - Redevelopment method: Centrifugal Pump

  - Performed by: Dames & Moore

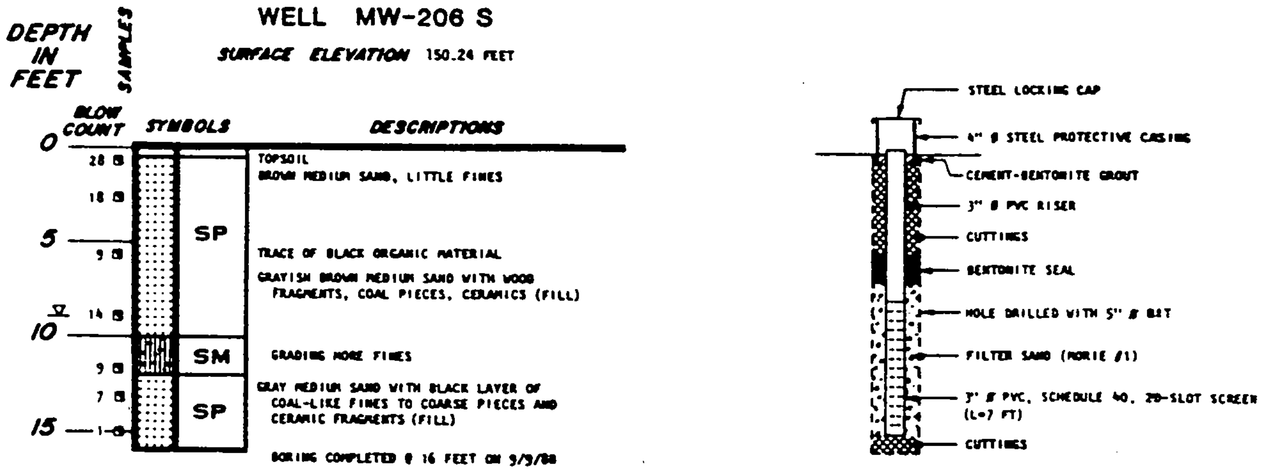




LOG AND MONITORING WELL DETAILS

DAMES & MOORE

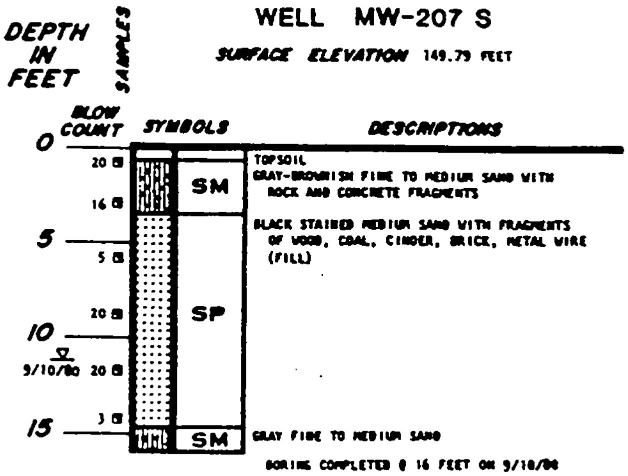
FIGURE 20/23

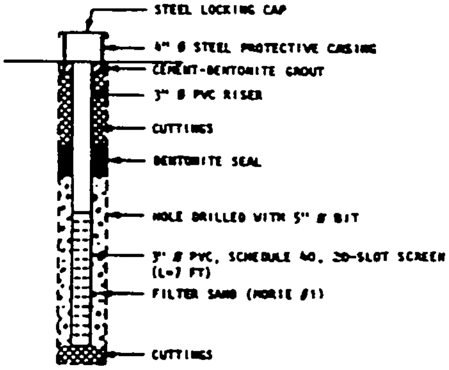


LOG AND MONITORING WELL DETAILS

DAMES & MOORE

FIGURE 20/23

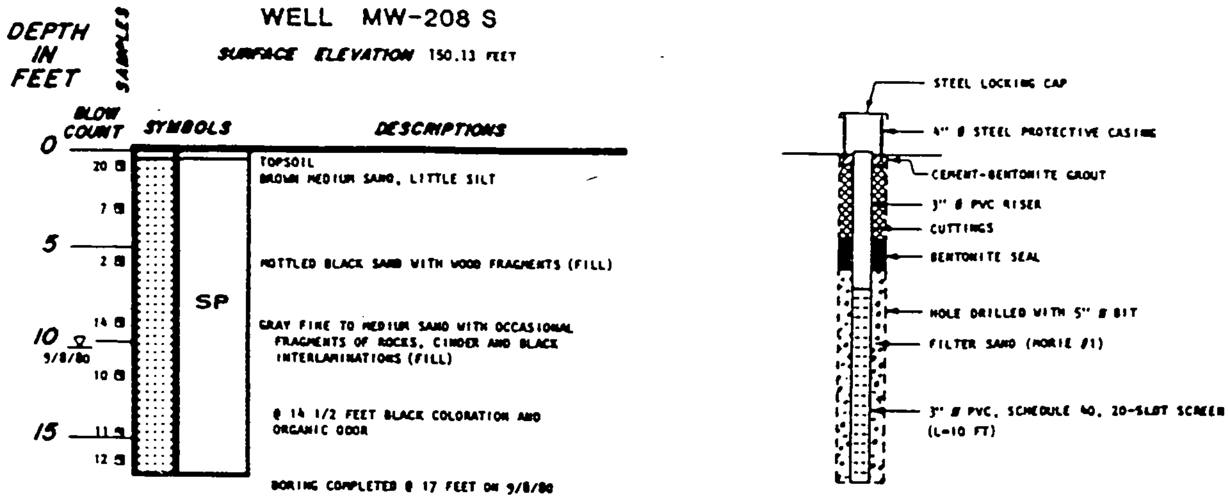




LOG AND MONITORING WELL DETAILS

DAMES & MOORE

FIGURE 20/23



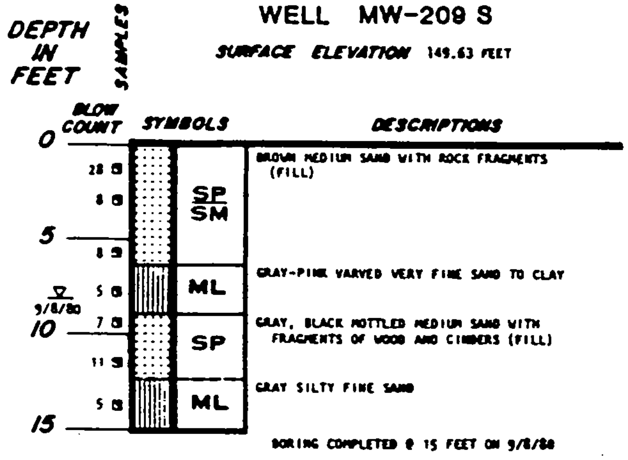
LOG AND MONITORING WELL DETAILS

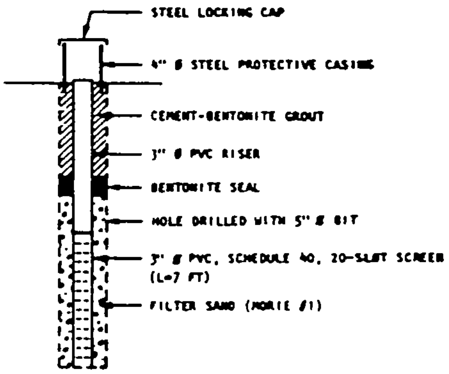
DAMES & MOORE

FIGURE 20/24

WELL MW-209 S

SURFACE ELEVATION 149.63 FEET

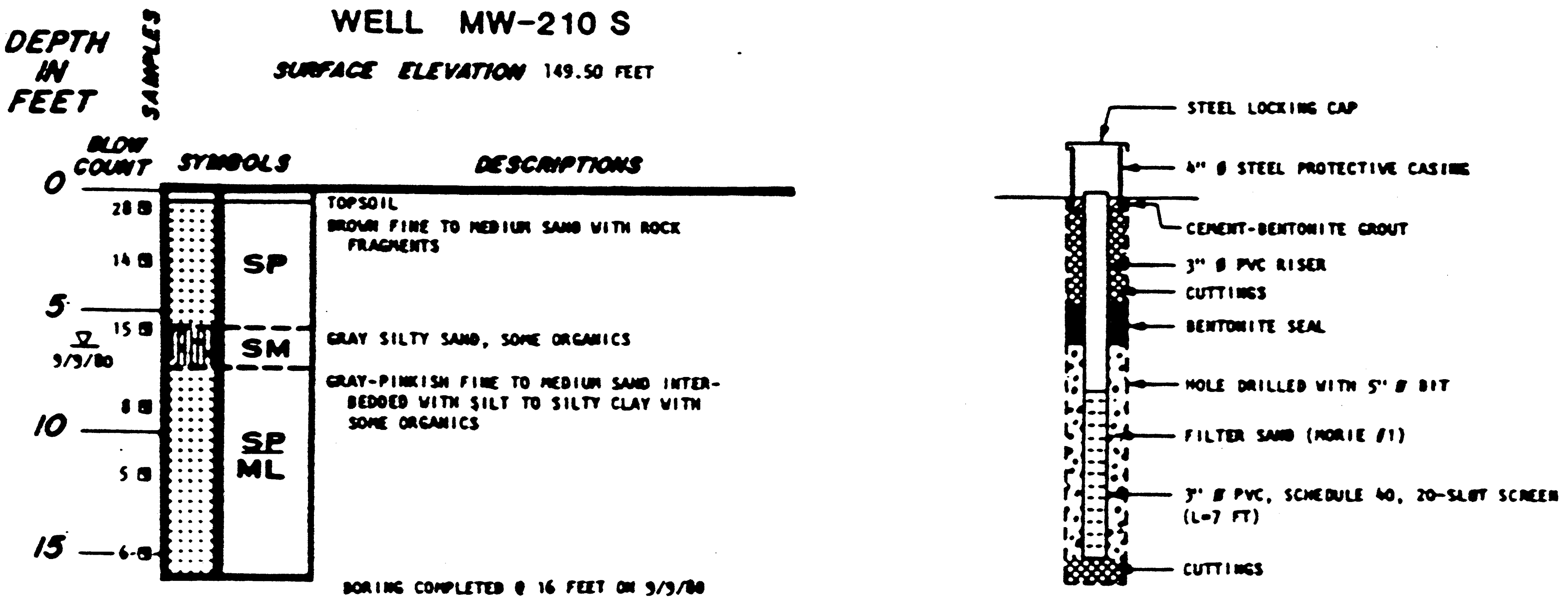




LOG AND MONITORING WELL DETAILS

DAMES & MOORE

FIGURE 20/24



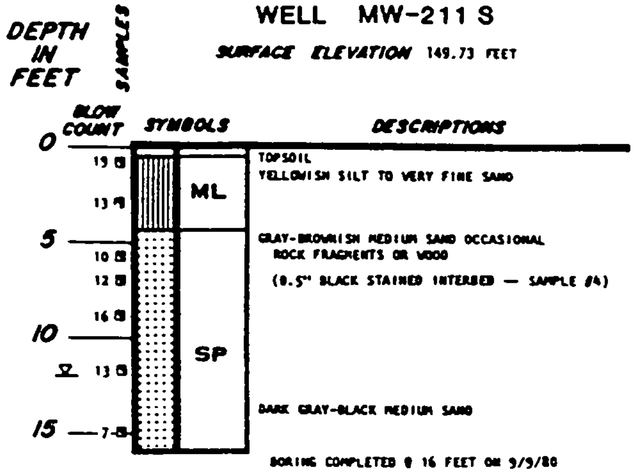
LOG AND MONITORING WELL DETAILS

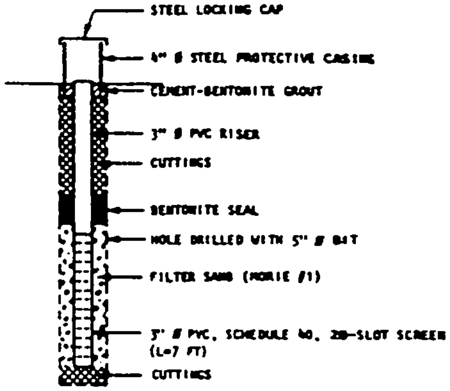
DAMES & MOORE

FIGURE 20/24

WELL MW-211 S

SURFACE ELEVATION 149.73 FEET





LOG AND MONITORING WELL DETAILS

DAMES & MOORE

FIGURE 20/25

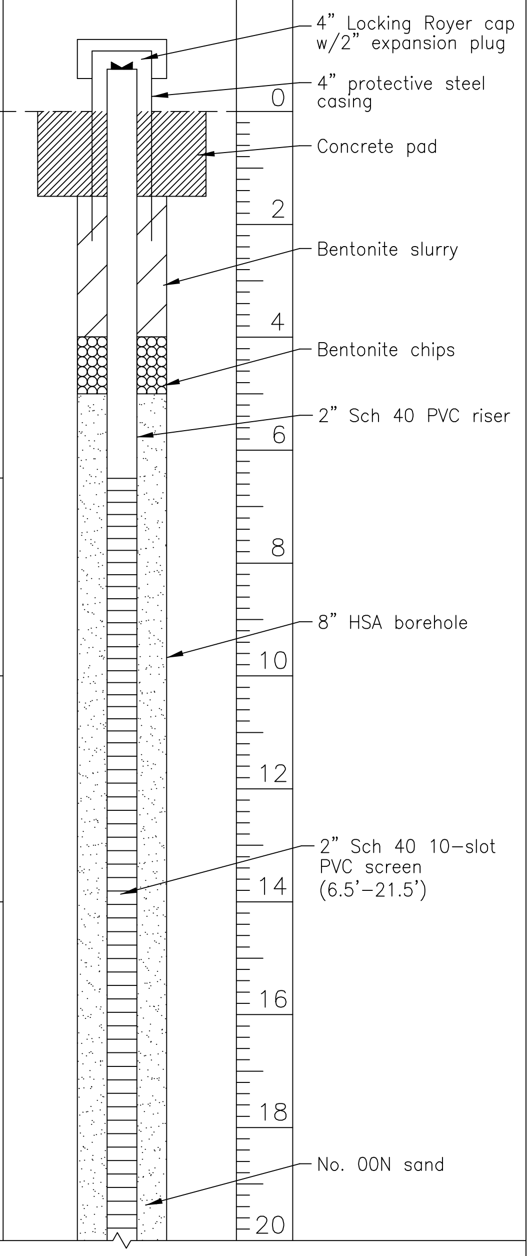
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 94013

Boring No. MW-225S
Location C&D Landfill Area
NE of MW-224S

TOC Elev. 143.89
GS Elev. 141.43
Page 1 of 2

Depth Feet	Blow Counts	PID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2	2-2-3-4	0	1	21"	SILT: dusky yellow brown, lit vf sand top 2", then weathered yellow brown below w/occ rootlets and plant debris, crumbly, moist.	ML/ OL
4	4-4-2-2	0	2	20"	: same as above, w/vf sand top 7", lit-some below 7", turning wet at 11", lit clay, sl plastic.	
6	1-1-1-1	0	3	21"	SILT: pale yellow brown to mod yellow brown, lit clay, lit vf sand w/decayed organic material flakes throughout, v sandy in lower portion, pred vf-f, sl gray color, loose in sand, cohesive in silt, wet.	
8	1-1-1-1	0	4	10"	: same as above, top 5". SAND: at 5", olive gray to med gray, vf-f sand with silt, homogeneous, loose, wet.	SP/ SM
10	WOR-3-2-1	0	5	15"	SAND: med gray to olive gray, silty vf-f sand, pred f sand, f sand w/occ pale red to brownish gray silt laminations between 6" and 12", same as top in lower 3", cohesive, wet.	
12	WOR-1-1-2	0	6	16"	SILT & SAND: med gray to olive gray, vf-f sand and silt, tr silt laminations, occ med sand layer, tr rootlets, cohesive, wet.	SM
14	2-1-2-1	0	7	21"	SILT & SAND: as above, laminated with occasional silt/clay layers and med sand, laminated at 17", tr clay, cohesive, wet.	
16	WOR/1.5'-1	0	8	20"	SILT: brownish gray, tr clay, faintly laminated, tr vf sand laminations, tr white flakes (organic), dense, stiff, slightly plastic, wet to moist.	ML
18	1-2-4-4	0	9	22"	: same as above, 45° fracture filled with white and black organic material, plastic, wet to moist.	
	AUGERED					
20	WOR/2'	0	10	21"	SILT: as above, top 12".	

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 10-27-94
Drilling Completed: 10-27-94
Well Construction: 10-27-94
Well Developed: 10-31-94
Well Coords.: N719415.77
E590176.37

Notes:

*No response to sample jar headspace scans.

WOR - Weight of Rods

Measured DTB from grade (10/28/94, 11:50): 20.5'.

SWL 4.25' (10/28/94, 11:49; from grade).

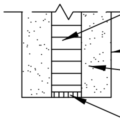
GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-225S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 94013

Boring No. MW–225S
Location C&D Landfill Area
NE of MW–224S

TOC Elev. 143.89
GS Elev. 141.43
Page 2 of 2

Depth Feet	Blow Counts	PID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20	WOR/2'	0	10	21"	SAND: med dk gray, f–m w/vf, lit c, tr silt, loose, wet, brown silt mass in lower 1". SAND: as above w/tr shale frags (lg frag at bot), tr clay masses.	SW		20	2" Sch 40 10–slot PVC screen (6.5'–21.5') 8" HSA bore hole No. 00N sand Bottom end cap
	WOR–50/1"	0	11	6"	SHALE BEDROCK: at 21.5' (?), dk gray.				
22					Total Depth: 21.5'.			22	
24								24	
26								26	
28								28	
30								30	
32								32	
34								34	
36								36	
38								38	
40								40	

Notes:

*No response to sample jar headspace scan.

GROUNDWATER SCIENCES CORPORATION

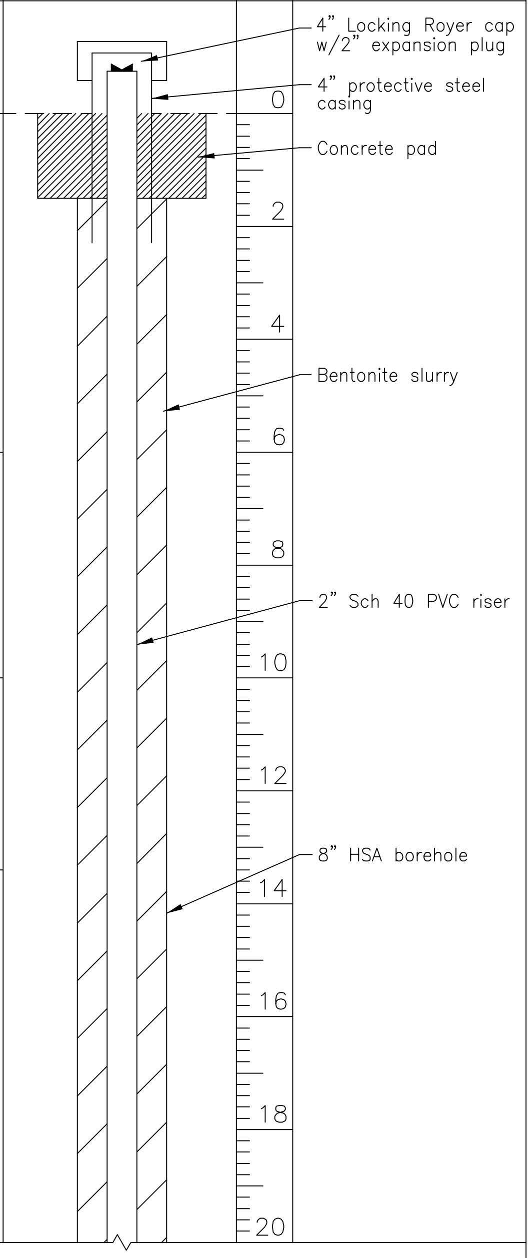
Geologic Log: MW–225S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 94013

Boring No. MW–232M
Location B035 and B001 Alcove

TOC Elev. 180.94
GS Elev. 178.23
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED					
8	1–1–3–4	0 (0)	1	22"	SAND: fine, some silt, brown, dry. SAND: fine–medium, salt & pepper texture, (black/white grains), dry.	SW
10	4–5–6–8	0 (0.4)	2	18"	SAND: fine–medium, as above. : wet.	
12	3–2–3–4	0 (0.3)	3	22"	SAND: fine, little medium sand, brown.	SP
14	4–3–3–7	0 (0.6)	4	22"	SAND: fine, brown. : 2–3mm thick brown–pink clay/silt laminations at 13.4' & 13.7', grading to fine–medium sand.	
16	6–14–19–23	0 (0)	5	24"	SAND: fine, brown. : fine–medium, brown; 2–3mm thick clay/silt lamination at 15.5'.	SP/SM
18	10–17–21–23	0 (0.4)	6	16"	SAND: fine, brown, occasional 2–3mm silt/clay laminations.	
20	8–15–29–31	0 (1.2)	7	16"	SAND: fine, brown, occasional 2–5mm silt/clay laminations.	



Driller: SoilTesting, Inc.
Logged by: C. Rine, GSC
Drilling Started: 10–25–94
Drilling Completed: 10–25–94
Well Construction: 10–25–94
Well Developed: 10–28–94
Well Coords.: N717575.54
E591461.48

Notes:

Hand augered to 6.0'.

*Number in parentheses represents FID reading of jar headspace.

SWL 19.10' (from TOC) 10/25/94 11:19.

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–232M

Soil Augering Log

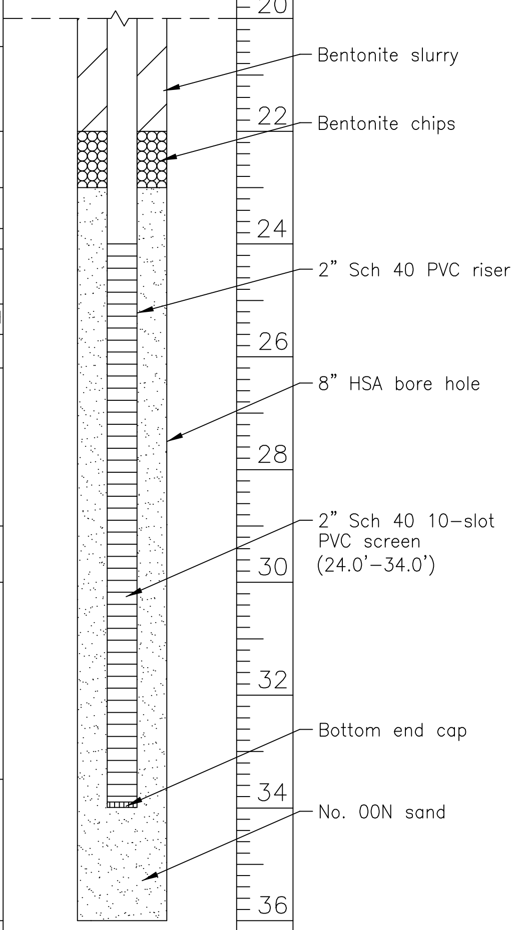
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 94013

Boring No. MW–232M
Location B035 and B001
Alcove

TOC Elev. 180.94
GS Elev. 178.23

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20	4–11–17–15	0 (0.6)	8	14"	SAND: fine–medium, brown. SAND: very fine, gray, tr silt. : lit silt.	SW SP
22	10–19–18–8	0 (1.2)	9	14"	SILT: light gray, tr very fine sand. SAND: very fine, little silt, wet.	SM/ ML SP
24	4–5–5–4	0 (6.4)	10	20"	SILT: gray. SAND: very fine, some silt, gray. SILT/CLAY: varved, alternating pink and gray. SAND: very fine–fine, gray.	ML SP MH/CH SW
26	4–3–3–5	0 6.2)	11	14"	SAND: fine, gray, somewhat loose, wet.	SP
28	4–6–5–4	0 (6.8)	12	20"	SAND: fine. SILT: gray, tr clay, pink clay lam. at 29'.	MH/ CH
30	4–6–7–5	0 (10+)	13	14"	SAND: fine, gray.	SP
32	8–6–4–6	0 (1.0)	14	16"	SAND: fine, gray. SILT: varved, tr clay, pink/gray lams.	
34	7–7–5–6	0 (3.6)	15	16"	CLAY/SILT: varved, no sand.	MH/ CH
36					Total Depth: 36.0'.	
38						
40						

Well Construction Graphic / Well Construction Details



Notes:

*Number in parentheses represents FID reading of jar headspace.

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–232M

Soil Augering Log

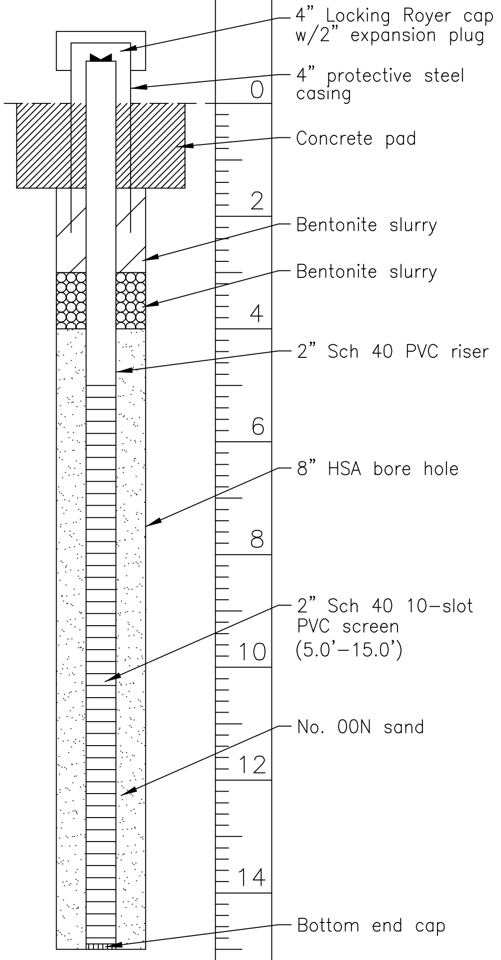
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 94013

Boring No. MW-232S
Location B035 and B001
Alcove

TOC Elev. 181.03
GS Elev. 178.23
Page 1 of 1

Depth Feet	Blow Counts	FID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				[See log for MW-232M]	
6–15	AUGERED					
15					Total Depth: 15.0'.	

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: C. Rine
Drilling Started: 10-26-94
Drilling Completed: 10-26-94
Well Construction: 10-26-94
Well Developed: 10-28-94
Well Coords.: N717572.12
E591461.47

Notes:

SWL 10.92' (10/28/94 11:33 from TOC)

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-232S

Soil Augering Log

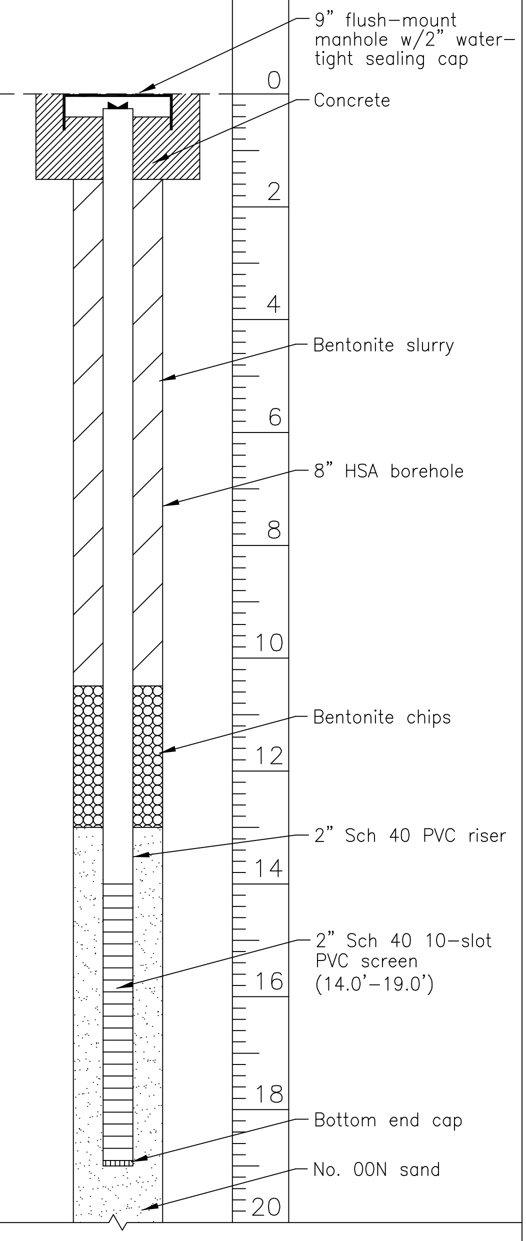
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 94013

Boring No. MW-236M
Location Between B031 and B032

TOC Elev. 180.80
GS Elev. 181.01
Page 1 of 2

Depth Feet	Blow Counts	PID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Asphalt w/gravel base 0-6" gray silt, sand and angular gravel (fill). SAND: at 20", dk yellow brown, f-m sand, lit vf, tr silt, tr c-vc, homogeneous, loose, moist. : SWL at 5.5' in hand-auger hole.	FILL SW
6–8	1-1-2-3	0 (0)	1	20"	SAND: dk yel brown, pred f-m, lit vf, tr silt, tr c, homogeneous, overall pred c, sl grayish top 7", silty mod brown lower 2", loose, tr dk brown organic flakes 7-20", wet. SAND: dk yel br, f-m, some c, tr silt, fines slightly to 14", vc S grains at 3", faint mod lt br silt lams 9-14", sharp contact at 14", loose, sl cohesive, wet.	SW
8–10	3-4-2-3	0 (0)	2	24"	SAND: at 14", dk yel br, m-c, some f, tr-lt vf, tr silt & vc sand, tr dk br organic flakes below 14". SAND: dk yel br, m-c, some f, lit-tr vf, tr vc, tr silt, loose, wet. SAND & SILT: at 10" mod yel br, varved, horiz. w/interlams of f-m sand, tr c sand, silt 14.5-15", 15.75-16.25" and 16.5-17".	SW
10–12	1-1-3-4	0 (0)	3	22"	SILT: at 19" varved, mod yel br, tr clay, dense, sl plastic, faint vf sand lams, SA 0.25" pebble at 2", angled to varves. SILT: v dense, lit-tr clay, varved 1-3". SILT & SAND: mod-dk yel br, vf sand & silt, sl cohesive, yel orange to dk br organic-rich color banks, occ. dk br organic flakes 12-14", more cohesive, stiff, sl less vf sand below 14" still color-banded, wet.	SW SM ML
12–14	2-1-1-2	0 (0)	4	16"	SAND: dk yel br, f-c, lit vf, tr c grains, occ mod yel br weathered clay/silt mass, fining to pred f-m, some vf, tr silt below 14" then sl coarsening to pred m, lit c sand 18-19", wet.	SM
14–16	3-4-5-5	0 (0)	5	24"	SILT: at 19", lt br, varved, wthrd, dense, rapidly grading to unit below, wet. SAND & SILT: at 20", dk yel br, vf sand w/silt, homogeneous, sl color-banded, wet.	SW SM
16–18	2-1-1-2	0 (0)	6	24"	SAND: dk yel br, f-m, homogeneous, tr silty/clay masses, wet. SILT: at 14", brownish gray silt 14-15", tr clay, plastic, grades to mod yel br, sl plastic, varved w/faint pink lams below 20", moist, stiff, lit vf sand below 22", laminated.	SP ML/CL
18–20	1-2-1-1	0 (0)	7	20"	SAND: dk yel br, f, lit m and vf, some silt, homogeneous, loose, wet. SILT: at 7", mod yel br, varved, wthrd, lit-some clay, dense, plastic, turning brownish gray at 13", gradational color change, varved, dense, plastic.	SP ML ML/CH

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 10-19-94
Drilling Completed: 10-19-94
Well Construction: 10-19-94
Well Developed: 10-28-94
Well Coords.: N716971.14
E592305.54

Notes:

Hand augered to 6.0'.

*Number in parenthesis represents PID reading of jar headspace.

Measured DTB from grade (10/20/93, 07:44): 19.1'

SWL 5.55' (10/20/94, 07:46; from grade).

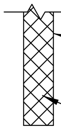
GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-236M

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 94013

Boring No. MW–236M
Location Between B031 and B032

TOC Elev. 180.80
GS Elev. 181.01
Page 2 of 2

Depth Feet	Blow Counts	PID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20–22	2–4–3–4	0 (0)	8	24"	SILT w/CLAY: brownish gray, varved, dk gray, vf sand layer 9–10".	MH/CH		20–22	2" dia split spoon boring Collapsed/swelled formation
22					Total Depth: 22.0'.			22	

Notes:

*Number in parenthesis represents PID reading of jar headspace.

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW–236M

Soil Augering Log

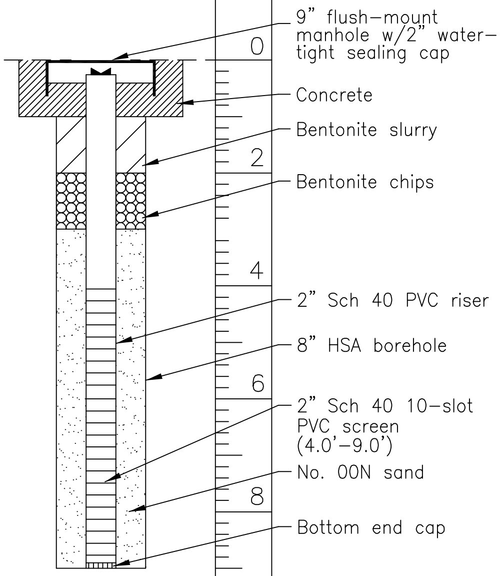
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 94013

Boring No. MW-236S
Location 5' SW of MW-236M
B031/B032 Area

TOC Elev. 180.66
GS Elev. 181.01
Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
					[See log for MW-236M]	
2						
	HAND AUGERED					
4						
6						
8	AUGERED					
10					Total Depth: 9.0'.	
12						
14						
16						
18						
20						

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 10-19-94
Drilling Completed: 10-19-94
Well Construction: 10-19-94
Well Developed: 10-28-94
Well Coords.: N716969.51
E592300.78

Notes:

Hand augered to 6.0'.

Measured DTB from grade (10/20/94, 07:40): 9.3'.

SWL 5.35' (10/20/94, 07:41; from grade).

GROUNDWATER SCIENCES CORPORATION

Geologic Log: MW-236S

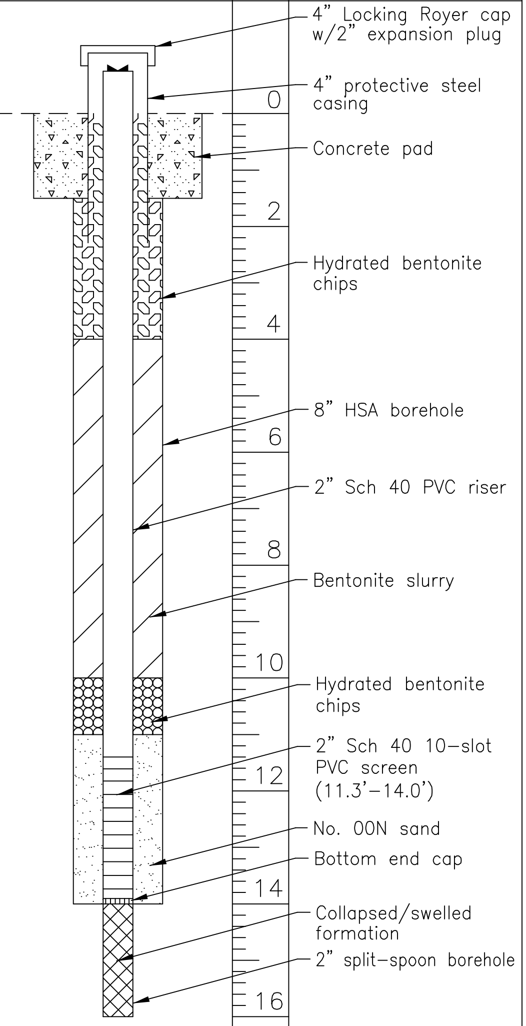
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-250M
Location ~75'W and ~8'S of SE corner B005

TOC Elev. 178.09'
GS Elev. 176.18'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2	HAND AUGERED				Sod 0-3". Dark brown sand w/gravel at 1'.	FILL
4					: water at 2.9'. : flowing sand below 3'.	SP
6	5-4-3-2	0.1	1	16"	SAND: dk yel br, f-m w/vf, pred m w/f-vf top 5", homogeneous, loose, sl grayish tone to color, v wet.	
8	2-2-2-3	0.1	2	18"	SAND: as above, tr organic flecks betw 7" and 14", w/more dk yel br than above betw 7" and 14", tr c sand top 6", v wet.	
10	1-1-3-4	0	3	24"	SAND: dk yel br, pred m w/f-vf, tr silt, homogeneous, wthrd silt/clay rip-up masses at 13" & 17", f SR oval qtz pebble at 11", tr organic(?) masses below 12", lit c sand below 11", wet.	
12	1-1-2-1	0	4	24"	SAND: as above top 17" w/wthrd silt lams at 15-16". SILT: at 17", mod yel br w/lt br layers w/vf sand, horiz. lam, cohesive, grades to unit below, wet. SAND: at 21", dk yel br, w/vf-f silty sand, homogeneous in layers, sl flowing, A shale frag at 13", wet.	ML
14	1-1-2-2	0	5	24"	SAND: as above top 20", v homogeneous, tr clay rip-up masses. SILTY CLAY: at 20", mod yel br, wthrd, horizontal layering, dense, sl plastic, tr organics.	SM
16	3-2-2-5	0	6	10"	SILTY CLAY: as above w/dk yel br color, tr horiz. layering, incr clay, color grades to br gray at 2.5", occ pale red varves lower 4", dense, plastic, wet.	MH/CH
18					Total Depth: 16.0'.	
20						

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7-16-96
Drilling Completed: 7-16-96
Well Construction: 7-16-96
Well Developed: 7-16-96
Well Coords.: N717403.007
E592167.925

Notes:

*Volatile scan of split spoon.

Measured Depth to Bottom: 15.64' (from TOC).

SWL 2.9' (7/16/96; from grade).
4.85' (7/16/96, from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-250M

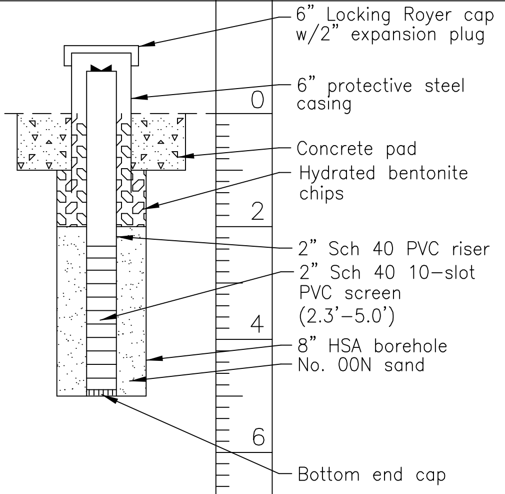
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–250S
Location ~5'E of MW–250M
S of B005

TOC Elev. 178.60'
GS Elev. 176.20'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–3	HAND AUGERED				[See MW–250M log for lithologic descriptions.]	FILL
3–5	AUGERED					SP
5					Total Depth: 5.0'.	



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–16–96
Drilling Completed: 7–16–96
Well Construction: 7–16–96
Well Developed: 7–16–96
Well Coords.: N717403.115
E592171.669

Notes:

*Volatile scan of split spoon.

Measured Depth to Bottom: 7.39' (from TOC).

SWL 2.9' (7/16/96; from grade)
5.33' (7/16/96, from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–250S

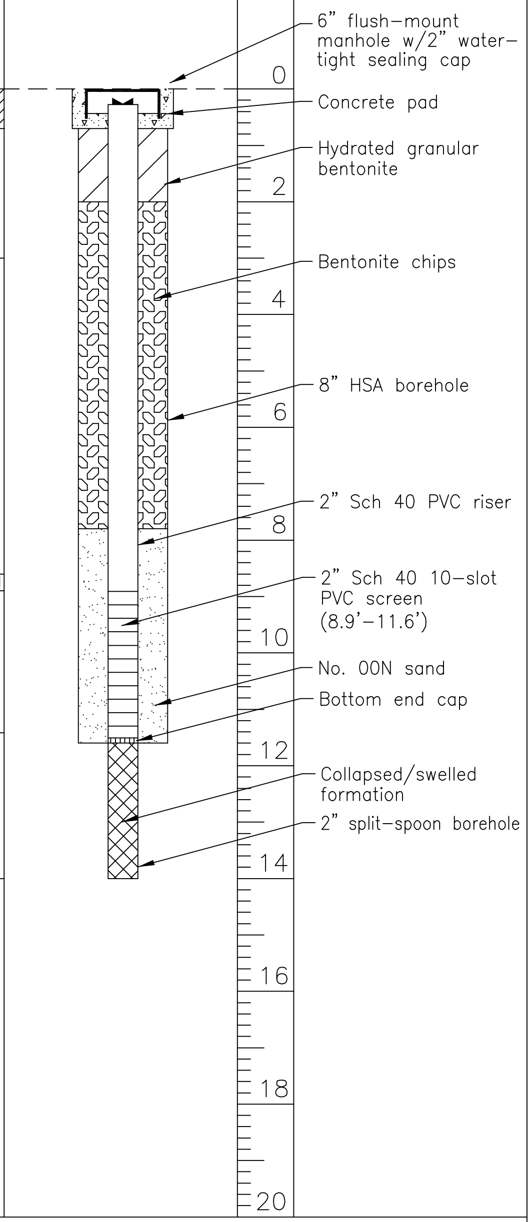
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–251M
Location ~55'W & ~26'N of SE corner B005, inside bldg.

TOC Elev. 174.78'
GS Elev. 175.10'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
	AUGERED				Concrete floor 0–8" w/wire mesh at base, some c gravel base 8–10".	
2	HAND AUGERED				SAND: dk yel br, f–m w/vf & c, some vc, lit f–m SR–SA gravel near top, loose, some olive gray color below 1.5', moist, water at 1.9'.	FILL
4	2–3–2	0 18	1	9"	SAND: dk yel br, f–m w/vf, tr c top 2", rusty iron frag w/yel orange areole at 5", tr silt & tr dusky br organic(?) masses, loose, flowing, v wet.	
6	WOH–1–1–3	0 7	2	18"	SAND: dk yel br f–m w/vf, homogeneous, tr wthrd silt mass at 5" & 16", tr dusky yel br organic(?) masses, loose, flowing, wet.	SP
8	2–2–4–7	0 6	3	24"	SAND: as above, w/some–lit c top 8", fining to pred vf–f, tr m lower 4", dk br organic–rich lam at 20", tr faint horiz. organic & silt/clay lams betw 15" & 20", loose to sl cohesive, occ wthrd silt/clay rip–up mass, incr silt w/depth, wet.	
10	1–1–2–1	0 7	4	16"	SAND: as above, f–m w/vf, lit silt, homogeneous 0–8". SILT/CLAY: br gray to mod yel br, horiz. lam, tr vf sand lower 1", sharp top, gradational base, dense, plastic, wet. SAND: dk yel br, vf–m, lit silt, occ horiz color lams, tr silt/clay lams & organic lams, loose, wet.	MH/CH SM
12	1–1–2–4	0 6	5	24"	SAND: pred f–m w/vf, tr silt, homogeneous, dk yel br, occ wthrd silt/clay lams below 12", wet. SILT/CLAY: at 18", br gray, pred silt w/clay, tr vf sand lams, horiz. lam, dense, plastic, wet, top 1.5" is oxidized mod yel br to yel orange.	
14	2–4–4–4	0 6.5	6	10"	SILT & CLAY: brownish gray, v dense, plastic.	MH/CH
16 18 20					Total Depth: 14.0'.	



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–22–96
Drilling Completed: 7–22–96
Well Construction: 7–22–96
Well Developed: 7–30–96
Well Coords.: N717436.394
E592187.804

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement. Background was ~3.5ppm.

WOH = Weight of Hammer

Measured DTB: 11.35' (from TOC).

SWL 1.9' (7/22/96; from grade).

GROUNDWATER SCIENCES CORPORATION

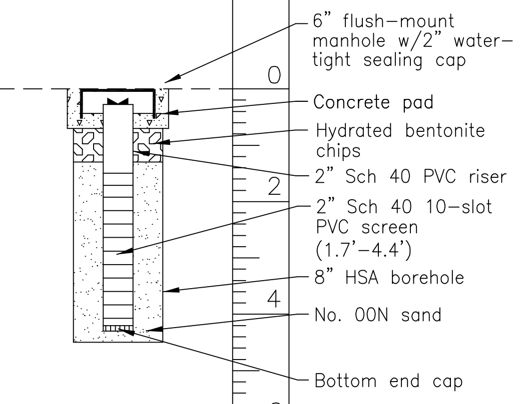
Well Log: MW–251M

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-251S
Location ~52'W & ~26'N of SE corner B005, inside bldg.

TOC Elev. 174.85'
GS Elev. 175.10'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–4.5	AUGERED				[See MW-251M log for lithologic descriptions.]	FILL SP
4.5					Total Depth: 4.5'.	



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7-22-96
Drilling Completed: 7-22-96
Well Construction: 7-22-96
Well Developed: 7-30-96
Well Coords.: N717436.409
E592190.979

Notes:

*Volatile scan of split spoon.

Measured Depth to Bottom: 4.13' (from TOC).

SWL 1.9' (7/16/96; from grade).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-251S

Soil Augering Log

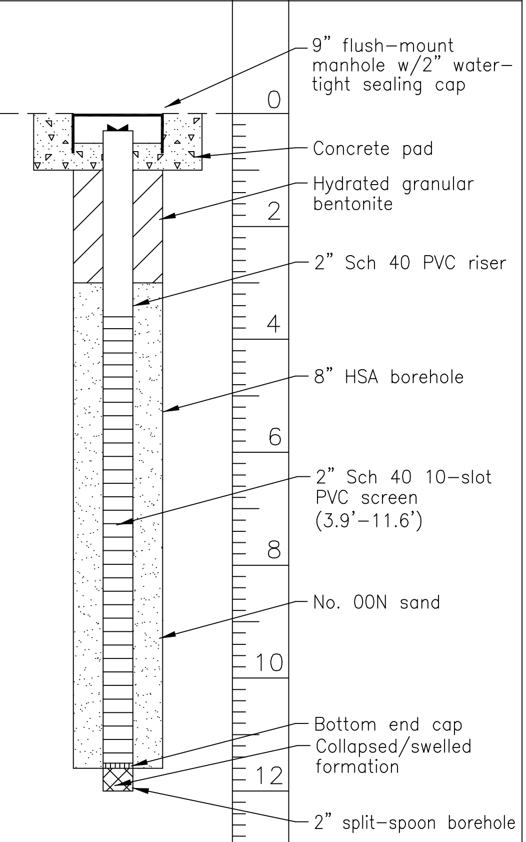
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-255S
Location ~8'E and ~320'N of SE corner of B005

TOC Elev. 178.62'
GS Elev. 179.00'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
	AUGERED				Asphalt pavement 0-3". Gravel base to 9". SAND: dk yel br to lt br, f-m w/vf, lit c, tr vc and f gravel, occ clay mass, loose, moist.	FILL
2 4 6	HAND AUGERED				: olive gray color, incr moisture below 4'. : wet at 4.9'.	
8	2-3-3-3	0 5	1	15"	SAND: dk yel br to olive gray, f-m w/vf, tr silt, homogeneous, loose to cohesive, tr silt/clay rip-up masses, wet.	SP
10	WOR/1'-2-3	0 2	2	24"	SAND: as above, occ dk br organic masses, homogeneous, mod yel br silt and clay layer 21-21.5", horiz. oriented, some iron-staining in sand at base of spoon.	
12	WOR/1'-2-3	0 0	3	24"	SAND: as above w/incr in slit/clay, SR rip-up masses, several br gray masses at 1-5" & lg mod yel br mass at 10", zone containing several clay masses betw 13-15" w/tr vc sand and f SR-R gravel. SILT & CLAY: at 15", br gray w/some vf sand top 3", sl flowing then v dense, plastic w/pale red varves, clay-rich, lg blk organic-rich zone at bottom.	MH/CH
14 16 18 20					Total Depth: 12.0'.	

Well Construction Graphic



Depth Feet

Well Construction Details

- 9" flush-mount manhole w/2" water-tight sealing cap
- Concrete pad
- Hydrated granular bentonite
- 2" Sch 40 PVC riser
- 8" HSA borehole
- 2" Sch 40 10-slot PVC screen (3.9'-11.6')
- No. 00N sand
- Bottom end cap
- Collapsed/swelled formation
- 2" split-spoon borehole

Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7-24-96
Drilling Completed: 7-24-96
Well Construction: 7-24-96
Well Developed: 8-3-96
Well Coords.: N717725.659
E592260.404

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOR = Weight of Rods

Measured DTB from TOC: 11.17'.
Measured DTB from grade: 11.6'.

SWL 4.9' (7/24/96; from grade).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-255S

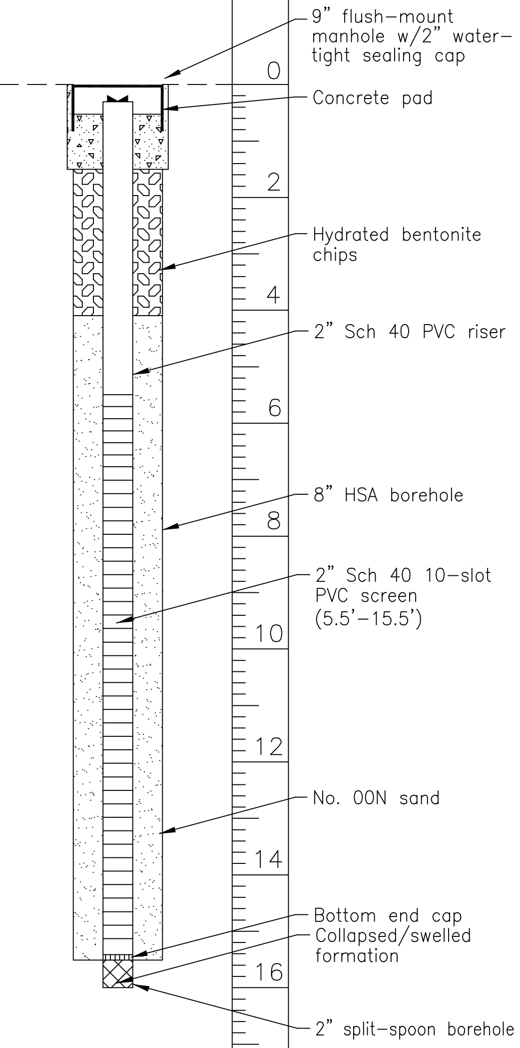
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–260S
Location Inside B005, ~40'S N side/~45'E W side

TOC Elev. 178.85'
GS Elev. 179.20'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Cement to 0.7'. GRAVEL/COBBLES: in sand matrix to 2.1'. SAND: brown at top to brownish gray at base, m w/some c and cobbles, dry at top, moist near base.	▨ FILL SP
8	3–3–5–4	0 0.1	1	14"	SAND: grayish brown, mostly m w/some fines, iron–stained zone at 4", loose, saturated.	
10	5–5–5–8	0 0.1	2	20"	SAND: top 6", grayish brown, m at top to f at base, finely laminated, saturated. SILTY CLAY: 6–13", brownish gray, m stiff, laminated. SAND: 13–20", iron–stained at top, grayish brown at base, m, loose, saturated, tr organics.	ML/CL
12	3–3–3–3	0 0.2	3	8"	SAND: grayish brown, m, loose, occ clay clast, saturated.	SP
14	3–3–4–5	0 0.1	4	14"	SAND: as above w/faint oxidized zone at 2".	
16	WOH–3–3–7	0 0	5	13"	SAND: grayish brown, m, loose, silt lens (1/4" thick) at 6", iron–stained zone above and below silty lens, saturated. SILTY CLAY: grayish brown, lam, m stiff, saturated.	SP/SM ML/CL
18 20					Total Depth: 16.0'.	

Well Construction Graphic — Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–13–96
Drilling Completed: 8–13–96
Well Construction: 8–13–96
Well Developed: 8–20–96
Well Coords.: N717974.382
E592062.747

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 15.24'.

SWL 7.1' (8/13/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–260S

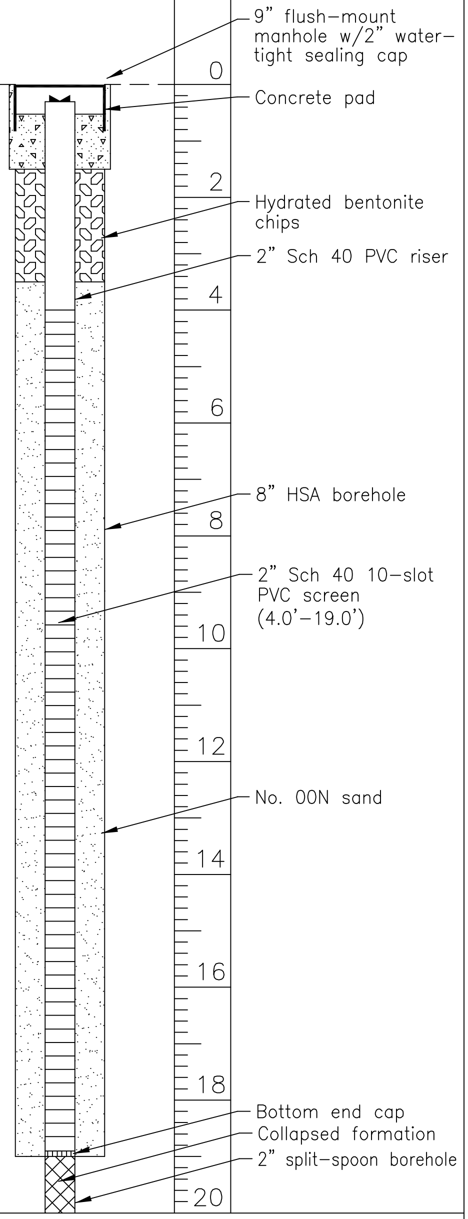
Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-261S
Location Inside B005, ~190' SE of MW-260S

TOC Elev. 178.85'
GS Elev. 179.20'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Cement to 0.5'. SAND: brown at top to grayish brown near base, mostly m w/some A gravel, dense gravel/cobble zone at 4.2'; dry at top, saturated near base.	▨ FILL
8	2-3-4	0/0.2	1	11"	SAND: grayish brown, m, loose with 1/8" silty clay laminations at 4" and 7", saturated.	SP/SM
10	2-3-5-5	0/0.4	2	18"	SAND: grayish brown, m, loose w/ occ thin silty clay lams and small clay clasts, saturated.	
12	3-5-9-10	0/0.4	3	19"	SAND: as above, brownish orange near base.	
14	9-5-5-3	0/0.2	4	19"	SAND: top 14", grayish brown, m, loose w/occ thin silty clay lam and small clay clasts, saturated. SILTY SAND: 14-19", grayish brown, vf sand & silt mix, faintly laminated, saturated.	SM
16	WOH/2'	0/0.4	5	6"	SILTY SAND: as above. SAND: grayish brown w/iron-stained zone at 4", vf at top, grades to m near base, occ clay clasts.	SP/SM
18	6-6-6-6	0/0.1	6	6"	SAND: grayish brown, m, loose, occ silty clay laminations, saturated.	
20				NR		



Total Depth: 20.0'.

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-23-96
Drilling Completed: 8-25-96
Well Construction: 8-26-96
Well Developed: 9-3-96
Well Coords.: N717787.808
E592106.351

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.
WOH = Weight of Hammer
NR = No Recovery
Length of well material: 18.7'.
SWL 6.14' (8/23/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

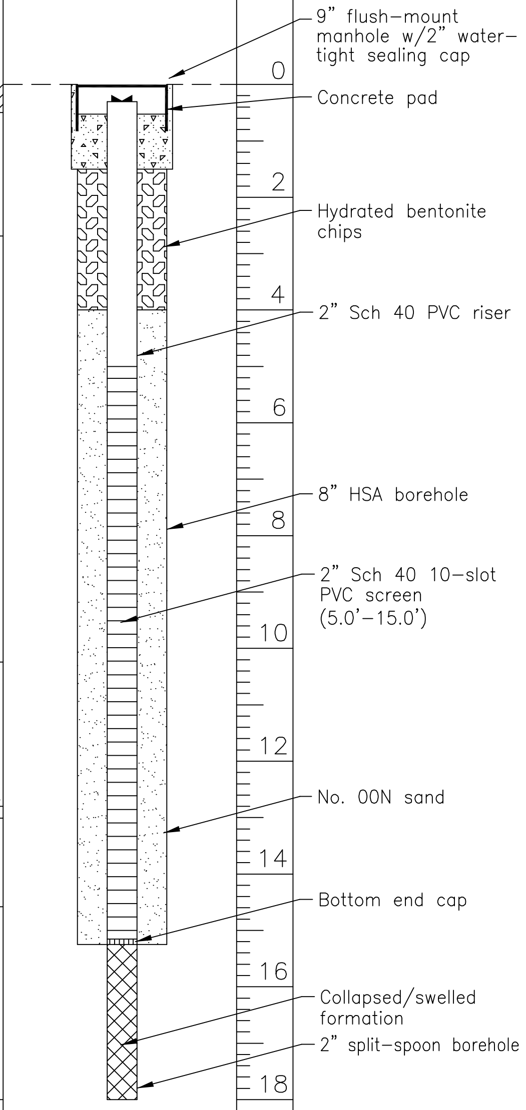
Well Log: MW-261S

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-262S
Location Inside B005, ~130' NW of SE corner B005

TOC Elev. 178.81'
GS Elev. 179.20'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Cement to 0.6'. GRAVEL/COBBLES: with sand matrix to 2.7'. SAND: brownish gray, m, loose w/some grayish brown silty clay, moist.	FILL
8		0 0	1	16"	SAND: grayish brown, m, occ clay clasts, saturated.	
10		0 0	2	19"	SAND: brownish gray, f-m, loose; irregularly spaced 1/8"-thick pinkish-gray silty clay lams throughout, saturated.	SP/SM
12		0.1 0	3	18"	SAND: brownish gray, f-m, loose, finely laminated, occ clay clasts, saturated.	SP
14		0.1 0	4	20"	SAND: as above, top 10". SILTY CLAY: 10-12", iron-stained at top, br gray in center iron-stained at base, laminated, stiff. SAND: 12-20", iron-stained at top, br gray to base, m, finely lam'd, loose, occ pinkish-gray clay clasts, sat.	ML/CL SP
16		0.2 0	5	16"	SAND: top 6", br gray, m, loose, f lams, saturated. SILTY CLAY: 6-16", orangish brown at top to gray at base, 1/4"-thick dk brown sand lens at 8", med-stiff, laminated, faint tr of organic lams near base, saturated.	
18		0 0	6	7"	SILTY CLAY: gray brown, finely laminated, med stiff, saturated.	ML/CL
20					Total Depth: 18.0'.	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-12-96
Drilling Completed: 8-13-96
Well Construction: 8-13-96
Well Developed: 8-20-96
Well Coords.: N717477.310
E592130.997

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Blow counts not available because hammer could not be thrown properly.

Length of well material: 14.7'.

SWL 6.4' (8/13/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-262S

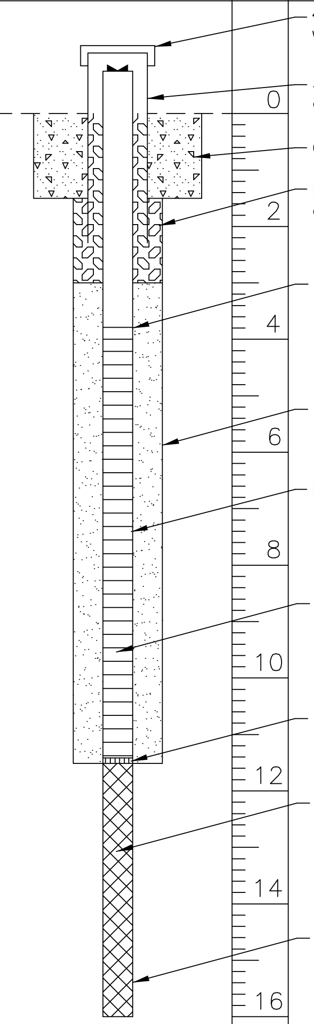
Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-263S
Location ~22'E of MW-504S and S of B005

TOC Elev. 177.82'
GS Elev. 175.53'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–4	HAND AUGERED				SAND: dark brown, m, moist at top, saturated at 3'.	SP
4–6	2-2-2-2	0 0	1	13"	SAND: dark brown, m-c, SR-SA, loose, occ organic laminations, 1/4"-thick lens of grayish brown silt at 8", saturated.	SP/SM
6–8	2-4-5-4	0 0	2	20"	SAND: as above, top 8". SILT: 8-13", grayish brown, mostly silt w/some vf sand, saturated. SAND: 13-20", dark brown, m-c, SR-SA, loose, occ organic lam & lenses of grayish brown silt, saturated.	ML SP/SM
8–10	2-4-4-4	0 0.5	3	19"	SILTY SAND: top 2", grayish brown silt w/vf sand, occ iron-stained grains. SAND: 2-17", brownish gray, loose, saturated. SILTY CLAY: 17-19", gray, med stiff w/pink lam to bottom.	SM SP ML/CL
10–12	1-1-1-1	0 0	4	11"	SILTY CLAY: top 4", gray, med stiff w/pink lam. SAND: 4-11", brownish gray, c, organic-rich, iron-stained w/lens of grayish-pink clay at base.	SP
12–14	1-1-3-4	0 0	5	17"	SILTY CLAY: gray w/pink lam, occ organics, med stiff, saturated.	ML/CL
14–16	4-5-5-7	0 0	6	16"	SILTY CLAY: as above.	
16–20					Total Depth: 16.0'.	



Well Construction Details

- 4" Locking Royer cap w/2" expansion plug
- 4" protective steel casing
- Concrete pad
- Hydrated bentonite chips
- 2" Sch 40 PVC riser
- 8" HSA borehole
- No. 00N sand
- 2" Sch 40 10-slot PVC screen (3.8'-11.5')
- Bottom end cap
- Collapsed/swelled formation
- 2" split-spoon borehole

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-16-96
Drilling Completed: 7-16-96
Well Construction: 7-16-96
Well Developed: 7-23-96
Well Coords.: N717391.333
E592136.097

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 13.8'.

SWL 5.04' (7/23/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-263S

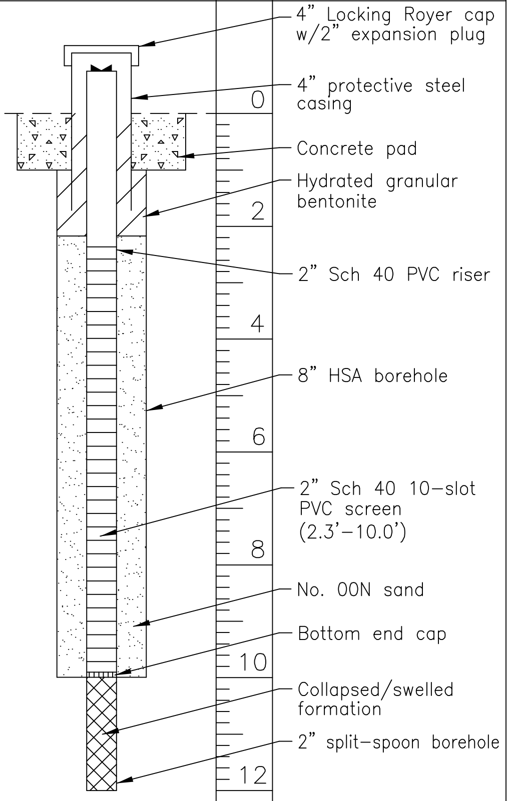
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–264S
Location ~15'S and ~75'E of SW corner B005

TOC Elev. 177.91'
GS Elev. 175.29'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4	HAND AUGERED				Sod 0–3". : water at 3'.	FILL
6	3–3–4–3	0/0	1	19"	SAND: dk yel br, m w/c top 7", some vf–f, tr silt, A–SA limestone pebble at 2", loose, grades to pred f–vf, tr silt below 7", dusky br organic(?) masses 15–16", then lt br to yel orange, coarsening sl to f–m, wet. SAND & SILT: at 18", br gray vf sand w/silt, dense, wet.	SP
8	2–3–3–2	0/0	2	16"	SILT: br gray silt w/vf sand, horiz. laminated 0–9", dense, sl plastic, wet, grading into unit below. SAND: f–m w/vf, tr silt, color change to dk yel br at 14".	ML/SM SP
10	1–2–2–2	0/0	3	17"	SAND: as above w/gray silt layer (~.5" thick) at 9", becoming iron–stained, lt br to yel orange 9–15". SILT: at 15", br gray, top 0.5" oxidized, dense, sl plastic, wet.	
12	1–1–1–5	0/0	4	16"	SILT: as above, brownish gray, horiz. laminated, tr vf sand, wet.	MH/CH
14 16 18 20					Total Depth: 12.0'.	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–16–96
Drilling Completed: 7–16–96
Well Construction: 7–16–96
Well Developed: 7–23–96
Well Coords.: N717396.800
E592075.817

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Measured DTB: 12.81' (from TOC).

SWL ~3' (7/16/96; from grade).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–264S

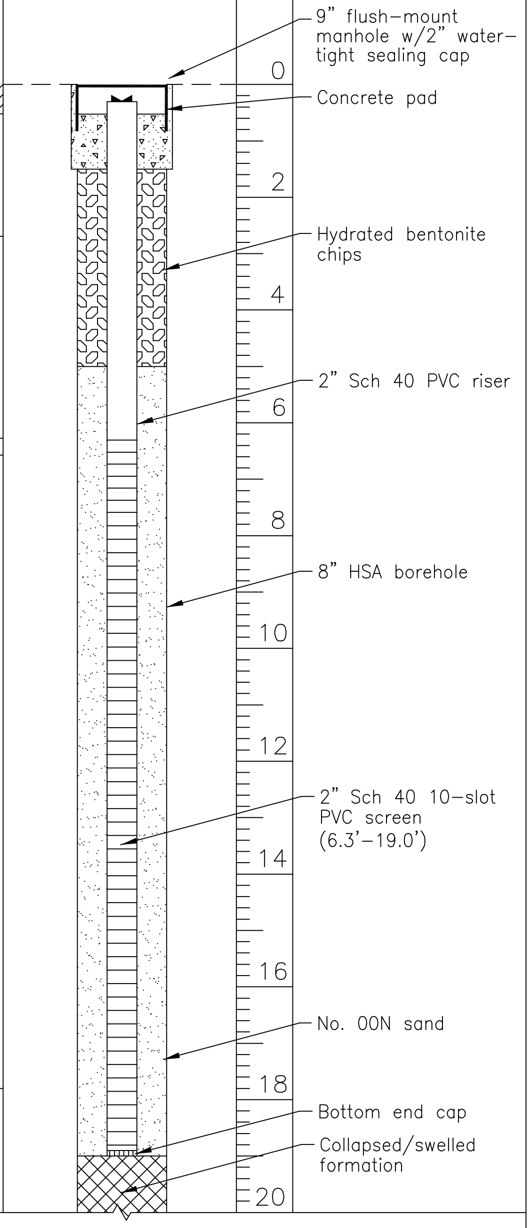
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-265S
Location Inside B003, ~82'W of E side; ~510'S of N side

TOC Elev. 178.77'
GS Elev. 170.05'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Concrete to 7". SAND: brown, mostly m w/some A gravel, loose, dry.	FILL SP
6–8	5-5-7-6	1.7 / 2.6	1	13"	SAND: top 4", brown, m-c, loose, some organic-rich lams, dry. CLAY: 4-6", brownish orange, laminated, stiff, dry. SAND: 6-13", brown, m, loose, moist.	CL
8–10	6-8-8-10	0.2 / 4.2	2	7"	SAND: brown, m, faintly laminated, moist at top to saturated at base.	SP/SM
10–12	4-4-3-4	0 / 1.4	3	12"	SAND: brown, m grading to f-m near base, loose, tr brownish-orange clay lam at 2", saturated.	
12–14	3-3-3-3	0 / 0.7	4	17"	SAND: brownish gray at top to grayish brown near base, f-m, fine laminations, loose, occ clay clasts, saturated.	
14–16	5-4-2-3	0 / 0.9	5	16"	SAND: grayish brown, f-m, laminated, loose, occ clay clasts, saturated.	
16–18	3-4-2-2	0 / 1.0	6	14"	SAND: as above with 1/2" iron-rich zone at base (note: silty sand in shoe of spoon).	
18–20	3-9-12-15	0 / 1.6	7	13"	SILTY SAND: grayish brown, mostly silt w/some f sand, dense, laminated (some cross lams).	SM

Well Construction Graphic — Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-23-96
Drilling Completed: 8-27-96
Well Construction: 8-27-96
Well Developed: 9-3-96
Well Coords.: N717913.613
E591779.614

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

NR = No Recovery

Length of well material: 18.7'.

SWL 7.64' (9/3/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-265S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

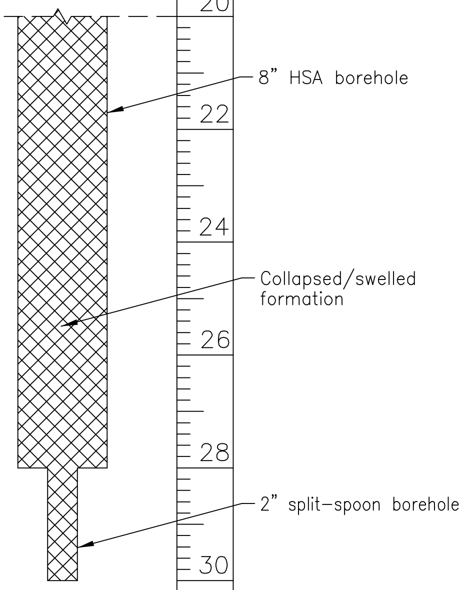
Boring No. MW–265S
Location Inside B003, ~82'W of E side; ~510'S of N side

TOC Elev. 178.77'
GS Elev. 179.05'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	9–10–9–12	0 / 0.7	8	11"	SILTY SAND: as above.	SM
22–24	10–11–6–5	– / –	9	NR		
24–26	9–15–12–14	0 / 1.0	10	16"	SILTY SAND: as above with 1/4" silty clay lam at 5".	SM
26–28	12–14–9–10	0 / 0.5	11	17"	SILTY SAND: as above with silty clay lam at 5".	SM/CL
28–30	9–6–7–6	0 / 1.4	12	18"	SILTY SAND: as above with thin intermittent lenses of silty clay.	SM/CL
30					Total Depth: 30.0'.	

Well Construction Graphic

Well Construction Details



GROUNDWATER SCIENCES CORPORATION

Well Log: MW–265S

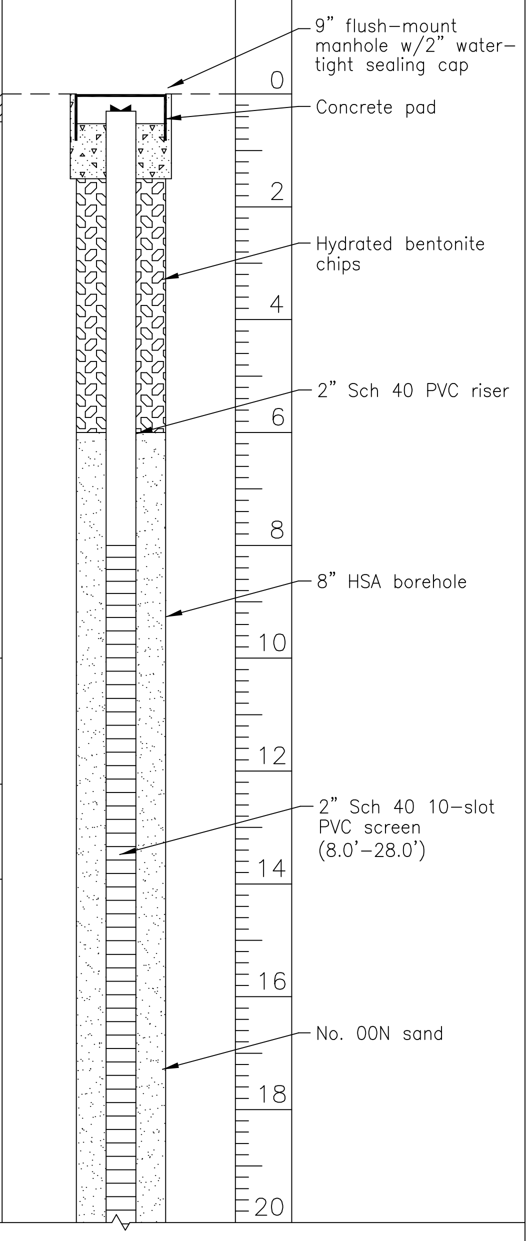
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-266S
Location Inside B003, ~75'W of E side; ~218'S of N side

TOC Elev. 178.73'
GS Elev. 179.15'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED TO 7.25'				Cement to 6". FILL: brown sand, m-c w/occ gravel, occ clay clasts, dry.	▨ FILL
8	14	0 / 11.5	1	9"	FILL: brownish orange m-c sand w/some interlayered dense gray clay, occ gravel, dry.	
10	15-15-12-12	5.2 / 42	2	19"	FILL: grayish brown sand w/occ black organic-rich zones, mostly m, finely laminated, wood chip at base, dry at top, slightly moist at base.	
12	7-10-7-7	12 / 21	3	14"	SAND: grayish brown, c-vc at top grading to vf sand and silt at base, loose, finely laminated, saturated.	SW
14	6-10-7-8	0.1 / 34.8	4	13"	SAND: top 1", grayish brown, f-m, loose, grading to silty clay mix, saturated. SILTY CLAY: 1-12" grayish brown, finely lam, vf sand/silt at top to silty clay near base, laminated, med-stiff. SAND: 12-13", grayish brown, m, loose, saturated.	ML/CL
16	WOH-3-4-4	0.6 / 20.4	5	13"	SAND: grayish brown, m, loose, organic-rich zone 1-4" w/occ grayish brown 1/8 to 1/4" thick silty clay laminations, saturated.	SP/SM
18	5-6-6-7	0.4 / 5.2	6	17"	SAND: grayish brown, m at top, grades to f-m near base, loose, occ clay clast, saturated.	
20	7-8-7-7	0.8 / 6.8	7	14"	SAND: grayish brown, m grading to f-m at base, loose, large silty clay clast (~1/2" thick) at 9", saturated.	

Well Construction Graphic — Depth Feet — Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-20-96
Drilling Completed: 8-21-96
Well Construction: 8-21-96
Well Developed: 9-3-96
Well Coords.: N718203.620
E591793.117

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Faint odor at 10'.

Length of well material: 27.7'.

SWL 8.18'' (9/3/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

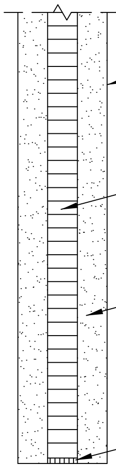
Well Log: MW-266S

Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–266S
Location Inside B003, ~75'W of E side; ~218'S of N side

TOC Elev. 178.73'
GS Elev. 179.15'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20–22	8–11–12–14	0.2 / 1	8	18"	SAND: top 4", grayish brown, m, loose, saturated. SILTY SAND: 4–18", grayish brown, vf sand and silt mix, laminated, dense, saturated.	SP/SM		20–22	8" HSA borehole
22–24	12–10–11–11	0.2 / 3.9	9	13"	SILTY SAND: as above.	SM		22–24	2" Sch 40 10–slot PVC screen (8.0'–28.0')
24–26	10–12–11–10	0.1 / 0.8	10	13"	SILTY SAND: as above.			24–26	No. 00N sand
26–28	3–3–4–7	0 / 0.1	11	6"	SILTY SAND: as above, top 2". SILTY CLAY: 2–6", gray, mostly silt w/some clay, laminated, med stiff.	ML/CL		26–28	Bottom end cap
28–40					Total Depth: 28.0'.			28–40	

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–266S

Soil Augering Log

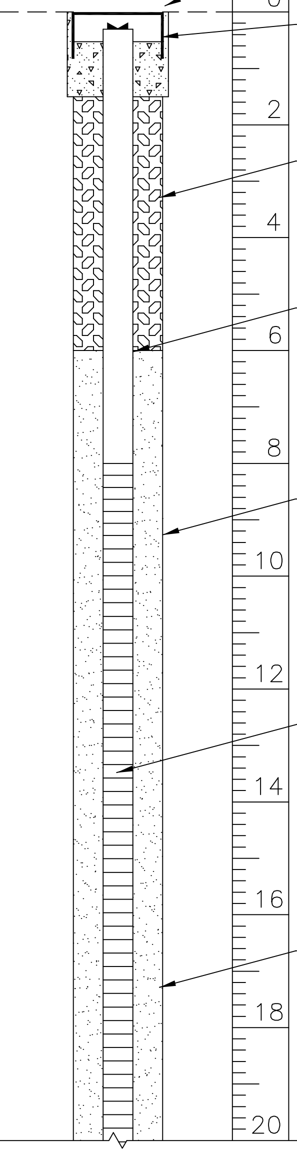
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–267S
Location Inside B003, ~28'N and ~98'W of B002

TOC Elev. 178.77'
GS Elev. 179.10'
Page 1 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Cement to 0.3'. SAND: brown at top to grayish brown at base with some c and A gravel, dry at top to slightly moist at base.	FILL
8	WOH–2–3–4	0.2 / 2.8	1	10"	SAND: grayish brown, m, loose w/interlayer of silty clay 4–8", large woodchip at 3", moist.	SP/SM
10	6–7–7–6	0.6 / 0.8	2	18"	SAND: grayish brown, m, loose, finely laminated, interlayer of silty clay top 2", saturated.	
12	1–4–5–6	0.1 / 0	3	16"	SAND: grayish brown, mostly m with 1/4–1/2" thick interlayers of f sand at 1" and 15", loose, saturated.	
14	3–4–4–5	0 / 0	4	13"	SAND: grayish brown, m at top grading to f–m at base, 1/4" thick grayish pink silty clay lamination at 7", loose, saturated.	
16	WOH–1–3–4	0 / 0.9	5	12"	SAND: grayish brown, m loose, occ clay clast in sand matrix, saturated.	SP
18	3–4–4–6	0 / 0	6	12"	SAND: grayish brown, m at top grading to f–m near base, loose, saturated.	
20	8–3–4–4	0 / 0.6	7	10"	SAND: grayish brown, m, finely laminated, loose, saturated.	

Well Construction Graphic



Well Construction Details

- 9" flush–mount manhole w/2" water–tight sealing cap
- Concrete pad
- Hydrated bentonite chips
- 2" Sch 40 PVC riser
- 8" HSA borehole
- 2" Sch 40 10–slot PVC screen (8.0'–28.0')
- No. 00N sand

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–16–96
Drilling Completed: 8–19–96
Well Construction: 8–19–96
Well Developed: 8–20–96
Well Coords.: N718051.049
E591710.943

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 27.7'.

SWL 8.6' (8/19/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–267S

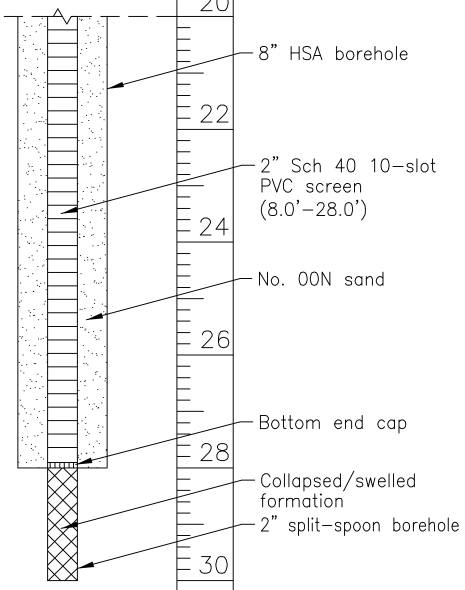
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-267S
Location Inside B003, ~28'N and ~98'W of B002

TOC Elev. 178.77'
GS Elev. 179.10'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	6-12-9-8	0 / 0.1	8	24"	SAND: top 19", grayish brown, mostly m grading to f-m near base, loose, occ clay clast, saturated. SILTY SAND: 19-24", grayish brown, vf sand & silt, finely laminated, dense, saturated.	SP
22–24	7-8-8-9	0 / 1.4	9	4"	SILTY SAND: as above.	SM
24–26	12-14-12-12	0 / 1.2	10	8"	SILTY SAND: as above.	
26–28	4-4-7-4	0 / 0.2	11	12"	SILTY SAND: as above.	
28–30	5-4-6-4	0 / 0.7	12	10"	SILTY SAND: as above.	
30					Total Depth: 30.0'.	

Well Construction Graphic / Well Construction Details



GROUNDWATER SCIENCES CORPORATION

Well Log: MW-267S

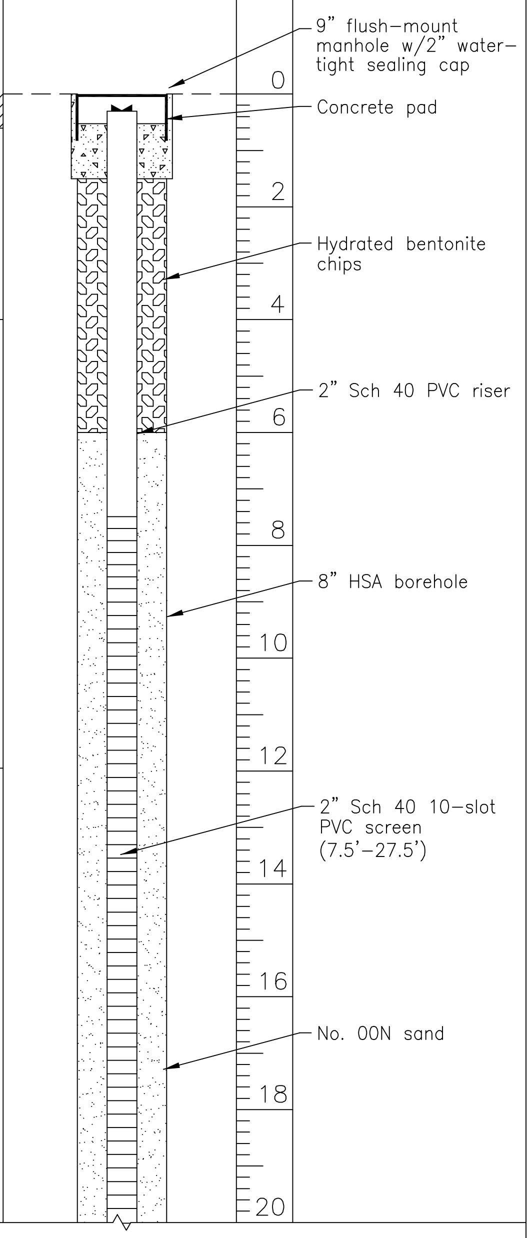
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-268S
Location Inside B003, ~28'S of N and ~110'E of W side

TOC Elev. 178.65'
GS Elev. 179.05'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Cement to 0.6'. SAND: brown, m, occ c, occ gravel, loose, dry at top, slightly moist near base.	SW SP
6–8	1-4-2-2	0 / 0.1	1	18"	SAND: brown, m, occ c, occ A gravel, sl moist.	
8–10	1-1-5-8	0 / 0	2	24"	SAND: as above; saturated near base.	
10–12	3-4-4-4	0 / 0	3	17"	SAND: brown at top to grayish brown at base, m, occ c, occ A gravel, loose, saturated.	
12–14	3-4-5-6	0 / 0	4	19"	SAND: grayish brown, m, loose with 1/2" iron-rich zones at 6" and 19", 1/2" laminated brown silty clay lenses at 12" and 18", saturated.	SP/SM
14–16	WOH-2-4-3	0 / 0	5	18"	SAND: grayish brown, m w/some A gravel at top to f-m at base, iron-rich zone 10-12" with 1/4" thick silty clay lam at base, loose, saturated.	
16–18	3-5-7-12	0.1 / 0	6	19"	SAND: grayish brown, m w/iron-rich zones 2-13" and 15-16", 1/2" thick silty clay lams at base of iron-rich zones, thin organic lam at 12", loose, saturated.	
18–20	4-6-7-8	0.4 / 0	7	24"	SAND: brownish gray, m, slightly fining toward base, loose, occ clay clasts, saturated.	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-15-96
Drilling Completed: 8-15-96
Well Construction: 8-15-96
Well Developed: 8-19-96
Well Coords.: N718388.178
E591732.152

Notes:
*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 27.2'.

SWL 9.4' (8/15/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-268S

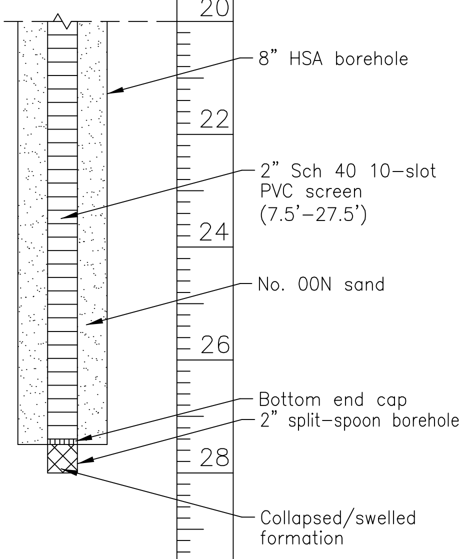
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–268S
Location Inside B003, ~28'S of N and ~110'E of W side

TOC Elev. 178.65'
GS Elev. 179.05'
Page 2 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	8–8–5–6	0 / 0	8	14"	SAND: grayish brown, m grading to f–m near base, loose, saturated.	SP
22–24	3–4–4–5	0 / 0.1	9	18"	SAND: as above.	
24–26	5–7–7–9	0 / 0	10	16"	SILTY SAND: grayish brown, vf sand and silt, finely laminated, loose, dense, saturated.	SM
26–28	5–3–2–2	0 / 0	11	12"	SILTY SAND: as above, top 8". SILTY CLAY: 8–12", gray, med stiff.	ML/CL
28					Total Depth: 28.0'.	



GROUNDWATER SCIENCES CORPORATION

Well Log: MW–268S

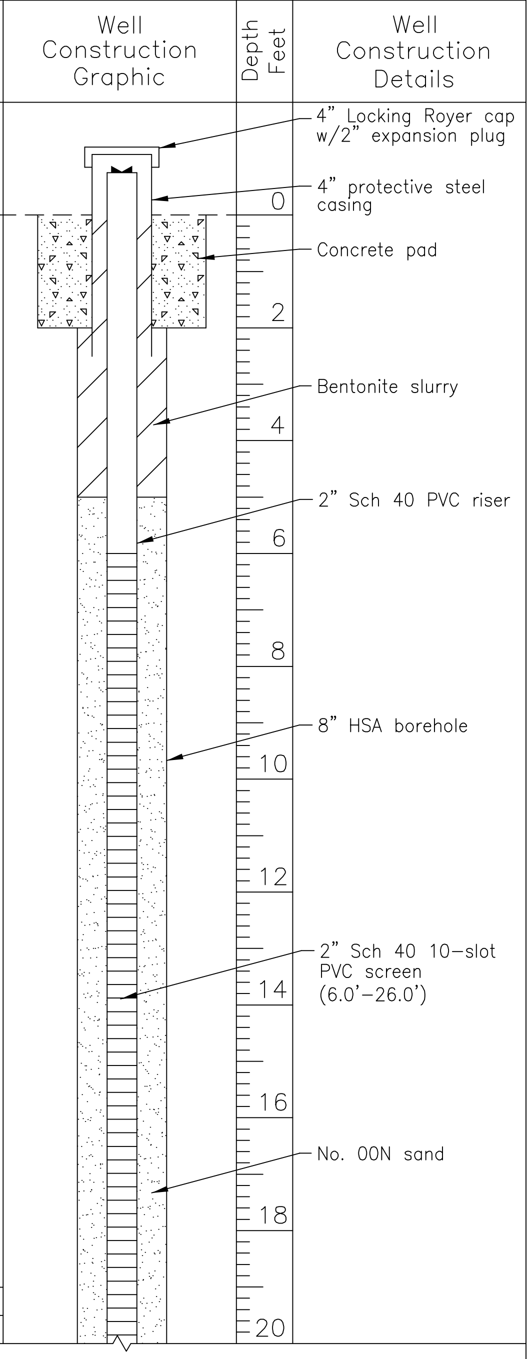
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–269S
Location ~28'N and ~125'E of NE corner B003

TOC Elev. 180.89'
GS Elev. 178.49'
Page 1 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Sod 0–3". SAND: dk yel br, f–m w/vf, tr silt, homogeneous, loose, dry to moist.	SP
8	1–1–1–1	0 / 4	1	11"	SAND: dk yel br, f–m, some f, lit vf, tr silt & sand, wthrd silt masses at 2", 5", & 8", tr rootlets, homogeneous, loose, moist.	
10	3–2–4–2	47 / 45	2	17"	SAND: as above w/thin wthrd silt/clay lam at 5", trace rootlets, stained dk gray to br gray below 9" w/strong petrol. odor, wet below 5".	
12	1–2–2–2	90 / 2000	3	19"	SAND: dk gray to dusky br, f–m w/some vf, tr silt, homogeneous, loose, sl flowing w/petrol odor & sheen, fining to vf–f w/some silt, tr m below 14", return to dk yel br color below 15", wet.	
14	1–2–3–2	1 / 14	4	24"	SAND: dk yel br, pred f w/vf, lit–tr silt, tr m, homogeneous, loose, sl flowing, sl septic(?) odor, wet.	
16	1–1–2–1	4 / 40	5	18"	SAND: dk yel br, f–m w/vf, tr silt, homogeneous, loose, sl flowing, some mod yel br coloration below 8", tr c–vc disseminated sand grains, wet.	
18	1–1–2–2	4 / 52	6	14"	SAND: as above, f–m w/vf, top grading to pred f–vf, tr m at 6–10", sl flowing, homogeneous, oily sheen 5–8" w/sl septic(?) odor, then pred f–m below 10", wet.	
20	2–2–2–1	9 / 31	7	21"	SAND: as above top 12", lt br color band at 12", sl incr in silt & vf sand. SAND & SILT: br gray vf sand & silt w/faint horiz lams 12–18", sl flowing. SAND: dk yel br, f–m w/vf, some silt, homogeneous, loose.	SM SP



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–11–96
Drilling Completed: 7–11–96
Well Construction: 7–11–96
Well Developed: 7–18–96
Well Coords.: N718450.941
E591749.791

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Measured Depth to Bottom: 28.26' (from TOC).

SWL 8.70' (7/18/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–269S

Soil Augering Log

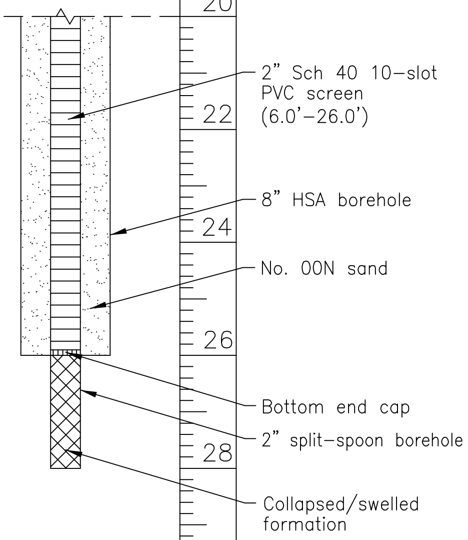
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–269S
Location ~28'N and ~125'E of NE corner B003

TOC Elev. 180.89'
GS Elev. 178.49'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20						
22	4–4–5–4	7 / 45	8	24"	SAND: dk yel br, pred vf–f, lit m, lit silt, homogeneous, loose, thin br gray silt/vf sand layer at 17", ~.5" thick, some color banding betw 17–22" w/ lt to mod br, wet. SAND & SILT: br gray, pred vf & silt, tr f sand top .25", wthrd lt br to mod yel br, homogeneous, faint horiz. layering(?), sl plastic, wet.	SP SM
24	3–6–6–8	6 / 12	9	24"	SAND: dk yel br, pred vf–f w/some m, lit–tr silt, homogeneous, tr isolated vc sand grains (shale), wet. SAND & SILT: below 15", br gray, pred silt w/vf sand, tr–lit clay, sl plastic, mod dense, wet.	SW
26	3–3–6–3	1.8 / 12	10	11"	SAND & SILT: as above w/pred silt & clay, varved 2–4", v plastic, v faint lam below 4", sl plastic wet.	SM
28	WOH–2–1–1	0.8 / 2.5	11	15"	SILT/CLAY: br gray, pred silt w/clay, varved, w/zones rich in vf sand at 1–2" & 11–12", horiz layering, contorted varved clay/silt, w/pale red varves 8–11", wet.	MH/CH
30					Total Depth: 28.0'.	
32						
34						
36						
38						
40						

Well Construction Graphic / Well Construction Details



GROUNDWATER SCIENCES CORPORATION

Well Log: MW–269S

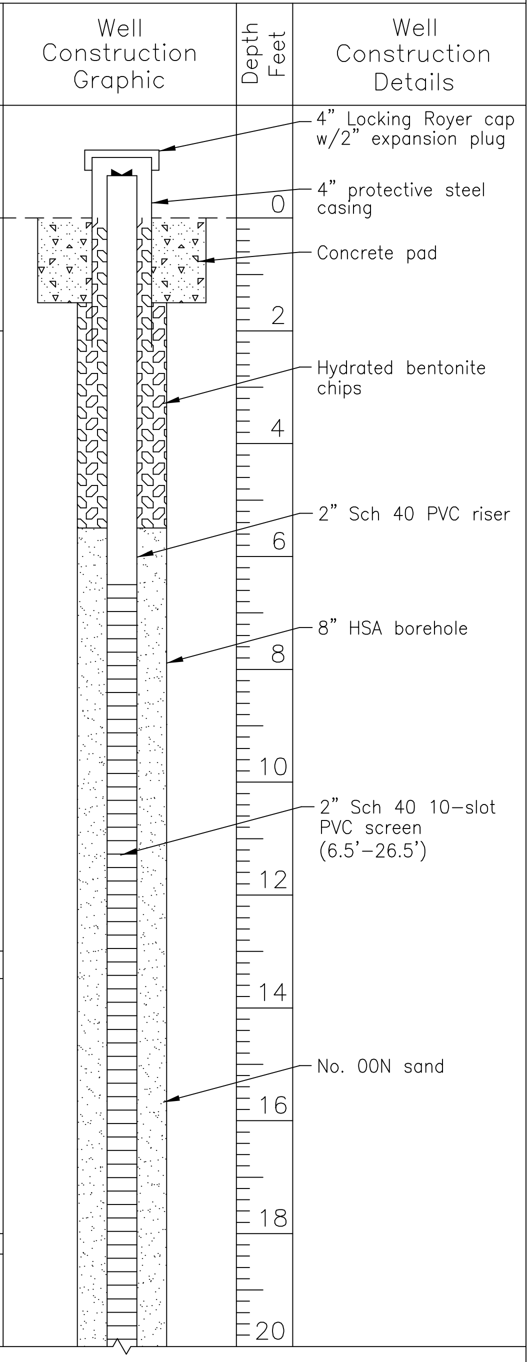
Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-270S
Location ~34'N and ~58'E of NW corner B003

TOC Elev. 180.48'
GS Elev. 177.82'
Page 1 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Sod 0-3". SAND: dk yel br, f-m w/vf, tr c, homogeneous, loose, moist.	FILL
8	3-5-5-5	0/0	1	15"	SAND: dk yel br, f-m w/vf, tr silt, homogeneous, loose, tr dusky yel mottling top 4", moist. SAND: dk yel br to med gray, pred m sand w/f, lit vf, tr silt w/dusky br patches 4-12" v common betw 9-12", dk patches are hard but crumbly, moist, wet below 12".	SP
10	2-1-2-2	100/2200	2	17"	SAND: br gray to olive gray, f-m w/vf, tr silt, homogeneous, loose, top 1" stained dk yel br, septic odor, wet.	
12	1-1-1-1	5/18	3	14"	SAND: as above, mod yel br, silty zone 3-5" ~.5" thick, wthrd silt/clay layer at 9", loose, wet. SAND: pred dk yel br, vf-f, some-lit silt, homogeneous below 9", loose, sl flowing, wthrd clay mass at 12".	
14	1-1-1-1	5/7600	4	22"	SAND: as above, br gray, coarsening sl to f-m w/vf, lit silt, vf sand layer 9-10". SILT/CLAY: mod yel br, varved w/tr vf sand lams, dense, cohesive, wet, 11-18". SAND: below 18", pred dk yel br, f-m w/vf, tr silt, wet.	MH/CH
16	1-1-2-2	2/76	5	18"	SAND: as above w/mod yel br silt/clay varved layers 8-10", 13-14" and 16-18", dense, mod plastic in silt/clay, flowing in sand, wet.	SP
18	1-1-2-2	0/24	6	15"	SAND: dk yel br, vf-f w/some silt, sl flowing, homogeneous, v silty zone 2-5" w/distinct clay lam at 5", clay mass at 7" and faint silt/clay lams betw 13-15", wet.	
20	1-3-3-3	3/25	7	19"	SILT/CLAY: 0-3", mod yel br, dense, plastic, wet. SAND & SILT: br gray vf sand w/silt, some f sand betw 7-11", flowing 11-15", whtrd mod yel br zone 15-17", br gray below 17", no septic odor.	MH/CH SM



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7-11-96
Drilling Completed: 7-11-96
Well Construction: 7-11-96
Well Developed: 7-18-96
Well Coords.: N718463.212
E591681.318

Notes:
*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Measured DTB: 26.4' (7/18/96, from grade).
Measured DTB: 29.06' (5/18/96, from TOC).

SWL 8.70' (7/18/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-270S

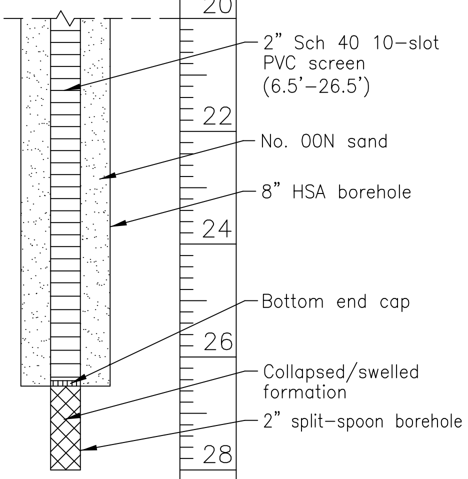
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–270S
Location ~34'N and ~58'E of NW corner B003

TOC Elev. 180.48'
GS Elev. 177.82'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	5–8–11–10	0 / 5	8	17"	SAND & SILT: br gray, vf sand w/silt, homogeneous, v faint crossbedding truncation surface at 10", faint crossbedding throughout, top 1" is wthrd to mod yel br, sl flowing 2–5", cohesive elsewhere, no septic odor, wet.	SM
22–24	3–5–7–7	1.5 / 22	9	19"	SAND & SILT: br gray to med gray, vf sand w/silt, sl flowing, wet. : silt 7–9", br gray w/some clay varves, angled top contact : silt layer 11–12". SAND & SILT: below 12", wthrd, loose, flowing.	SM
24–26	WOH/2'	0.5 / 8	10	20"	SAND & SILT: as above, flowing, faint horiz. lams, wthrd zone & flowing 10–12", some silt/clay, sand in lower 4", wet.	SM
26–28	2–2–2–2	0 / 1.8	11	20"	SAND & SILT: as above top 7". SILT/CLAY: br gray, varved, tr vf sand lams, dense, plastic, dk gray organic–rich layer at top, wet.	SM MH/CH
28					Total Depth: 28.0'.	



GROUNDWATER SCIENCES CORPORATION

Well Log: MW–270S

Soil Augering Log

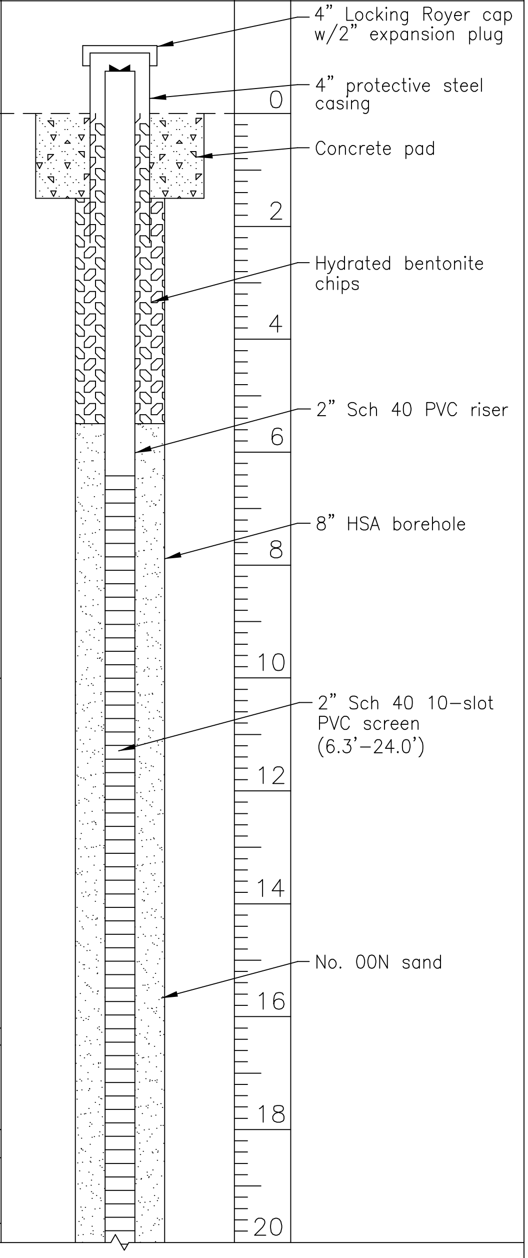
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–271S
Location ~65'NNW of NW corner B003

TOC Elev. 180.17'
GS Elev. 177.31'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Sod 0–3". Dk yel br f–m sand w/vf, tr silt, homogeneous, loose, moist.	SP
8	3–2–2–3	0.5 / 1	1	16"	SAND: dk yel br to olive gray, f–m w/f, pred vf–f top 5", some faint color staining, tr organic masses 14–16", homogeneous, loose to sl cohesive, lit–tr c sand betw 5–9", moist, turning wet at 9".	
10	1–1–2–2	1.0 / 50	2	15"	SAND: as above, silty top 5" w/mod yel br color, pred f–m w/vf, tr silt betw 5–13" w/tr black organic masses betw 11–13", pred vf silty sand lower 2", wet throughout.	
12	1–1–1–1	1.8 / 50	3	13"	SAND: dk yel br, pred vf sand w/f sand & silt, some faint layering by grain size and horiz. color banding lower 1", v silty, dense, tr clay, sl plastic, wet throughout.	SP/SM
14	3–3–2–2	0 / 3	4	17"	SAND: dk yel br, f–m w/vf, some silt, incr in sand fraction below 9", laminated silt between 3–9", grading slowly into sand below, cohesive, sl plastic in silt, br gray clayey silt 3–11", then mod yel, loose, sl flowing m sand, v wet.	
16	2–1–1–1	0 / 4	5	14"	SAND: pred dk yel br f–m w/vf, some silt, fining to pred silty vf–f sand below 7", loose, sl flowing, gray silt/clay rip–up mass at 5", v wet.	
18	WOH/1.5'–1	0 / 0	6	21"	SAND: as above, vf–f, silty top 2", grading to gray silt/clay at 2–5", bottom contact of silt/clay is steeply dipping and irregular, then f–m w/vf, tr silt below, flowing, v wet.	MH/CH SP
20	1–1–2–3	0.5 / 5	7	24"	SILT/CLAY: top 5" br gray, dense, plastic, iron–stained at bottom contact. SAND: below 5", dk yel br, f–m w/vf, tr silt, loose, w/occ wthrd silt/clay masses, wet. SILT/CLAY: below 20", mod yel br 20–22", then br gray, dense, plastic, tr varves, wet.	MH/CH SP MH/CH

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–11–96
Drilling Completed: 7–11–96
Well Construction: 7–11–96
Well Developed: 7–18–96
Well Coords.: N718494.741
E591615.683

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Measured Depth to Bottom: 26.85' (from TOC).

SWL 9.71' (7/18/96; from TOC).

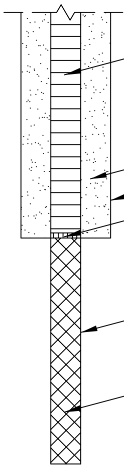
GROUNDWATER SCIENCES CORPORATION

Well Log: MW–271S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–271S
Location ~65'NNW of NW corner B003

TOC Elev. 180.17'
GS Elev. 177.31'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20–22	7–8–7–6	0 / 3	8	15"	SILT/CLAY: br gray, dense, plastic, wet, 0–3". SILT & SAND: br gray, vf sand w/silt, tr clay w/ faint horiz. lams, sl wthrd 3–5", dense, sl plastic, wet.	MH/CH SM		20–22	2" Sch 40 10–slot PVC screen (6.3'–24.0')
22–24	9–8–8–10	0 / 1	9	21"	SILT & SAND: as above w/br gray silt/clay layers 1–9", and 14–15", faint varves, sl flowing in sand, plastic in silt/clay, wet.	SM		22–24	No. 00N sand 8" HSA borehole Bottom end cap
24–26	4–3–2–2	0 / 2	10	20"	SILT & SAND: silt & clay layers 0–5" and 14–20" w/faint horiz. lams, dense, plastic, sl flowing in sand, dk gray to black organic lams at 14" at top of silt/clay, wet. SILT & CLAY: at 14".	SM		24–26	2" split–spoon borehole
26–28	2–3–3–3	0 / 0.5	11	24"	SILT: br gray, dense, sl plastic, cohesive, faint horizontal lams, wet.	MH/CH		26–28	Collapsed/swelled formation
28–40					Total Depth: 28.0'.			28–40	

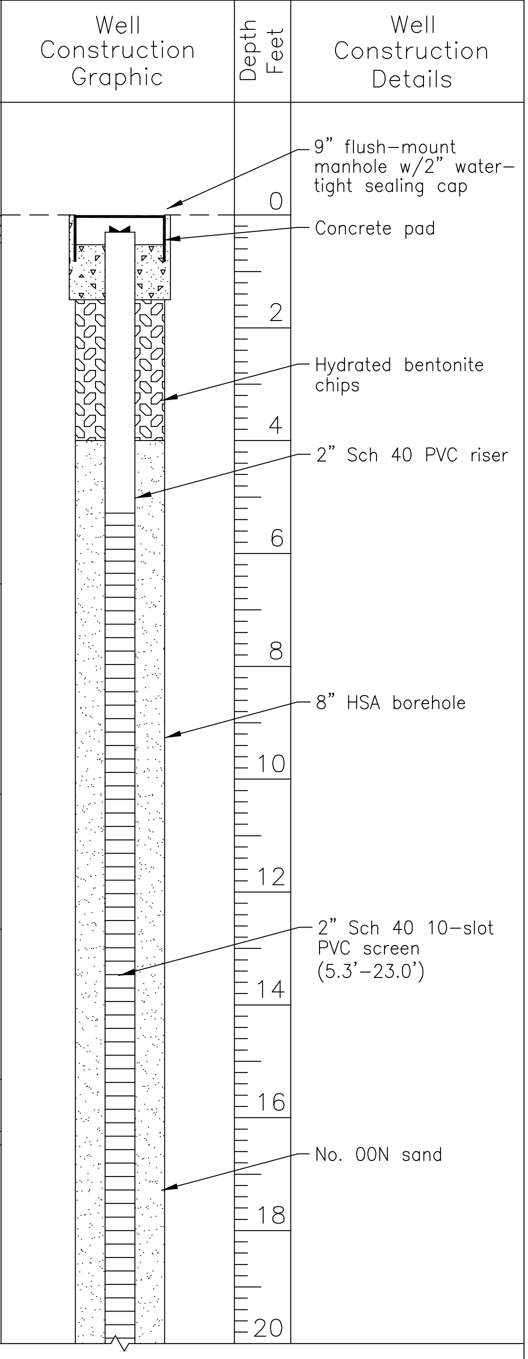
GROUNDWATER SCIENCES CORPORATION

Well Log: MW–271S

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-272S
Location Inside B003, ~38'E of E & ~110'S of N side B002
TOC Elev. 178.71'
GS Elev. 179.10'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Cement to 0.5'. SAND: brown, m, loose w/some A gravel clasts, dry.	▨ SW
8	4-5-6	0/0	1	12"	SAND: brownish gray, m-c, v loose, dry at top to slightly moist at base.	
10	6-5-4-5	0/0	2	16"	SAND: brownish gray, m-c, v loose, occ organic laminations near base, saturated near base.	SP
12	5-4-3-3	0/0.3	3	16"	SAND: top 4", brownish gray, m-c, loose, grading to v dark brown f-m, faintly laminated loose sand, saturated. SILTY CLAY: 14-16", brown to grayish brown, laminated, med stiff.	ML/CL
14	4-4-3-3	0/0.3	4	16"	SILTY CLAY: top 8", as above w/some orange brown laminations. SAND: 8-16", brown to brownish black, m, loose, occ clay clasts & silty clay laminations, saturated.	
16	WOH-2-2-1	0/0.2	5	16"	SAND: as above with 1/4" thick silty clay lamination at 7", saturated. SILTY SAND: grayish brown, vf sand and silt, finely laminated, dense, saturated.	SP/SM SM
18	3-3-2-2	0/0.2	6	11"	SILTY SAND: as above, top 4". SILTY CLAY: 4-5", grayish brown, laminated, med stiff. SAND: 5-11", grayish brown, m, finely laminated, loose, saturated.	ML/CL
20	1-2-3-3	0/0.2	7	16"	SAND: as above w/occ clay clasts, saturated.	SP



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-25-96
Drilling Completed: 8-27-96
Well Construction: 8-27-96
Well Developed: 9-3-96
Well Coords.: N717917.323
E591647.871

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 22.7'.

SWL 7.85' (9/3/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-272S

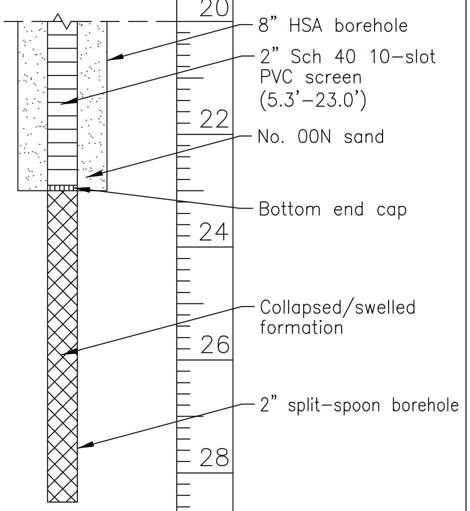
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-272S
Location Inside B003, ~38'E of E & ~110'S of N side B002

TOC Elev. 178.71'
GS Elev. 179.10'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	8-8-7-9	0 / 2.2	8	11"	SAND: top 3", as above w/absence of silty clay lams. SILTY SAND: 3-11", grayish brown, mostly w/some f sand, laminated, dense.	SP SM/CL
22–24	10-11-9-8	0. / 0.8	9	11"	SILTY SAND: as above.	SM/CL
24–28.5	11-5-5-8 8-5-8-9 17	0 / 0	10	37"	SILTY SAND: as above with 1/2"-1" thick silty clay laminations at 30" and 35".	SM/CL
					Total Depth: 28.5'.	

Well Construction Graphic — Well Construction Details



GROUNDWATER SCIENCES CORPORATION

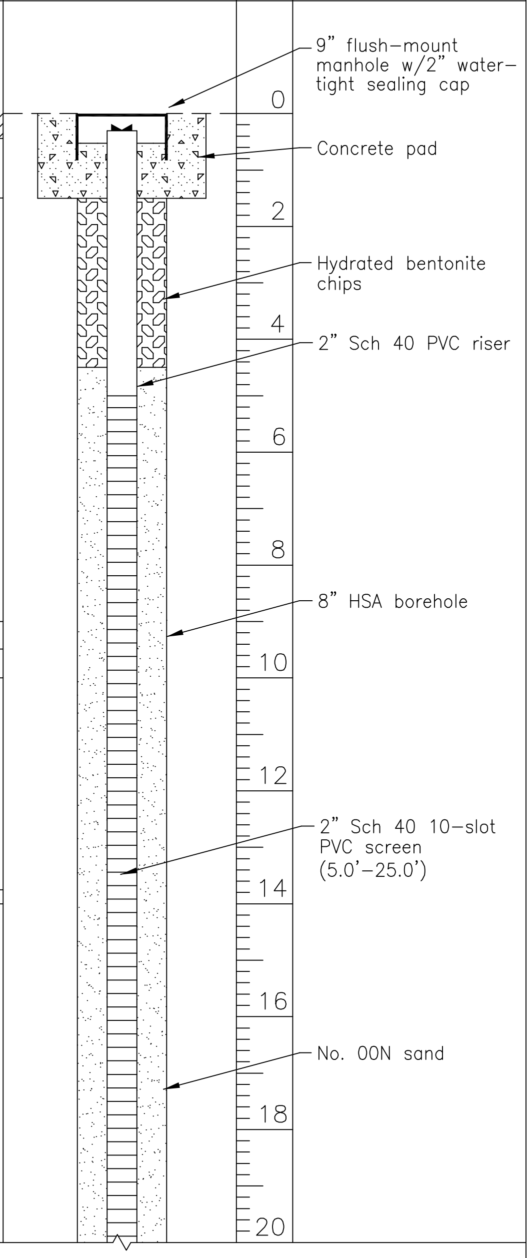
Well Log: MW-272S

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-273S
Location ~248'N and ~8'W of SW corner B003

TOC Elev. 177.91'
GS Elev. 178.22'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Asphalt to 0.4'. GRAVEL: to 0.8'. SAND: brown, m-c, SR-SA, dry.	FILL SP
8	3-3-2-3	0 / 0	1	22"	SAND: top 12", brownish gray, f-m, some orange-brown iron-stained lams, sl moist. SAND: brownish gray, m-c, some black organics, mostly SR-SA, saturated at bottom.	
10	WOH-1-1-2	0 / 0	2	14"	SAND: brownish gray, m-c, SR-SA grading to f sand/silt mix, saturated. SILTY CLAY: mostly brown w/iron-rich zones, med stiff.	SP/SM ML/CL
12	WOH-1-1-2	0.2 / 0	3	18"	SAND: brownish gray, m-c w/some vc, occ silty clay laminations (1/8" thick), loose, saturated.	
14	WOH-1-2-1	0 / 0	4	22"	SAND: as above w/occ silty clay lams (1/8-1" thick) grades to silty sand at base, loose, saturated.	SP/SM SM
16	WOH-1-1-2	0 / 0	5	16"	SAND: as above, grading to A, c at base, occ silty clay lams (1/8" thick), loose, saturated.	
18	2-2-3-3	0 / 0	6	23"	SAND: brownish gray, m-c, SR-SA, loose, grading to grayish brown f-m, loose, saturated.	SP
20	2-1-3-5	0 / 0	7	24"	SAND: brownish gray, m-c, SR-SA, loose, saturated.	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-22-96
Drilling Completed: 7-22-96
Well Construction: 7-22-96
Well Developed: 7-30-96
Well Coords.: N717672.161
E591598.626

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 24.7'.

SWL 6.67' (7/30/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-273S

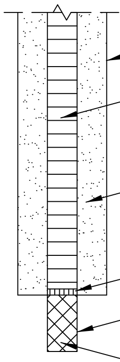
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-273S
Location ~248'N and ~8'W of SW corner B003

TOC Elev. 177.91'
GS Elev. 178.22'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	1-3-2-4	0 / 0	8	15"	SAND: as above.	SP
22–24	AUGERED				SAND: as above.	
24–26	WOH-1-2-1	0 / 0	9	12"	SAND: as above, top 3". SILTY CLAY: 3-12", grayish brown, med stiff, laminated.	ML/CL
26					Total Depth: 26.0'.	

Well Construction Graphic



Well Construction Details

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-273S

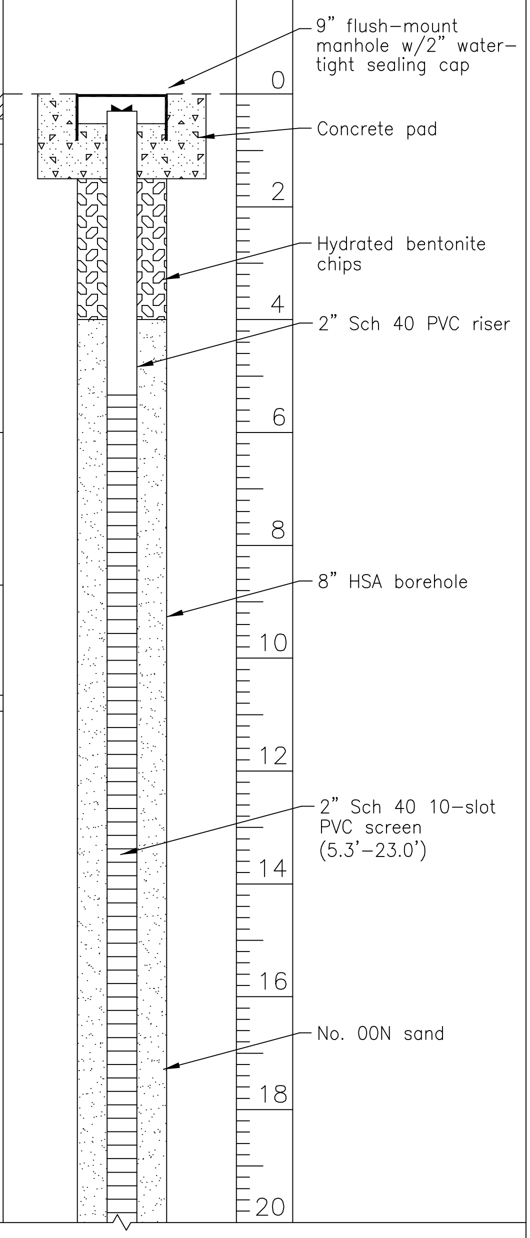
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-274S
Location ~6'W and ~112'S of NW corner of B002

TOC Elev. 177.71'
GS Elev. 178.00'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Asphalt to 0.4'. SAND/GRAVEL: to 0.7'. SAND: grayish brown, m-c w/some A gravel, dry.	FILL SW
6–8	1-4-5-4	0.6 / 0	1	19"	SAND: brownish gray, m-c, SR-SA, occ clay layer (1/4-1/2" thick), grading to finer sand at base, moist at top, saturated at base.	SP
8–10	2-2-3-3	0 / 0	2	13"	SAND: top 7", grayish brown, f-m, loose, saturated. SILTY SAND: 7-13", grayish brown, mostly f w/some silt, loose, black to orange lams near base, saturated.	SP SM
10–12	1-2-3-3	0 / 0	3	11"	SILTY SAND: top 6", as above w/absence of orange or black laminations. SILTY CLAY: 6-9", brown w/orange and black lams, med stiff, saturated. SAND: 9-11", brownish gray, m-c, occ clay clast, loose, saturated.	SM ML/CL SP/SM
12–14	WOH-1-1-2	1 / 0.4	4	14"	SAND: brownish gray, m-c, loose, occ silty clay lams (1/4 to 1/2" thick), grades to v loose, f-m near base, saturated.	SP/SM
14–16	WOH/1'-1/1'	0 / 0.4	5	12"	SAND: brownish gray, m-c, SR-SA, loose, occ silty clay lams (1/4 to 1/2" thick), saturated.	SP/SM
16–18	1-1-1-2	0 / 0.1	6	18"	SAND: brownish gray, m-c, occ clay clasts and silty clay laminations, saturated.	SP/SM
18–20	2-3-4-5	0 / 1	7	24"	SAND: as above.	SP/SM

Well Construction Graphic



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-23-96
Drilling Completed: 7-23-96
Well Construction: 7-23-96
Well Developed: 7-30-96
Well Coords.: N717572.339
E591595.010

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 22.7'.

SWL 6.47' (7/30/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-274S

Soil Augering Log

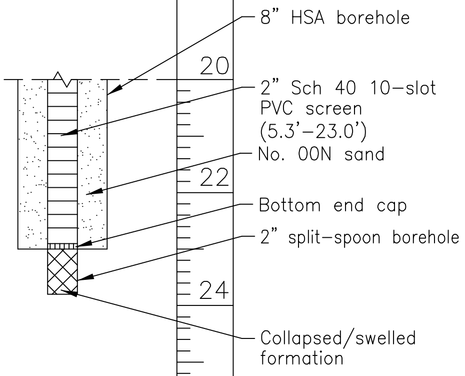
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–274S
Location ~6'W and ~112'S of NW corner of B002

TOC Elev. 177.71'
GS Elev. 178.00'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	2–1–2–2	0 / 0.7	8	24"	SAND: brownish gray, m–c w/some vc, loose, grading to f–m, loose, saturated.	SW
22–24	WOH–7–11–12	0 / 50	9	10"	SILTY CLAY: gray, med stiff, laminated.	ML/CL
24					Total Depth: 24.0'.	

Well Construction Graphic / Well Construction Details



GROUNDWATER SCIENCES CORPORATION

Well Log: MW–274S

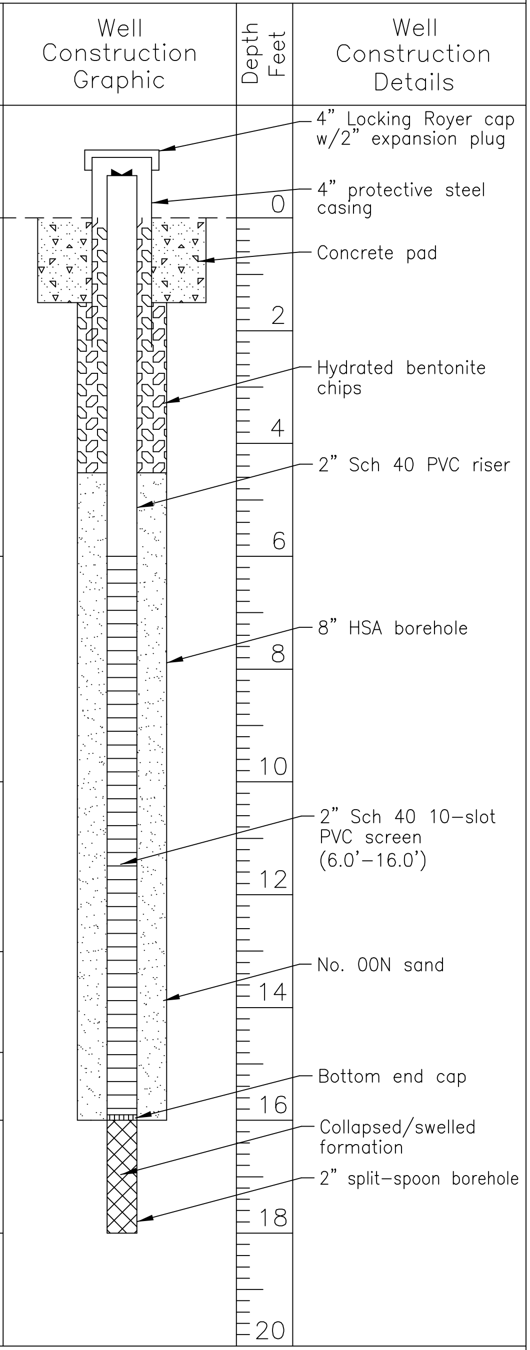
Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-275S
Location ~60'W and ~58S of NW corner B001

TOC Elev. 180.97'
GS Elev. 178.26'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				SAND: brown, m-c w/gravel and cobbles, dry.	FILL
8	2-3-4-4	0.5 / 0	1	14"	SAND: brownish gray, m-c, SR-SA, occ gravel and clay clasts, some layers of iron-stained laminations, moist.	SW
10	2-2-3-4	0 / 0	2	22"	SAND: as above.	
12	2-1-1-1	0 / 0	3	16"	SAND: brownish gray, m-c, SR-SA, loose, saturated.	SP
14	2-2-3-2	0.5 / 0.4	4	20"	SAND: as above top 12". SAND: 12-20", f w/some silt, v loose, saturated.	SP/SM
16	1-1-1-2	0.5 / 0.2	5	17"	SAND: top 12", brownish gray, interbedded m-c & f silty sand, loose, saturated. SILTY CLAY: grayish brown, iron-stained at top, med stiff, pink laminations, saturated.	ML/CL
18	4-5-7-10	0 / 0	6	14"	SILTY CLAY: 12-17", grayish brown, med stiff, black organic layer near base, saturated.	OL
20					Total Depth: 18.0'	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-19-96
Drilling Completed: 7-19-96
Well Construction: 7-19-96
Well Developed: 7-23-96
Well Coords.: N718380.528
E591161.531

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 18.4'.

SWL 10.67' (7/23/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-275S

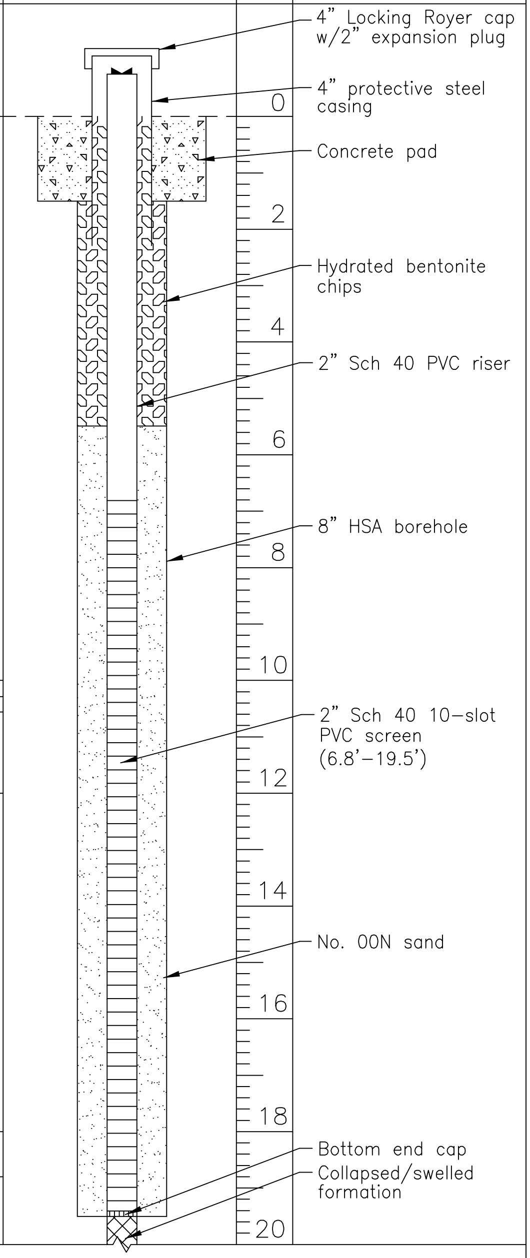
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–276S
Location ~200'S and ~40'W of NW corner B001

TOC Elev. 180.17'
GS Elev. 177.73'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				SAND: brown, m–c, loose, dry to moist near bottom.	SP
6–8	1–2–3–3	0 0.1	1	16"	SAND: brownish gray, m–c, SR–SA; grades to f–m at base, loosely packed, saturated.	
8–10	2–3–3–2	0 0.1	2	19"	SAND: as above.	
10–12	WOH/1'–1–1	0 0	3	18"	SAND: top 5", brownish gray, vc w/some gravel, SR–SA, saturated. SAND: 5–9", brownish gray, m–c w/some A c clasts, loose, saturated. SILTY SAND: brownish gray, mostly f w/some silt, loose, saturated.	SW SP SM
12–14	2–1–1–1	0.1 0	4	16"	SAND: 9–18", brownish gray, m–c w/SA–A gravel clasts, loose; grades to brownish gray, f–m at base w/occ gravel and cobbles, saturated.	SW
14–16	WOH/1'–1–2	0.1 0	5	11"	SAND: brownish gray, m–c, loose w/some SA gravel and cobbles, saturated.	
16–18	2–2–3–2	0 0.1	6	24"	SAND: as above.	
18–20	2–3–5–9	0 0.4	7	12"	SAND: top 9", brownish gray, f–m, SR–SA, loose, iron–rich at base, saturated. SILTY CLAY: 9–12", grayish brown, laminated, stiff, saturated.	SP ML/CL



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–18–96
Drilling Completed: 7–18–96
Well Construction: 7–18–96
Well Developed: 7–23–96
Well Coords.: N718233.542
E591177.196

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 21.5'.

SWL 9.46' (7/23/96; from TOC).

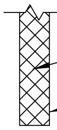
GROUNDWATER SCIENCES CORPORATION

Well Log: MW–276S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–276S
Location ~200'S and ~40'W of NW corner B001

TOC Elev. 180.17'
GS Elev. 177.73'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20								20	
	2–2–3–4	0 0	8	10"	SILTY CLAY: as above	ML/CL			Collapsed/swelled formation 2" split–spoon borehole
22					Total Depth: 22.0'.			22	
24								24	
26								26	
28								28	
30								30	
32								32	
34								34	
36								36	
38								38	
40								40	

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–276S

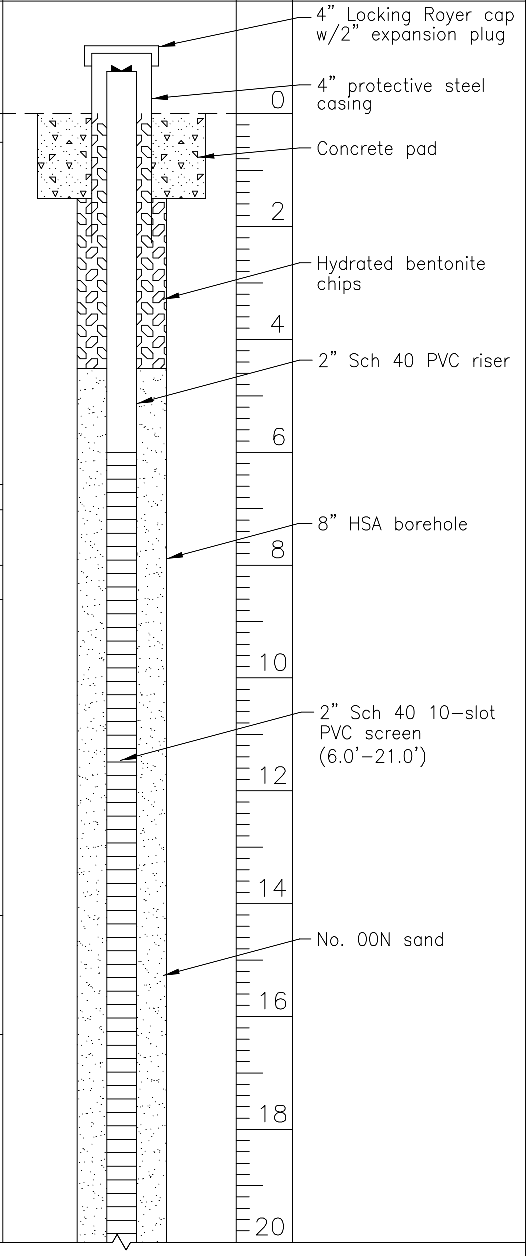
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-277S
Location ~308'S and ~12'W of NW corner B001

TOC Elev. 180.33'
GS Elev. 177.96'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				SAND & GRAVEL: brown, m-c, mixed w/A gravel & cobbles to ~0.5', dry. SAND: brown, m-c, grading to brownish gray near base, occ vc and gravel, slightly moist near base.	FILL SW
6–8	5-5-5-5	0/0.1	1	19"	SAND: top 7", brownish gray, f-m, finely lam, some wood chips/roots, iron-rich zones. SILTY CLAY: 7-14", brownish orange w/lams, grading to brown silty sand w/organic laminations at base, saturated. SAND: 14-19", brownish gray, m, loose, saturated.	OL/SM SP
8–10	5-5-10-7	0.1/0.1	2	24"	SAND: top 7", brownish gray, vf-f w/dk br m-c lams (1/4" thick) & 1/2" thick pinkish silty gray clay lam, zones of orange in f sand above and below lam (1/2" thick), saturated. SAND: 7-24", brownish gray, m, grades to f-m w/black lams near base, saturated.	SW SP
10–12	8-4-3-4	0/0	3	13"	SAND: brown, m-c w/some vc, loose, grades to brownish gray, m, loose, saturated.	SP
12–14	13-9-8-7	0.1/0.3	4	13"	SAND: brownish gray, m, loose, occ clay clasts and black organic staining, saturated.	SP
14–16	4-4-4-5	0/0.1	5	23"	SAND: as above w/occ brown silty clay laminations (1/4 to 1/2" thick).	SP/SM
16–18	2-1-2-2	0.2/0.2	6	19"	SAND: brownish gray, m, v loose, saturated.	SP
18–20	2-1-2-3	0/0.2	7	18"	SAND: as above, becomes finer near base.	SP

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-24-96
Drilling Completed: 7-24-96
Well Construction: 7-24-96
Well Developed: 7-30-96
Well Coords.: N718133.521
E591202.231

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 23.4'.

SWL 9.55' (7/30/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-277S

Soil Augering Log

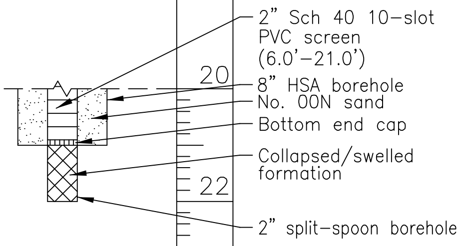
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–277S
Location ~308'S and ~12'W of NW corner B001

TOC Elev. 180.33'
GS Elev. 177.96'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	2–3–2–3	0.2 0.6	8	23"	SAND: top 10", brownish gray, m, loose, saturated. SILTY CLAY: 10–23", gray, laminated, med stiff, saturated.	SP ML/CL
22					Total Depth: 22.0'.	

Well Construction Graphic / Well Construction Details



GROUNDWATER SCIENCES CORPORATION

Well Log: MW–277S

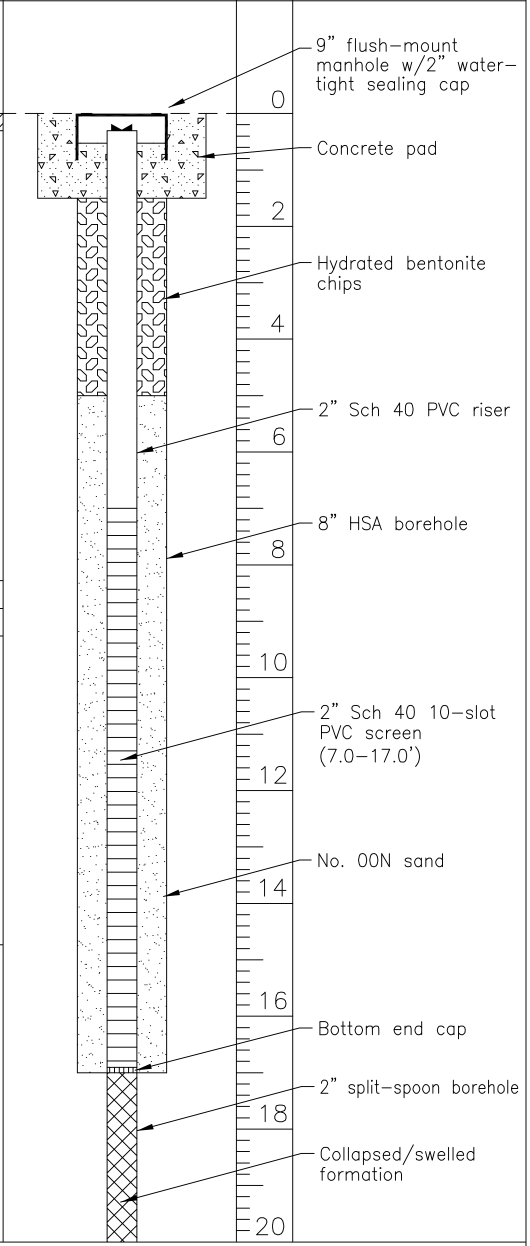
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–278S
Location ~188' NW of NW corner B001

TOC Elev. 177.32'
GS Elev. 177.65'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Asphalt to 0.3'. GRAVEL: to 0.5'. SAND: brown, m–c, loose w/some dense gray clay to 6', dry.	SP
6–8	3–4–4–4	0/0	1	17"	SAND: grayish brown at top to brown at base, m–c, SR–SA, occ iron– and organic–rich zones, loose, moist at base.	SP
8–10	1–3–2–3	0/0	2	17"	SAND: as above, top 3". SILTY SAND: 3–9", grayish brown, mostly f sand w/silt, some organics, saturated. SILTY CLAY: 9–16", orange–brown w/some sand interlayers. SAND: 16–17", br gray, m–c, SR–SA, loose, saturated.	SM SM/CL
10–12	1–1–2–2	0/0	3	14"	SAND: brownish gray, m–c, SR–SA, occ dark black laminations (organic–rich), occ gravel, saturated.	SP
12–14	WOH–1–2–1	0/0	4	16"	SAND: brownish gray, m–c, SR–SA, occ A gravel and cobbles, occ clay rip–up clasts and thin clay lenses, saturated.	SP
14–16	WOH–1–1–2	0/6.4	5	18"	SAND: as above, top 8". SILTY CLAY: 8–18", brown to brownish gray w/pink varves, orange streaking near base, med stiff, grading to brown sand at base.	SP ML/CL
16–18	3–4–3–3	0/0.4	6	16"	SILTY CLAY: brownish gray at top with orange streaking grading to gray silty clay, med stiff, saturated.	ML/CL
18–20	1–1–1–1	0/0.5	7	13"	SILTY CLAY: gray, med stiff, laminated, saturated.	ML/CL



Total Depth: 20.0'

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–22–96
Drilling Completed: 7–22–96
Well Construction: 7–22–96
Well Developed: 7–23–96
Well Coords.: N718603.066
E591132.715

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 16.8'.

SWL 10.67' (7/23/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–278S

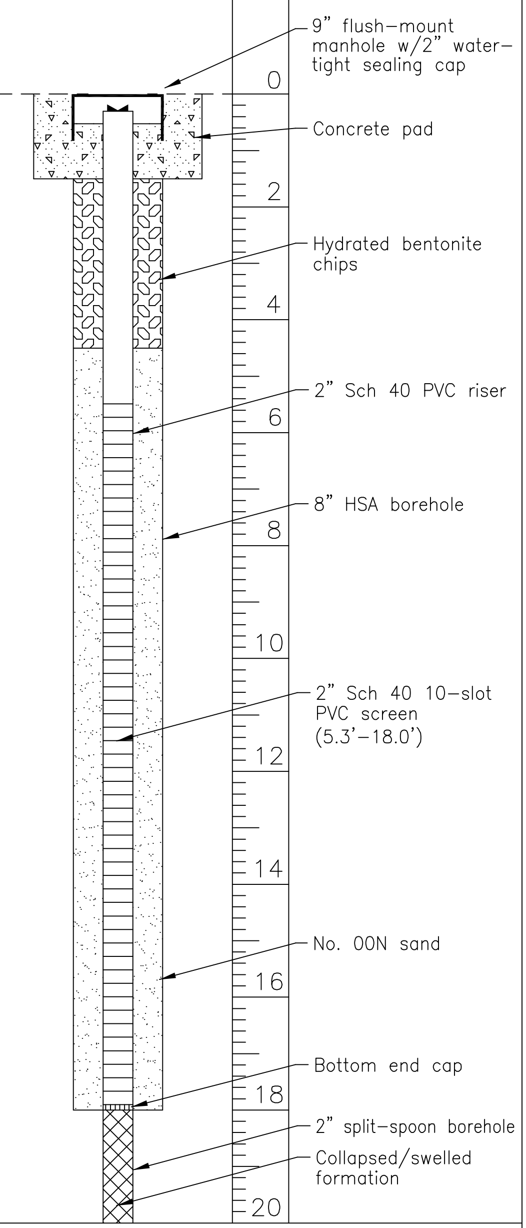
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–279S
Location ~95W and ~52'S of N side B001

TOC Elev. 177.32'
GS Elev. 177.60'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Asphalt to 0.2'. GRAVEL/SAND: mix 0.2–0.7'. SAND: grayish brown, m–c w/some gravel, cobbles, dry 0.7–6.0'.	FILL
8	2–2–3–3	0/0	1	18"	SAND: brown grading to grayish brown at base, m–c, SR–SA, slightly moist at base.	SP
10	1–1–1–1	0.1/0	2	13"	SAND: grayish brown, m–c w/occ vc, SR–SA w/ some clay clasts near base of spoon, saturated.	
12	WOH–2–3–2	0/0	3	14"	SAND: as above w/occ silty clay laminations (1/8" thick), saturated.	
14	WOH–2–2–3	0.2/0	4	16"	SAND: as above, top 11". SILTY SAND: 11–16", brownish gray, mostly f with some silt, v loose, saturated.	SM
16	2–4–4–4	0/0	5	24"	SAND: brownish gray, m–c grading to f w/silt at base, loose, saturated.	SP/SM
18	2–2–2–3	0/0	6	24"	SAND: as above, top 22". SILTY CLAY: 22–24", brown with pink varves, iron–rich zone near base, med stiff.	
20	1–2–4–4	0/0	7	13"	SILTY CLAY: grayish brown, laminated, med stiff.	ML/CL

Well Construction Graphic / Well Construction Details



Total Depth: 20.0'

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–22–96
Drilling Completed: 7–22–96
Well Construction: 7–22–96
Well Developed: 7–23–96
Well Coords.: N718388.980
E591073.241

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 17.7'.

SWL 7.61' (7/23/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–279S

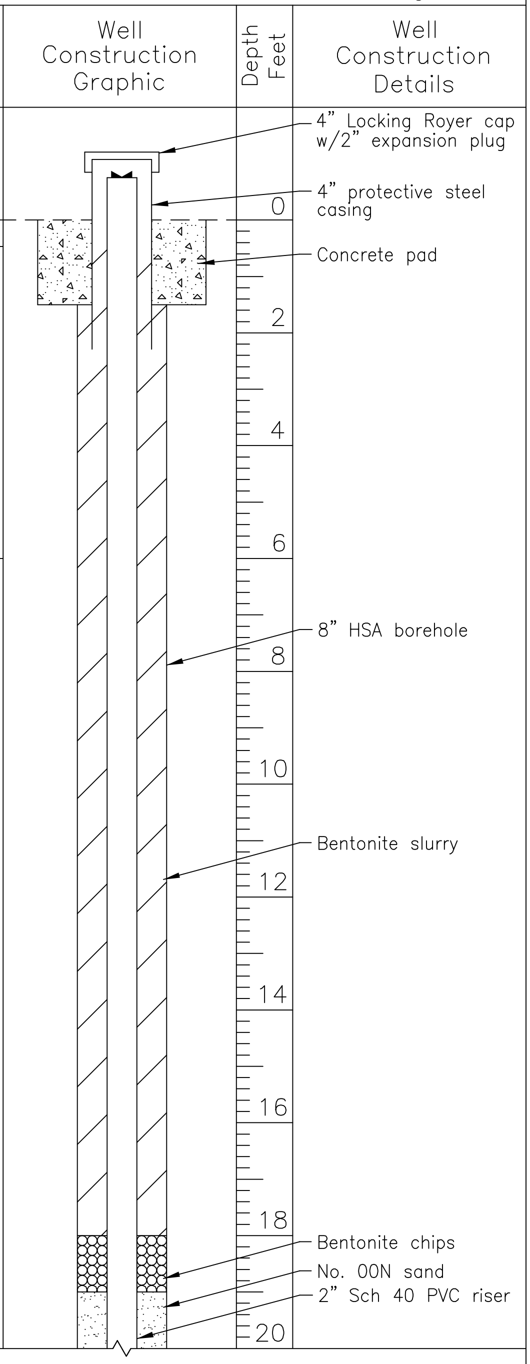
Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-280M
Location ~90'E and ~172'N of SE corner B025

TOC Elev. 180.57'
GS Elev. 178.17'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				SAND & GRAVEL: to 0.3'. SAND: brown, m–c w/some vc, loose, dry.	FILL SW
6–8	2–3–2–2	0/0	1	19"	SAND: grayish brown w/orange staining, m–c, SR–SA, occ organics, moist at top, saturated at base.	SP
8–10	1–1–2–2	0/0.4	2	17"	SAND: dark brown, c w/some vc, SR–SA, loosely packed, occ organics, grading to brownish gray, m–c sand at base, saturated.	
10–12	WOH–1–2–2	0/0.1	3	14"	SAND: brownish gray, m–c, SR–SA w/some A vc, occ clay clast, loosely packed, saturated.	
12–14	1–1–2–3	0/0	4	20"	SAND: brownish gray, m–c, SR–SA w/some A vc, loosely packed, saturated.	
14–16	1–1–2–3	0/0	5	23"	SAND: as above.	
16–18	4–4–5–7	0/1	6	24"	SAND: as above.	
18–20	2–3–3–4	0/0.5	7	24"	SAND: as above.	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–23–96
Drilling Completed: 7–23–96
Well Construction: 7–23–96
Well Developed: 8–3–96
Well Coords.: N717033.096
E591412.054

Notes:
*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

NR = No Recovery
WOH = Weight of Hammer

Length of well material: 38.4'.

SWL 9.26' (8/3/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-280M

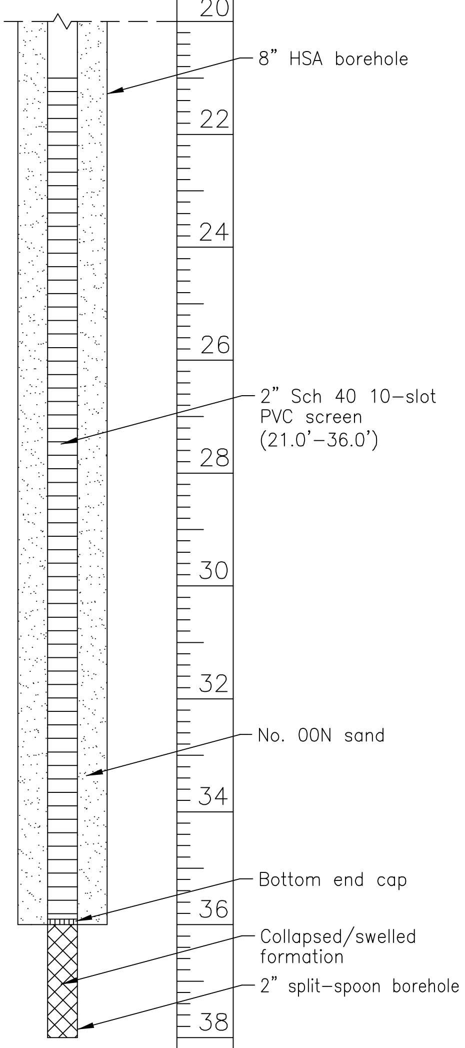
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-280M
Location ~90'E and ~172'N of SE corner B025

TOC Elev. 180.57'
GS Elev. 178.17'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–24	AUGERED			NR	Note: heaving sand.	SP
24–26	3-3-4-3	0.4/0.4	8	11"	SAND: as above.	
26–28	WOH/1'-1/1'	0/0	9	6"	SAND: brownish gray, m-c, SR-SA, loose, occ grayish brown silty clay lams (1/4-1/2" thick) and brown clay clasts, saturated.	SP/SM
28–30	2-3-2-4	0/0	10	18"	SAND: as above, top 5". SILTY SAND: 5-8", gray, mostly laminated f sand & silt w/m brown sand interlayers. SILTY CLAY: 8-11", gray, med stiff. SILTY SAND: 11-18", gray, mostly lam f sand & silt w/m br sand interlayers; zone of organic lam near base.	SM ML/CL SM
30–32	3-3-3-6	0/0.2	11	16"	SILTY SAND: as above, top 5". SAND: 5-16", brownish gray, m-c, loose w/occ orange lams and black streaks and grayish brown silty clay interlayers, saturated.	SP/SM
32–34	6-5-6-6	0/0	12	18"	SAND: top 10", as above w/occ gray silty clay interlayers, saturated. SAND: 10-16", grayish brown, m grading to f sand and silt near base, loose, saturated. SILTY CLAY: 16-18", gray, med stiff, laminated.	ML/CL
34–36	5-1-3-2	0/0	13	17"	SAND: grayish brown, m-c, loose, grades to f-m near base, saturated. SILTY CLAY: gray, med stiff, laminated (small amount near base).	SP
36–38	2-2-1-1	0/0	14	1"	SILTY CLAY: gray, med stiff, laminated, saturated.	ML/CL
38–40					Total Depth: 38.0'.	

Well Construction Graphic / Well Construction Details



GROUNDWATER SCIENCES CORPORATION

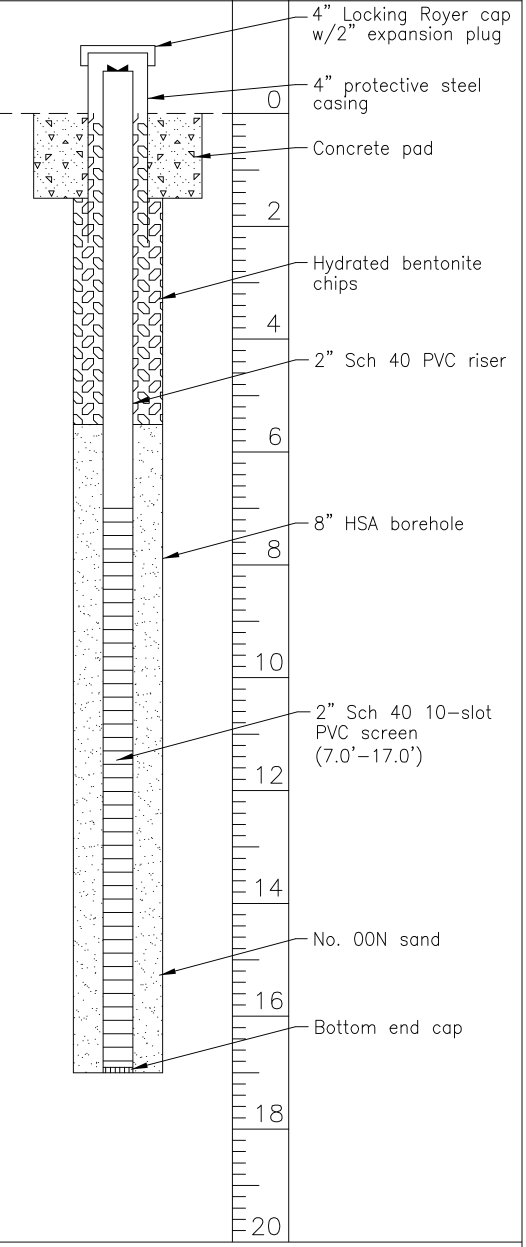
Well Log: MW-280M

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–280S
Location 4.5'W of MW–280M, SE of B025

TOC Elev. 180.78'
GS Elev. 178.17'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
17.0					Total Depth: 17.0'.	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–23–96
Drilling Completed: 7–23–96
Well Construction: 7–23–96
Well Developed: 7–30–96
Well Coords.: N717033.388
E591407.553

Notes:
*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Well completion only; no samples taken.

Length of well material: 19.6'.

SWL 9.42' (7/30/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–280S

Soil Augering Log

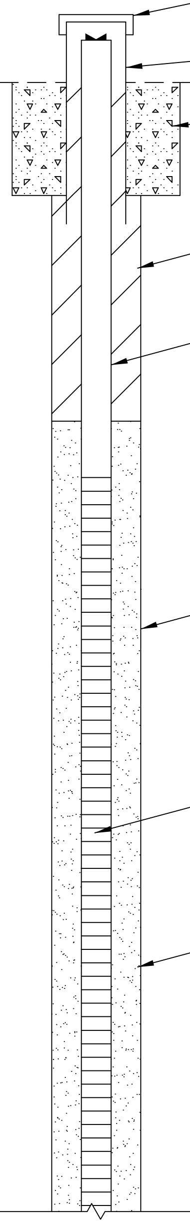
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-281S
Location ~120'N and ~75'W of NE corner of B003

TOC Elev. 179.96'
GS Elev. 177.56'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2	AUGERED				Landscaping gravel and soil, 0-1'. Asphalt pavement at 1'. SAND: below 1.25', dk yel br, f-m w/vf, some c, tr silt.	FILL
4 6	HAND AUGERED					
8	5-10-8-10	0/0	1	18"	SAND: dk yel br, f-m w/vf, tr silt, some dusky br organic blotches, homogeneous, cohesive, dk br top 4", sl mottled to 13", moist, turning wet in lower 4".	SP
10	6-6-5-5	0/2	2	14"	SAND: dk yel br, f-m w/vf, tr silt, fining to pred vf-f, lit silt lower 3", some dusky br organic blotches w/some horiz. layering between 2" & 4", cohesive to loose, sl flowing at bottom, saturated.	
12	2-2-2-2	0/0	3	24"	SAND: dk yel br, f-m w/incr vf sand and silt, cohesive, sl flowing, faint horiz. layering, v wet. SAND & SILT: mod yel br, vf sand & silt w/horiz. lam & faint clay lams throughout 10-11" and below 16", sl flowing, v wet.	
14	2-2-1-1	0/0	4	19"	SAND: dk yel br, f-m w/vf, tr-lit silt, homogeneous, loose, wthrd varved silt/clay layer, mod yel br betw 5-7", dense, plastic, tr clay masses lower 2", v wet.	SP/SM
16	1-1-2-2	0/0	5	13"	SAND: as above top 5". SILT/CLAY: mod yel br, then grading to br gray at 10.5", less cohesive, sl flowing 5-9", then dense, stiff, plastic below, wet throughout.	MH/CH
18	1-1-1-1	0/0	6	17"	SAND: dk yel br, f-m w/vf, tr silt, loose, clay mass at 6", v wet, 0-7". SILT/CLAY: at 7", mod yel br, grades to br gray at 8", then lt br w/dk yel orange below 10". SAND: as above at 12", fining to vf-f below 14", sl flowing in f sand, v wet.	SP MH/CH
20	1-1/1'-1	0/0	7	17"	SAND: dk yel br, f-m w/vf, tr silt, v homogeneous, flowing, small wthrd silt mass at 8", v wet.	SP

Well Construction Graphic



Well Construction Details

4" Locking Royer cap w/2" expansion plug

4" protective steel casing

Concrete pad

Hydrated granular bentonite

2" Sch 40 PVC riser

8" HSA borehole

2" Sch 40 10-slot PVC screen (7.0'-22.0')

No. 00N sand

Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7-12-96
Drilling Completed: 7-12-96
Well Construction: 7-12-96
Well Developed: 7-16-96
Well Coords.: N718543.949
E591802.612

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Measured Depth to Bottom: 24.00' (from TOC).

SWL 9.70' (7/16/96; from TOC).

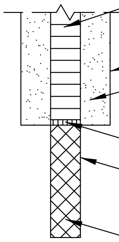
GROUNDWATER SCIENCES CORPORATION

Well Log: MW-281S

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-281S
Location ~120'N and ~75'W of NE corner of B003

TOC Elev. 179.96'
GS Elev. 177.56'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20								20	2" Sch 40 10-slot PVC screen (7.0'-22.0')
22	5-6-6-8	0 0	8	24"	SAND: as above top 10", gray sand 10-11", large wthrd silt/clay rip-up mas at 7-9", v wet. SILT & SAND: br gray silt w/vf sand, homogeneous, w/faint horiz lams, distinct & sloped top contact, dense, sl plastic, wet. SILT: at 16" br gray w/tr clay, mod dense, slightly plastic w/faint sl angled lams.	SP SM MH/CH		22	8" HSA borehole No. 00N sand
24	WOH/1'-2-3	0 0	9	5"	SILT/CLAY: br gray w/tr pale red varves 0-2", dense, plastic wet. SILT & SAND: br gray, vf sand w/silt, cohesive, no varves, wet.			24	Bottom end cap 2" split-spoon borehole Collapsed/swelled formation
					Total Depth: 24.0'.				
26								26	
28								28	
30								30	
32								32	
34								34	
36								36	
38								38	
40								40	

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-281S

Soil Augering Log

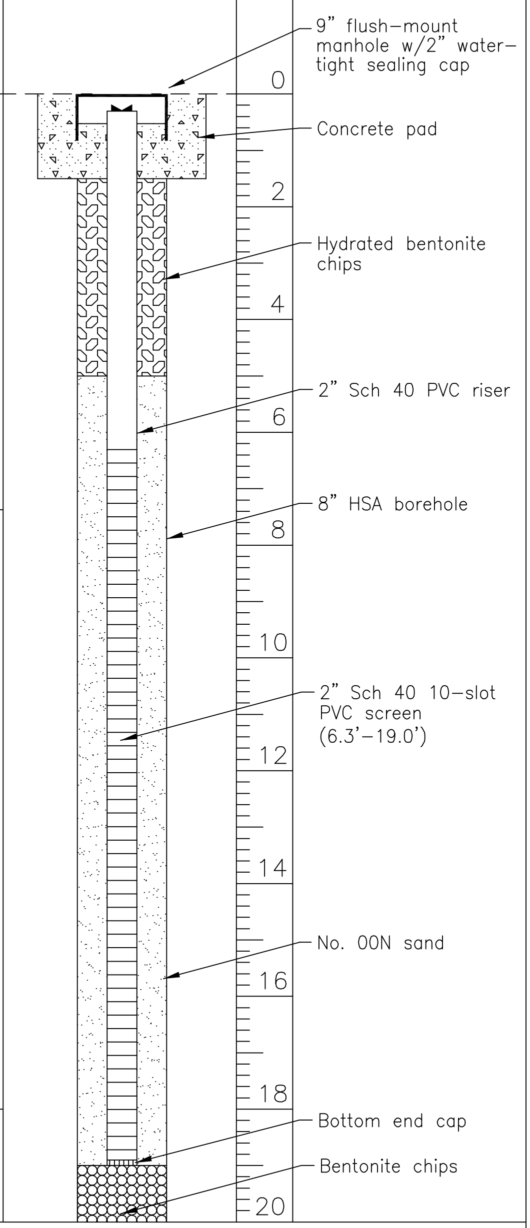
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-282S
Location ~145'NW of NW corner of B005

TOC Elev. 176.63'
GS Elev. 176.99'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				FILL: dark brown sand, m-c w/gravel, cobbles and wood chips to 6'.	FILL
8	7-8-9-14	5	1	21"	FILL: top 16". SAND: grayish brown, m, slightly moist, occ clay lens.	SP
10	7-10-10-11	0	2	17"	SAND: as above, saturated.	
12	7-4-4-5	0	3	14"	SAND: as above.	
14	2-2-3-3	0	4	12"	SAND: as above.	
16	2-2-3-3	0	5	14"	SAND: as above.	
18	2-2-3-4	0	6	17"	SAND: grayish brown, f-m, loose, silty clay lens at 9", saturated.	
20	4-4-8-10	0	7	12"	SILTY CLAY: gray, soft-med stiff, pink laminations.	ML/CL

Well Construction Graphic / Well Construction Details



Total Depth: 20.0'

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-15-96
Drilling Completed: 7-15-96
Well Construction: 7-15-96
Well Developed: 7-16-96
Well Coords.: N718547.503
E591918.591

Notes:

*Instrument malfunction during split-spoon scan; FID readings for jar headspace scan measurement only.

Length of well material: 18.7'.

SWL 6.55' (7/16/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-282S

Soil Augering Log

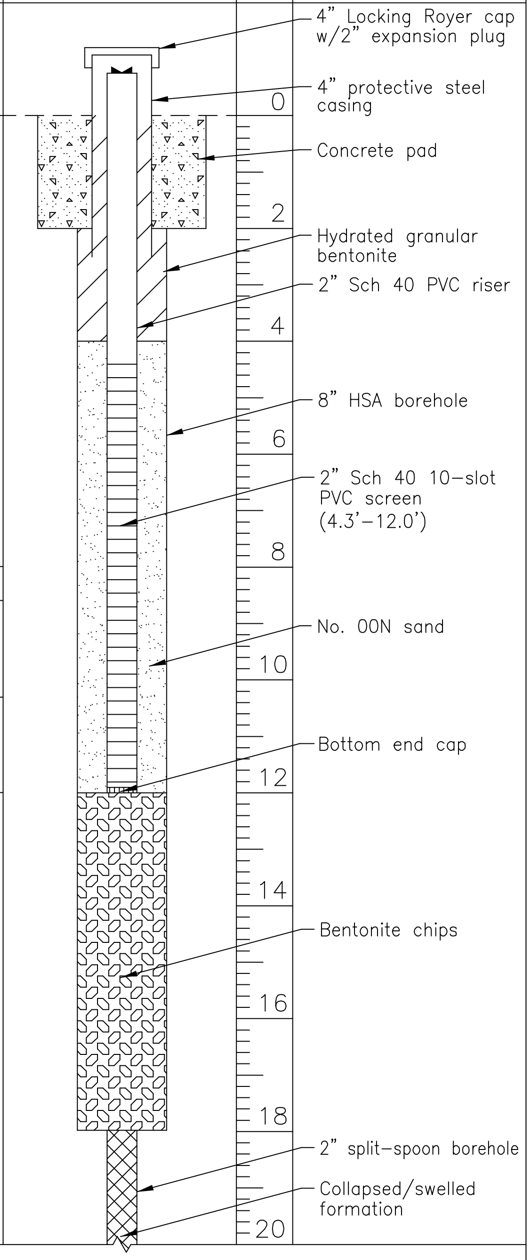
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–283S
Location ~30'N of NW corner of B005N

TOC Elev. 180.26'
GS Elev. 177.83'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Landscaping mulch 0–4". Dk yel br f–m sand w/vf, tr c, tr silt, loose, moist.	FILL
8	1–3–5–7	0.5 / 30	1	20"	SAND: dk yel br, f–m w/vf, tr c, some silt, dusky br organic–rich layers betw 3–15", cohesive, sl crumbly, wet zone 4–8", more gray tint below 3", tr rootlets throughout, top 3" dry, moist.	
10	4–10–10–9	0 / 25	2	14"	SILT: 0–7", lt olive gray, some vf sand top 2" w/ rootlets & organic frags throughout, faint horiz. laminations, cohesive, wet. SAND & SILT: 7–14", pred vf w/f, some silt, tr silt lam, some faint layering, cohesive, mostly vf sand w/silt lower 2", wet.	OL SM
12	4–3–3–2	0 / 64	3	15"	SAND & SILT: as above, wet 0–3" w/silt lam at 3", grading into unit below. SAND: lt olive gray, f–m w/vf, tr silt, homogeneous, occ rootlets, cohesive to sl flowing, wet.	SP
14	WOH–1–2–1	0 / 6	4	9"	SILT: br gray w/some vf sand, tr–lit clay, varved w/pale red lams 3–6", dk gray m sand lam at 6", cohesive, sl plastic, wet.	ML/CL
16	2–1–1–1	– / –	5	NR	No recovery–possibly running sandy silt.	
18	WOH/1'–1–2	0 / 1	6	10"	SILT: as above w/pale red clay–rich laminations 3–4", sl plastic, wet.	
20	5–7–7–8	0 / 1	7	18"	SILT: as above, no varves, sl flowing top 7", wet.	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–12–96
Drilling Completed: 7–12–96
Well Construction: 7–12–96
Well Developed: 7–19–96
Well Coords.: N718476.427
E592030.230

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer
NR = No Recovery

Measured DTB: 14.59' (from TOC).

SWL 9.18' (7/19/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

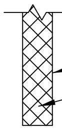
Well Log: MW–283S

Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-283S
Location ~30'N of NW corner of B005N

TOC Elev. 180.26'
GS Elev. 177.83'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20–22	7-9-7-6	0 / 1	8	17"	SILT: as above w/vf sandy zone 13-15", varves 15-16", cohesive, wet.	ML/CL		20–22	2" split-spoon borehole Collapsed/swelled formation
22–40					Total Depth: 22.0'.			22–40	

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-283S

Soil Augering Log

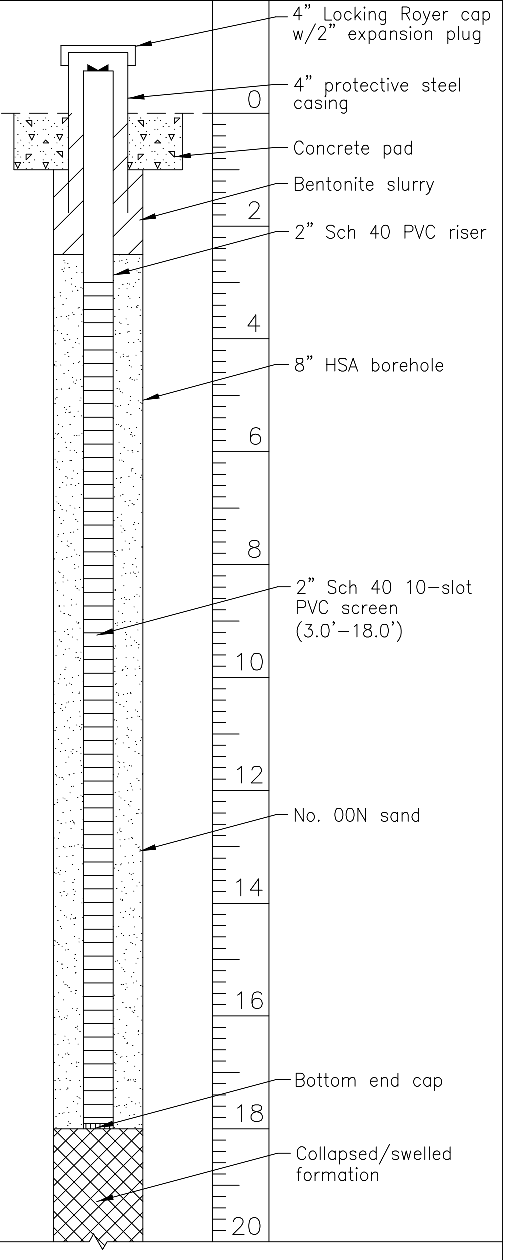
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–284S
Location ~510'N of NW corner of B005N

TOC Elev. 174.77'
GS Elev. 172.45'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2	HAND AUGERED				Sod 0–3". Dark yellow brown sand and silt soil. GRAVEL: dk gray m–c road bed gravel and cobbles with some silt & sand, loose, moist.	FILL
4 6	HAND AUGERED and AUGERED				: gravelly to 6'.	FILL
8	1–4–8–10	0 / 3	1	2"	SAND & SILT: br black, vf–f silty sand, some m, tr c–vc, organic–rich, occ rootlet, cohesive, sl crumbly, moist.	SM
10	2–3–3–3	0 / 0.8	2	16"	SAND: br gray to med gray, f–m w/vf, some–lit silt, homogeneous, grains composed of quartz, dk gray & red shale, loose, saturated.	SP
12	4–4–3–3	– / –	3	NR	: running sand, no measurable recovery.	SP
14	1–1–2–4	0 / 1.4	4	10"	SAND: as above, homogeneous w/rootlet at 7", incr silt & vf sand fraction lower 2".	SP
16	3–4–4–3	0 / 0.6	5	16"	SAND & SILT: pred br gray, f–m sand w/vf sand & silt, tr black organic masses top 6", sl flowing, becoming pred br gray vf sand & silt below 6", homogeneous, v faint horiz lams, no varves, sl plastic, more dense than above, wet.	SM
18	4–5–6–6	0 / 0	6	12"	SAND & SILT: br gray vf sand w/silt, homogeneous, no varves, sl plastic, dense, cohesive, wet.	SM
20	4–2–3–1	0 / 0	7	21"	SAND & SILT: br gray, homogeneous, vf–f sandy silt zones w/faint horiz lams, varved clayey silt layers at 1–3", 5–7" & 12–13", v plastic, dense, f–m w/vf, lit silt betw 13–17", wet. SILT/CLAY: br gray lower 4", v dense, v plastic, homogeneous, no varves.	SM/MH MH/CH

Well Construction Graphic — Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–9–96
Drilling Completed: 7–9–96
Well Construction: 7–9–96
Well Developed: 7–16–96
Well Coords.: N718960.745
E591983.172

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

NR = No Recovery

Measured Depth to Bottom: 20.36' (from TOC).

SWL 6.95' (7/16/96; from TOC).

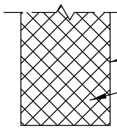
GROUNDWATER SCIENCES CORPORATION

Well Log: MW–284S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–284S
Location ~510'N of NW corner of B005N

TOC Elev. 174.77'
GS Elev. 172.45'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20	2–2–2–2	0/0	8	16"	SILT/CLAY: as above w/more clay, v plastic, dense, occ varved zones, homogeneous w/sl horizontal lams elsewhere, wet.	MH/CH		20	8" HSA borehole Collapsed/swelled formation
22					Total Depth: 22.0'.			22	
24								24	
26								26	
28								28	
30								30	
32								32	
34								34	
36								36	
38								38	
40								40	

GROUNDWATER SCIENCES CORPORATION

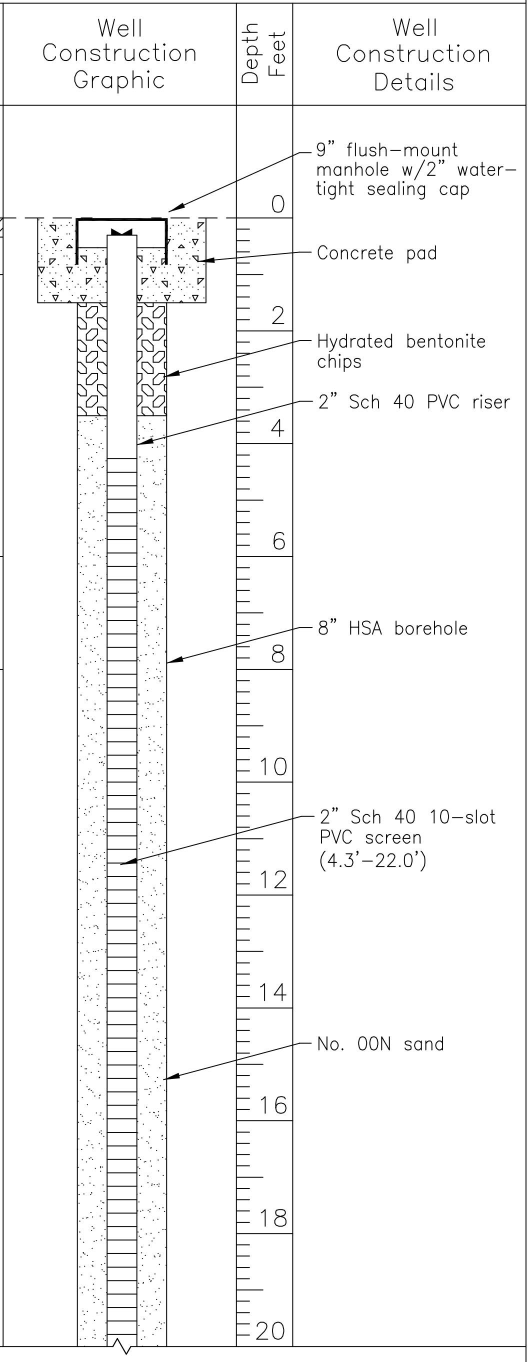
Well Log: MW–284S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–285S
Location ~42'W and ~28'S of N side of B003

TOC Elev. 177.49'
GS Elev. 177.89'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Asphalt to 0.3'. FILL: sand, gravel and cobble mix to 1.2'. SAND: dark brown, m–c, SR–SA, loose, occ gravel, moist.	FILL SP
6–8	1–2–1/1'	– –	1	NR		
8–10	3–3–3–3	0.4 80	2	8"	SAND: dark brown at top to gray at base, m–c, SR–SA, loosely packed, saturated.	SP/SM
10–12	WOH/1'–1–1	0 1.4	3	12"	SAND: dark brown, m–c, SR–SA, occ organics, occ clay clasts, loose, med brown silty clay lens ~1/4" thick) near base, saturated.	
12–14	1–1–3–3	7 62	4	14"	SAND: brownish gray, m–c, SR–SA, occ clay clasts, occ cobbles, loose, soft.	
14–16	1–1–1–1	4 48	5	17"	SAND: as above with 1" silty clay lens at 10".	
16–18	1–1–1–1	0.1 64	6	19"	SAND: as above.	
18–20	1–1–5–6	0.3 17	7	18"	SAND: as above.	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–18–96
Drilling Completed: 7–18–96
Well Construction: 7–18–96
Well Developed: 7–19–96
Well Coords.: N718401.017
E591583.329

Notes:
*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Oily sheen observed in 12–16' split–spoon samples.

NR = No Recovery
WOH = Weight of Hammer

Length of well material: 21.5'.

SWL 6.80' (7/19/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–285S

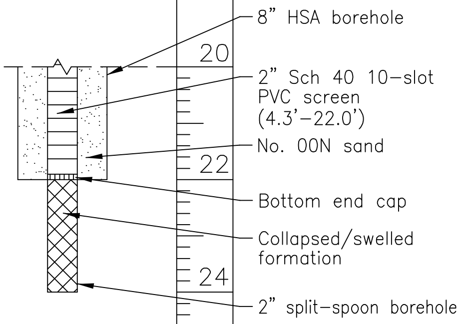
Soil Augering Log

Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-285S
Location ~42'W and ~28'S of N side of B003

TOC Elev. 177.49'
GS Elev. 177.89'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	4-5-9-9	0.3 / 0	8	24"	SAND: as above, top 20". SILTY CLAY: 20-24", orange brown at top (~1/4" thick, grading to gray silty clay, med stiff, laminated, saturated.	SP/SM
22–24	10-7-7-5	0 / 0	9	13"	SILTY CLAY: gray, med stiff, laminated, saturated.	ML/CL
24					Total Depth: 24.0'.	



GROUNDWATER SCIENCES CORPORATION

Well Log: MW-285S

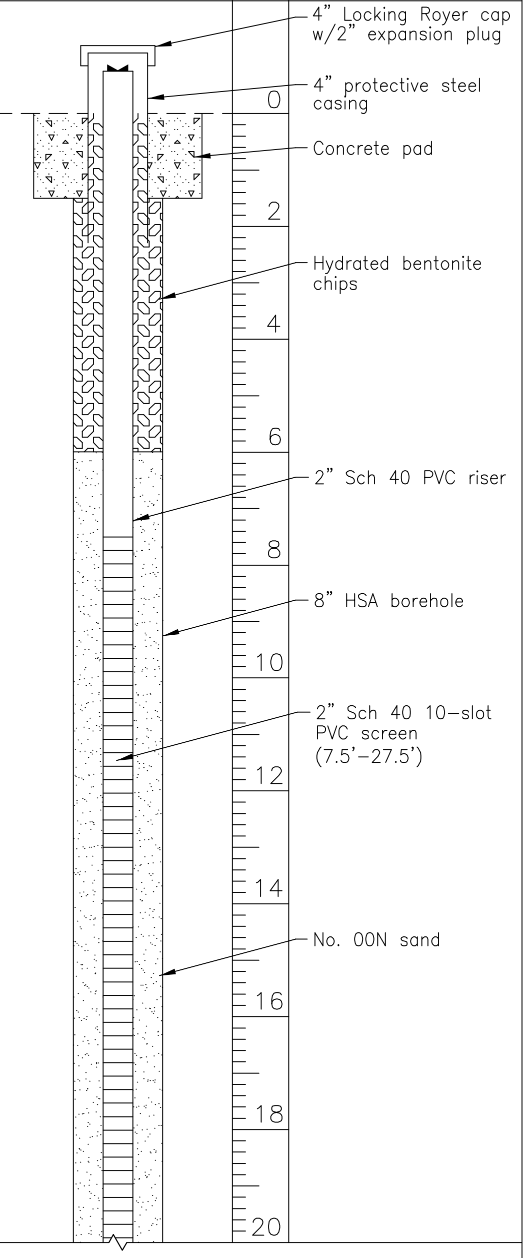
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–288S
Location ~58'W and ~8'N of NW corner B003

TOC Elev. 180.22'
GS Elev. 177.81'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				SAND: dark brown at top to grayish brown at base, m–c, SR–SA, loosely packed, sl moist.	SP
6–8	3–3–4–4	0/0	1	17"	SAND: grayish brown, m–c, SR–SA, loose, moist at top, saturated near base.	
8–10	3–3–2–2	0/2	2	20"	SAND: as above.	
10–12	1–1–2–1	0/5	3	22"	SAND: top 8", br gray, m–c, SR–SA, loose, sat. SAND: 8–12", grayish brown, m–c, SR–SA, loose, sat. SILTY SAND: 12–15", br gray, mostly silt w/f sand. SILTY CLAY: 15–22", brown, stiff w/iron–stained zones, saturated.	SM ML/CL
12–14	1–1–2–2	0/30	4	24"	SAND: grayish brown, m–c, SR–SA, loose, occ clay clasts throughout core, saturated.	SP/SM
14–16	3–2–2–3	0/28	5	24"	SAND: as above with 1/4" thick brown silty clay lens at 14", saturated.	
16–18	2–1–1–1	0/2	6	22"	SAND: as above with 1/2" thick silty clay lens at 21".	
18–20	2–2–4–5	0/18	7	24"	SAND: as above, top 5". SILTY CLAY: 5–11", gray, soft–med stiff, saturated. SILTY SAND: 11–24", orange brown, vf sand with some silt.	ML/CL SM

Well Construction Graphic



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–17–96
Drilling Completed: 7–17–96
Well Construction: 7–17–96
Well Developed: 7–18–96
Well Coords.: N718436.729
E591564.121

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 30.0'.

SWL 9.59' (7/18/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–288S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

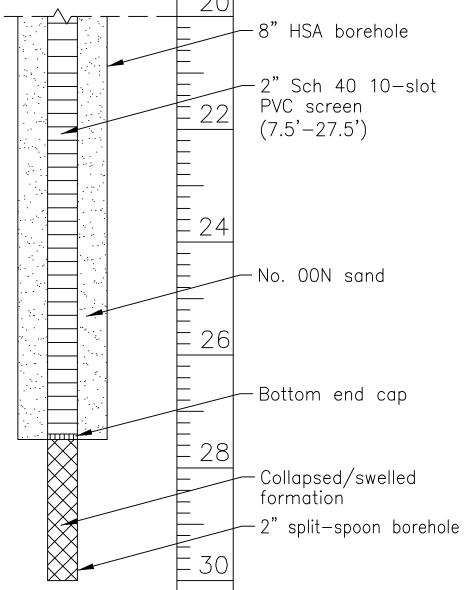
Boring No. MW–288S
Location ~58'W and ~8'N of NW corner B003

TOC Elev. 180.22'
GS Elev. 177.81'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20						
22	2–1–1–1	0 / 0.6	8	23"	SAND: brownish gray, m–c, SR–SA, loose, saturated.	SP
24	4–4–2–2	0 / 0.6	9	22"	SAND: as above.	
26	2–2–5–11	0 / 1	10	24"	SAND: as above, top 7". SILTY SAND: 7–24", brown, mostly f sand w/some silty clay laminations, saturated.	SM
28	5–2–3–2	0 / 0	11	20"	SAND: top 7", brownish gray, m–c, SR–SA, loose. SAND: 7–13", brown, m–c w/some fines & silty clay laminations. SILTY SAND: 13–19", brown, mostly f sand with some silt. SILTY CLAY: 19–20", gray, laminated, stiff, saturated.	SP SP/SM SM
30	5–2–4–6	0 / 1.5	12	12"	SILTY CLAY: gray, med stiff to stiff, w/pink lams, saturated.	ML/CL
32					Total Depth: 30.0'.	
34						
36						
38						
40						

Well Construction Graphic

Well Construction Details



GROUNDWATER SCIENCES CORPORATION

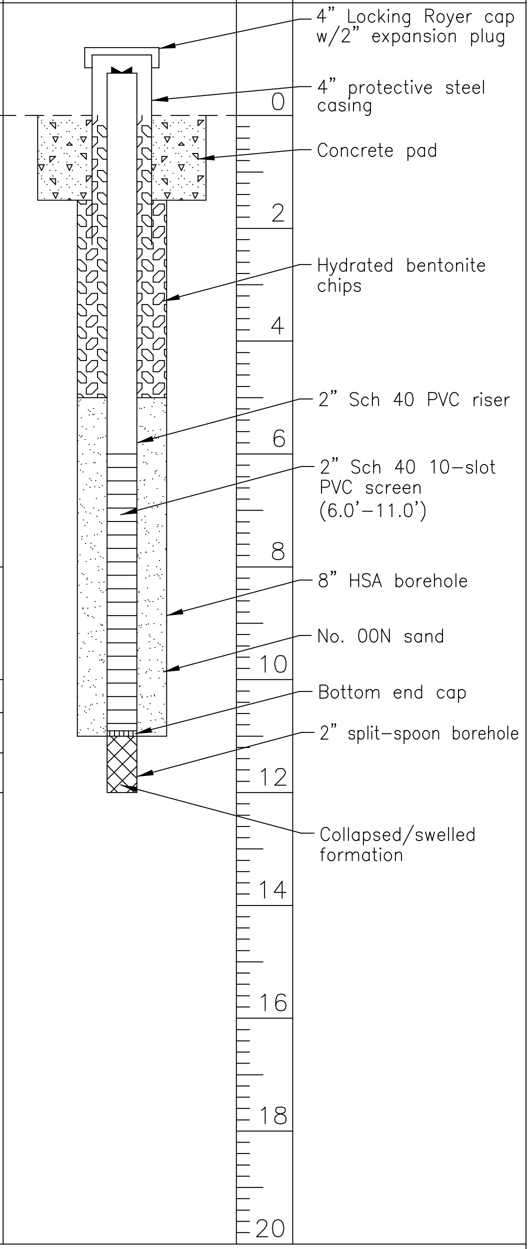
Well Log: MW–288S

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-289S
Location ~98'NW of NW corner of B036

TOC Elev. 156.98'
GS Elev. 154.50'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				FILL: brown sand w/c gravel and cobbles, brick fragment at ~3.5'.	FILL
6–8	3-4-5-3	0 / 0	1	18"	FILL: mix of mostly brownish gray m-c sand w/ some gravel, cobbles, and clay; moist near top, saturated near base.	
8–10	WOH-1-2-2	0 / 0.1	2	13"	SAND: brownish gray, m-c, loose, some A gravel, clay clasts, silty clay lam (~1/2" thick) near base, saturated.	SP/SM
10–12	3-4-5-8	3.2 / 1.1	3	16"	SAND: top 8", brownish gray, m, clay clasts throughout, grading to grayish brown f-m sand w/clay clasts and wood chips. SILTY CLAY: 8-15", grayish brown w/organic layers, abundant wood chips, root traces. SAND: 15-16", blackish gray, f-m, loose, saturated.	SP/OL OL SP
12					Total Depth: 12.0'	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-29-96
Drilling Completed: 7-29-96
Well Construction: 7-29-96
Well Developed: 8-1-96
Well Coords.: N718878.431
E590262.335

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 13.5'.

SWL 7.6' (8/1/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-289S

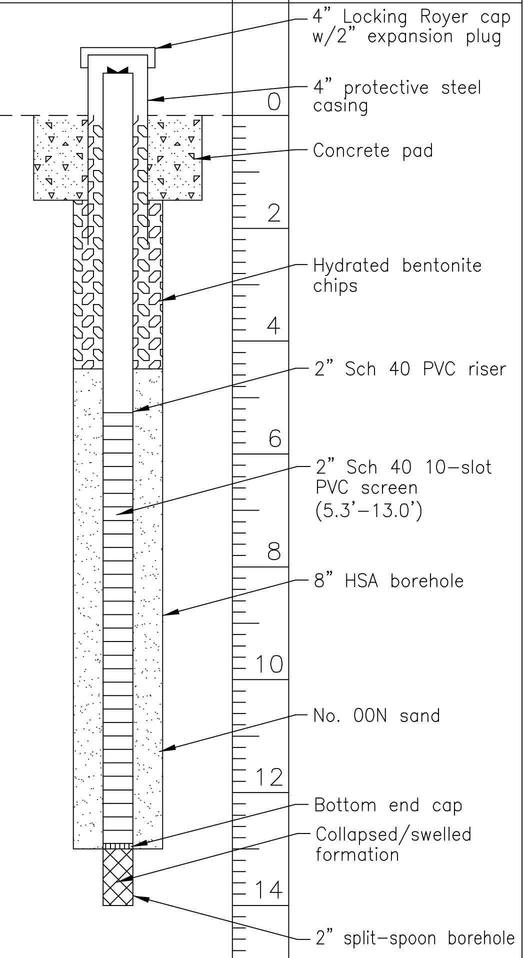
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–290S
Location ~48'W of MW–289S; Fire Training Area

TOC Elev. 154.83'
GS Elev. 152.39'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				FILL: mix of brown sand, m–c w/some vc gravel, cobbles, dry. FILL: gray cement foundation, 4–6'.	FILL
6–8	3/1.5'–7–8	0 / 0.3	1	10"	FILL: brown sand at top to grayish brown at base, m w/A gravel, occ roots, loose, saturated.	FILL
8–10	4–8–8–12	0.8 / 0.3	2	13"	SAND: grayish brown, m, loose, silty clay lams (1–1/2" thick) at 5" and 12", occ clay clasts, iron–staining on some grains near top, saturated.	SP/OL
10–12	4–7–9–11	0.4 / 0.1	3	14"	SAND: as above w/silty clay lams (~1–1/2" thick at 1" and 7", occ clay clasts and dark gray/black grains near top.	SP/OL
12–14	1–2–2–4	30 / 1.2	4	18"	SAND: top 16", as above w/silty clay laminations at 8" and 13", abundant organics (black wood chips). SILTY CLAY: 16–18", grayish brown, med stiff, organic–rich (wood chips, roots).	SP/OL OL
14					Total Depth: 14.0'	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–29–96
Drilling Completed: 7–29–96
Well Construction: 7–29–96
Well Developed: 8–2–96
Well Coords.: N718879.257
E590213.624

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 15.4'.

SWL 7.6' (8/1/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

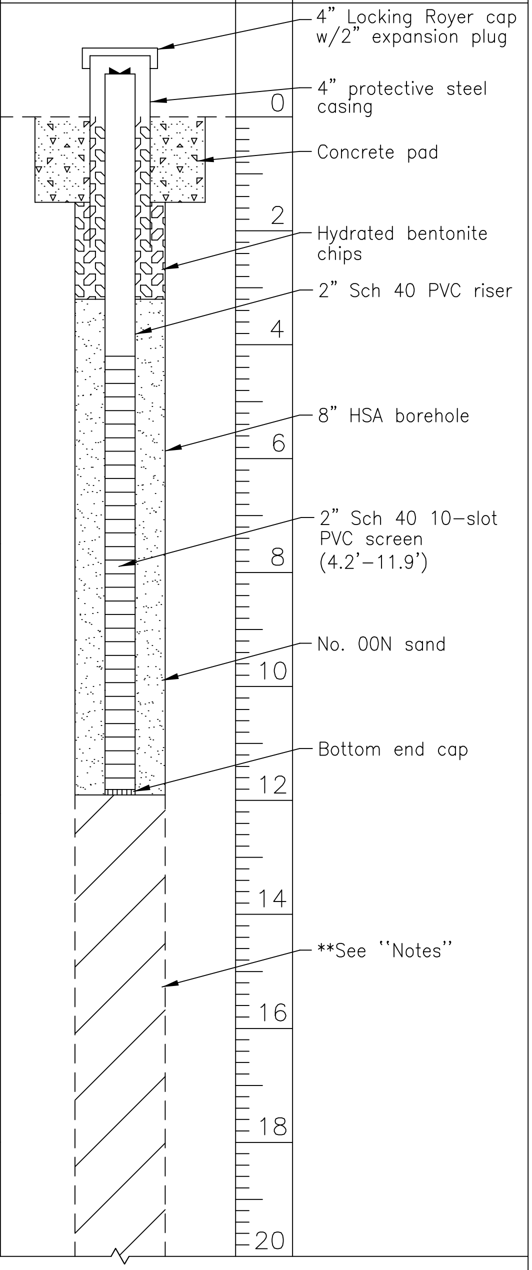
Well Log: MW–290S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–292S
Location ~22'W of MW–289S; Fire Training Area

TOC Elev. 155.68'
GS Elev. 153.12'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				FILL: clay, sand and gravel mix.	FILL
8	2–2–3–9	0.2/0.4	1	19"	FILL: as above top 14", slightly moist. SAND: brownish gray, m–c w/some c, loose, organic lenses near base, saturated.	
10	2–4–5–7	0.2/0.1	2	17"	SAND: brownish gray, m–c near to grading to f–m near base, loose, occ clay clast & thin silty clay laminations, brick fragment at top of sample, saturated.	SP
12	5–5–3–3	5/50	3	14"	SAND: brownish gray, m–c, interlayered w/grayish brown m sand, loose, saturated. SILTY CLAY: 1" lens at base, gray, med stiff, laminated.	
14	3–3–4–5	1/78	4	10"	Total Depth: 11.9'. SILTY CLAY: as above, top 2". SAND: brownish gray, m, roots and organic layering at top of core, loose, saturated.	ML/CL SP/SM
16	WOH/1'–2–2	0.8/20	5	12"	SAND: grayish brown, m–c, v loose, small clasts of brick, 1/4" clay lamination near base (5" thick), saturated; grades to brownish gray m sand, loose occ silty clay lam (~1/8" thick), saturated.	
18	2–3–3–3	0.2/8	6	17"	SAND: brownish gray, m, loose, finely lam, silty clay lam near top (~1/2" thick), occ iron–stained lams near base, some organics near base, saturated.	
20	5–4–3–6	0.1/1	7	12"	SAND: brownish gray, m, loose, finely lam, some organics, iron–stained zones throughout core, saturated.	SP



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–25–96
Drilling Completed: 7–25–96
Well Construction: 7–25–96
Well Developed: 8–1–96
Well Coords.: N718880.403
E590240.209

Notes:
*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.
**Boring drilled to 26.3' and abandoned; moved 5' west of original boring and installed well.
Length of well material: 14.4'.
SWL 6.81' (8/1/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

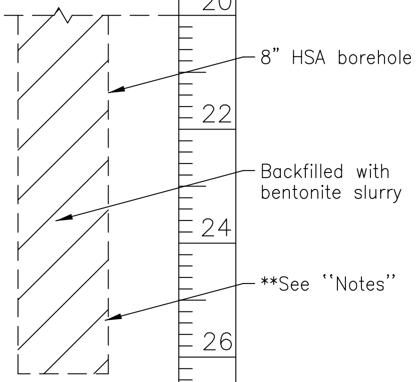
Well Log: MW–292S

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–292S
Location ~22'W of MW–289S; Fire Training Area
TOC Elev. 155.68'
GS Elev. 153.12'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20	6–4–5–7	0 / 3.2	8	11"	SAND: brownish gray, m, finely laminated, loose, saturated.	SP
22	2–4–4–5	0 / 22	9	14"	SAND: as above.	SP
24	7–8–9–5	0 / 2	10	8"	SAND: as above, top 1". SILTY CLAY: 1–8", gray, laminated, med stiff, 1" of f gray sand at base, saturated.	ML/CL
26	50/.3'	0/1	11	4"	SILTY CLAY: gray, laminated, stiff.	ML/CL
					BEDROCK: at 26.3'. Total Depth: 26.3'.	

Well Construction Graphic / Well Construction Details



GROUNDWATER SCIENCES CORPORATION

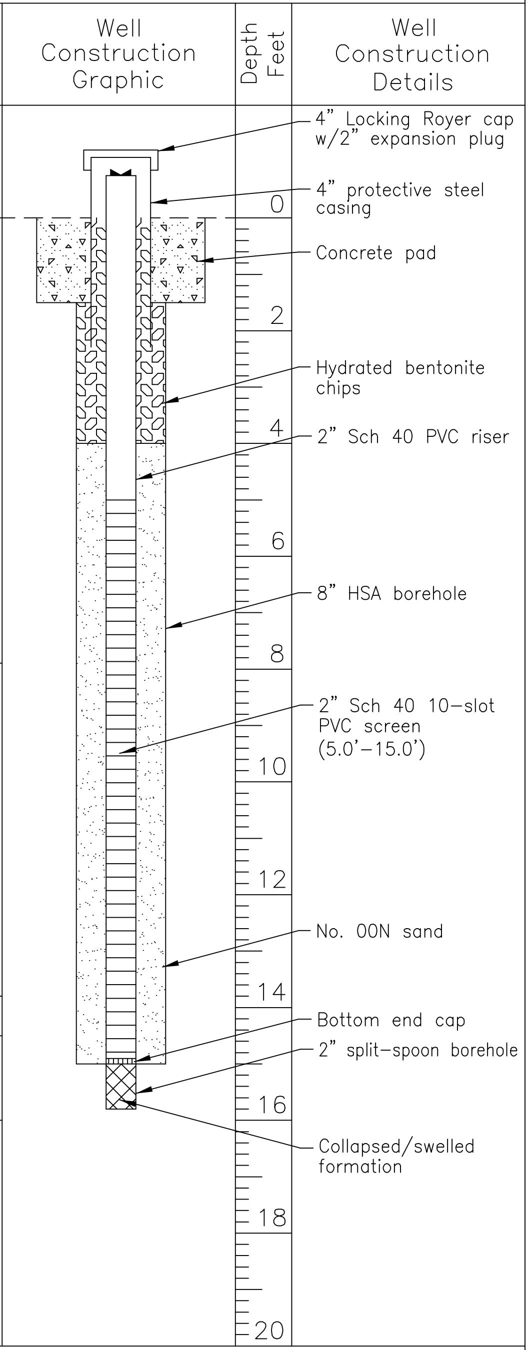
Well Log: MW–292S

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-293S
Location ~62'SW of MW-289S; Fire Training Area

TOC Elev. 154.46'
GS Elev. 151.97'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				FILL: brownish gray, m-c sand w/abundant A gravel clasts, occ wood chips, dry at top to moist near base.	FILL
6–8	11-12-22-40	0 32	1	20"	FILL: top 19", brownish gray, m sand w/A gravel clasts, loose, saturated. GRAVEL: 19-20".	
8–10	10-3-5-8	0 105	2	16"	SAND: brownish gray at top to grayish brown at base, m w/A gravel clasts, finely laminated, occ clay clast, loose, saturated.	SP
10–12	6-10-10-10	1.7 84	3	16"	SAND: grayish brown, m w/occ gravel and clay clasts, finely laminated, dark gray-black zone (organic-rich) in center of core (~1" thick), loose, saturated.	
12–14	2-1-2-4	3.8 110	4	17"	SAND: grayish brown, m, wood chips throughout core, distinct organic layering near top, loose, saturated. SILTY SAND: 1/2" in shoe of spoon, organic-rich.	
14–16	2-1-2-1	2.4 205	5	16"	SILTY SAND: top 6", grayish brown, loose, vf with some silt, organics (wood chips), saturated. SILTY CLAY: 6-16", grayish brown, med stiff, abundant, organics throughout (wood chips, roots), laminated.	SM OL
16–20					Total Depth: 16.0'	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-29-96
Drilling Completed: 7-29-96
Well Construction: 7-29-96
Well Developed: 8-2-96
Well Coords.: N718869.945
E590200.384

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 17.5'.

SWL 6.26' (8/2/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-293S

Soil Augering Log

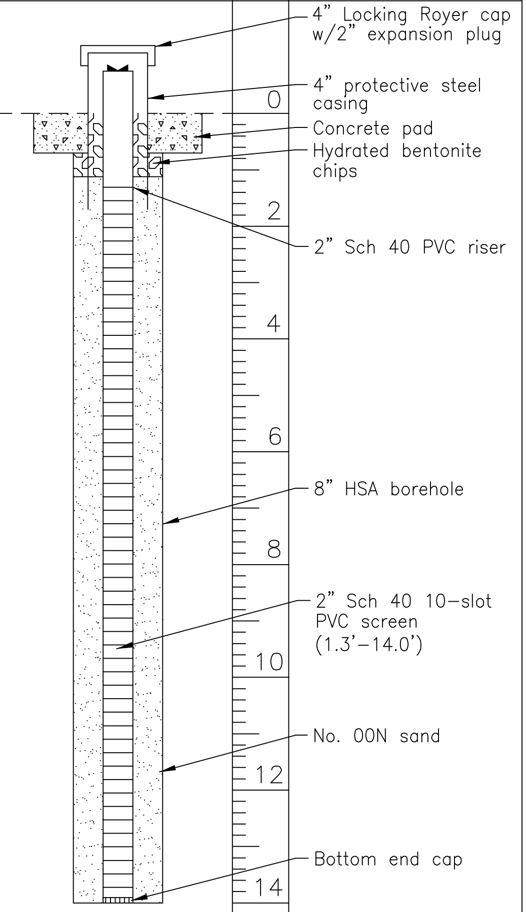
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-294S
Location ~40'NW of MW-289S; Fire Training Area

TOC Elev. 155.82'
GS Elev. 153.06'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				FILL: mix of clay, sand, gravel and brick fragments.	FILL
6–8	13-12-8-7	0 / 42	1	17"	FILL: mix of clay, sand, gravel and shale fragments.	
8–10	5-5-5-7	0 / 15	2	6"	FILL: mostly brownish gray sand w/gravel and shale chips at base.	
10–12	4-2-1-3	0 / 13	3	13"	FILL: as above, top 7". SAND: 7-13", brownish gray, m-c w/f laminations, v loose, saturated.	SP/SM
12–14	4-5-5-3	6 / 22	4	7"	SAND: top 5", brownish gray, m-c w/roots and organic-rich silty clay laminations. SILTY CLAY: 5-7", grayish brown, laminated at base of sample, roots, some organics.	OL
14					Total Depth: 14.0'	
16						
18						
20						

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-25-96
Drilling Completed: 7-25-96
Well Construction: 7-25-96
Well Developed: 8-1-96
Well Coords.: N718896.045
E590224.704

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 16.7'.

SWL 6.70' (8/1/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-294S

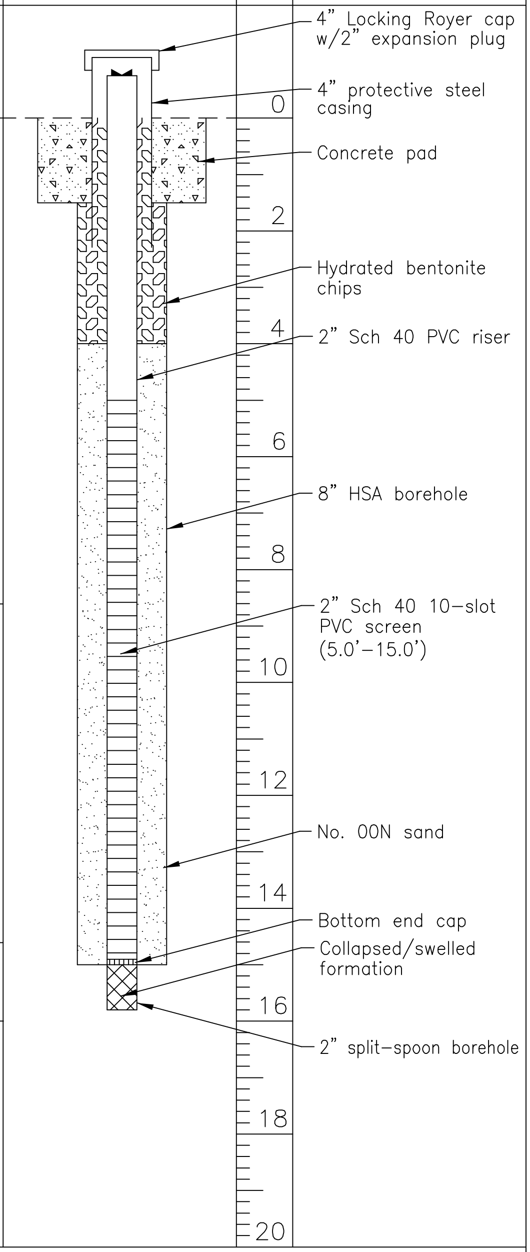
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-296S
Location ~60NW of MW-289S; Fire Training Area

TOC Elev. 154.69'
GS Elev. 152.19'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				FILL: brown, m sand w/A gravel clasts, dry.	FILL
6–8	10-11-8-7	0 / 0.1	1	18"	FILL: mostly brownish gray m-c sand, loose, zone of loose gravel and cobbles at 8", faint organic layering near base, saturated.	
8–10	3-5-7-7	0 / 0.6	2	16"	FILL: as above, top 8". SAND: 8-16", brownish gray, m w/some c, loose, occ organic-rich grains, occ clay clasts, saturated.	SP/OL
10–12	4-8-12-15	0 / 1.4	3	16"	SAND: brownish gray, m w/some SR-SA gravel, iron-stained layer at 9", well-preserved black wood chip near base, laminated.	
12–14	X-9-10-11	0.2 / 46	4	18"	SAND: grayish brown, f-m, loose w/distinct clay laminations (1/4" thick) at top and at 4", organic laminations near base, occ cobble, saturated.	
14–16	4-2-3-7	1.8 / 280	5	15"	SAND: top 7", grayish brown, f-m, loose, saturated. SILTY CLAY: 7-15", grayish brown, med-stiff, abundant organics (wood chips, root fragments).	OL
16–20					Total Depth: 16.0'	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-29-96
Drilling Completed: 7-29-96
Well Construction: 7-29-96
Well Developed: 8-2-96
Well Coords.: N718884.339
E590204.584

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

X = Driller's error

Length of well material: 17.5'.

SWL 6.00' (8/2/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-296S

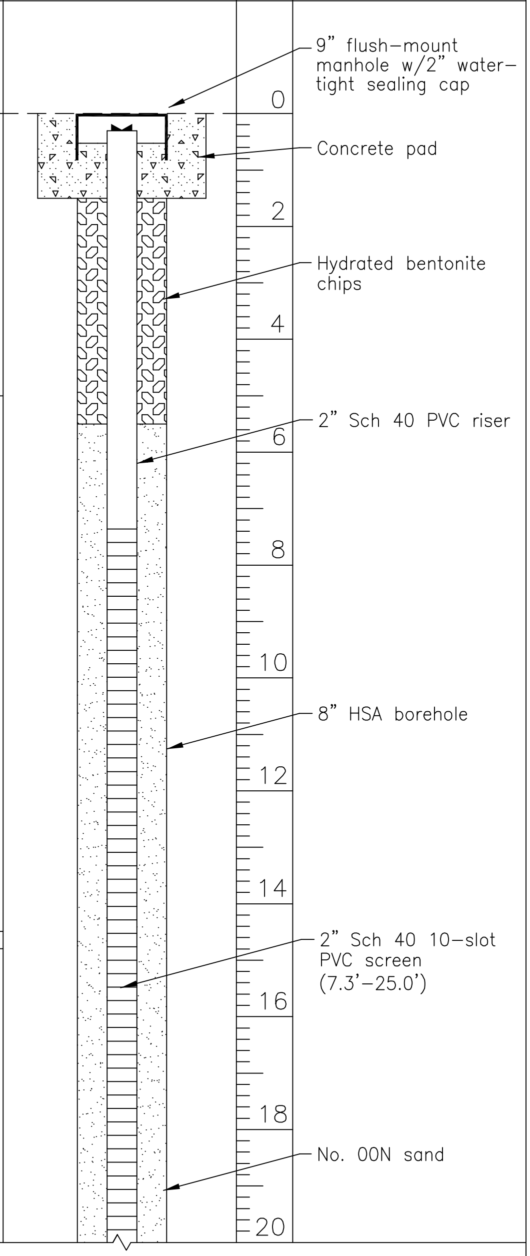
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-297S
Location ~130' NW of NW corner of B003

TOC Elev. 176.91'
GS Elev. 177.31'

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				SAND: brown, m-c w/occ gravel, loosely packed.	SW (0–5) SP (5–)
6–8	3-5-6-4	0 0	1	16"	SAND: brown to brownish pink, moist.	SP
8–10	3-5-4-4	0 0.7	2	16"	SAND: dark brown, f-m w/lenses of gray silty sand.	SP
10–12	3-3-2-2	0 0	3	17"	SAND: as above.	SP
12–14	1-1-1-2	0.5 4.6	4	24"	SAND: as above.	SP
14–16	1-3-3-4	0 0	5	19"	SAND: top 4", brown, f-m, loosely packed, saturated. SILTY CLAY: 4-6", pinkish, med stiff, saturated. SAND: 6-19", brown, f-m, loose saturated.	ML/CL SP
16–18	1-2-2-3	0 0.3	6	23"	SAND: brown, f-m, loose, saturated.	SP
18–20	3-2-2-4	0 0	7	24"	SAND: as above.	SP

Well Construction Graphic



Well Construction Details

9" flush-mount manhole w/2" water-tight sealing cap

Concrete pad

Hydrated bentonite chips

2" Sch 40 PVC riser

8" HSA borehole

2" Sch 40 10-slot PVC screen (7.3'-25.0')

No. 00N sand

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-15-96
Drilling Completed: 7-15-96
Well Construction: 7-15-96
Well Developed: 7-19-96
Well Coords.: N718546.504
E591568.570

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 24.7'.

SWL 6.97' (7/19/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

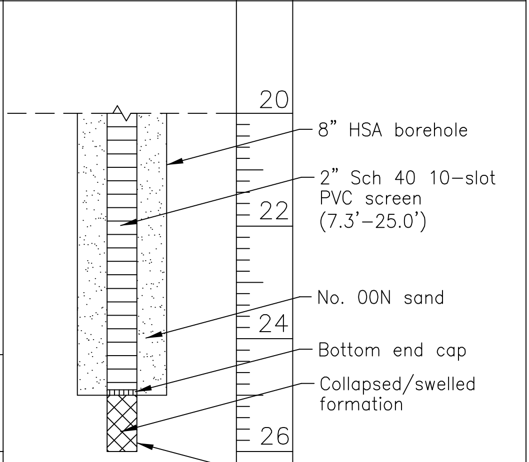
Well Log: MW-297S

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-297S
Location ~130' NW of NW corner of B003

TOC Elev. 176.91'
GS Elev. 177.31'

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	3-2-2-4	0/0	8	23"	SAND: as above.	SP
22–24	3-5-3-5	0/0.8	9	24"	SAND: as above.	
24–26	5-4-2-3	0/0	10	18"	SAND: as above, top 2". SILTY CLAY: 2-18", grayish brown, soft-med stiff, moist.	ML/CL
					Total Depth: 26.0'.	



GROUNDWATER SCIENCES CORPORATION

Well Log: MW-297S

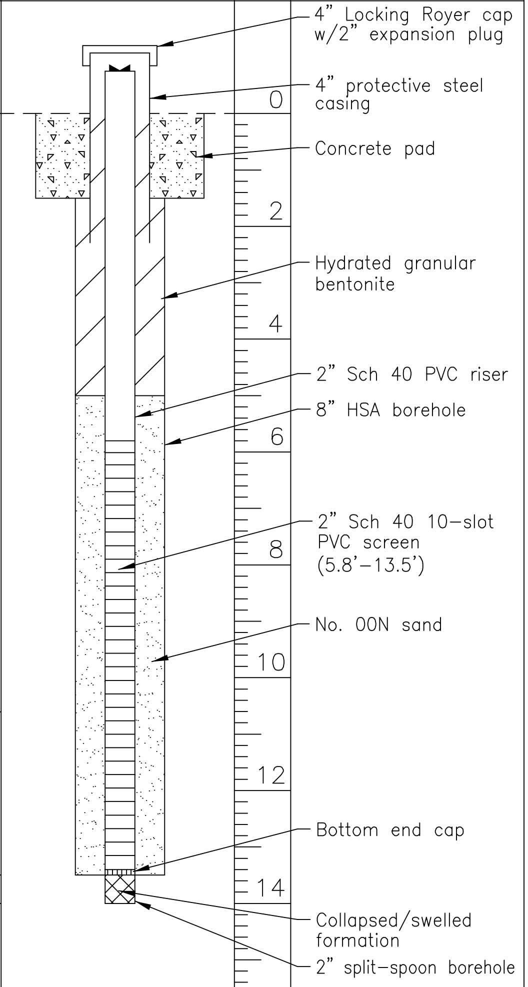
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-304S
Location ~5'N and ~5'W of NE corner B031

TOC Elev. 183.74'
GS Elev. 181.24'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Sod 0-3". SAND: dk yel br, f-m w/vf, tr c, tr silt, occ dk br organic-rich silt masses up to 4-5" across and occ lg masses of lacustrine clay, loose, moist.	FILL
8	1-1-1-1	0/0	1	13"	SAND: dk yel br, f-m w/vf, tr c-vc, tr-lit silt, occ silt/clay rip-up mass, yel orange and br gray color, loose, moist top 7", then wet and more cohesive.	
10	WOR/2.5'	–/–	2	NR	: void? 8-10.5'.	
12	3-2-2	0/16	3	12"	SAND: dk yel br, f-m w/vf and c, tr vc, occ silt/clay rip-up mass, fining to pred f-m w/vf, tr-lit silt below 7", sl cohesive, sl fining, wet.	SW
14	WOR-1-1-4	0/18	4	14"	SAND: as above 0-19", oxidized mod yel br silt/clay mass at 18" w/organic-rich sand at 18", organic-rich sand at base. SILT & CLAY: at 20", br gray, dense, plastic with varves, pale red clay lams, wet.	MH/CH
16 18 20					Total Depth: 14.0'.	

Well Construction Graphic — Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7-25-96
Drilling Completed: 7-25-96
Well Construction: 7-25-96
Well Developed: 8-1-96
Well Coords.: N717254.611
E592314.659

Notes:
*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOR = Weight of Rods
NR = No Recovery

Measured DTB: 16.15' (from TOC).

SWL 9.88' (8/1/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-304S

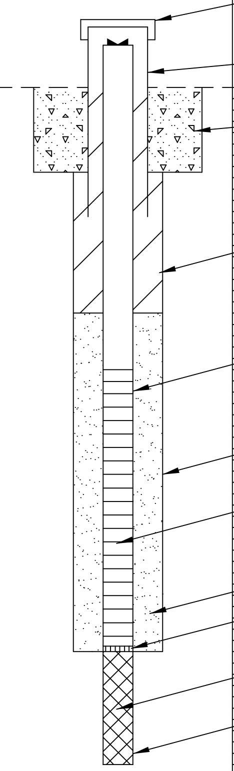
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–305S
Location ~95'NW of NE corner of B031

TOC Elev. 181.62'
GS Elev. 179.22'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Sod 0–3" SAND: dk yel br, f–m w/vf, some silt, cohesive, moist. SAND: at 4.2', dk yel br, m–c w/vc, tr f–vf, tr silt, tr f SA–SR gravel, loose, moist. : organic–rich dk br color at 5.5'; silt below 5.5'.	FILL
6–8	2–4–3–3	0 12	1	18"	SILT: 0–5" mod yel br w/clay, varved, dense, sl plastic, bottom cont angled ~30°, tr pale red varves. SAND: dk yel br, f–m w/vf, tr c top 2", tr silt, silty vf–f sandy zone 7–9" w/graded contacts, some fining w/depth, organic–rich lower 11–12", cohesive, wet at 6".	ML SW
8–10	WOR–1–2–1	0 9	2	24"	SAND: dk yel br to mod yel br, f–m w/vf, some silt, loose, coarsening w/depth w/c–vc, tr f, grades to units below & becoming more cohesive, v wet. SILT: at 12", varved mod yel br w/yel orange layers, dense, sl plastic, tr vf sand, wet. SILT & SAND: at 15", br gray w/clay & vf sand, occ pale red varve & organic–rich black lam, vf–f, loose, sandy zone 17–21", then becoming v dense, plastic, incr clay content.	ML SM
10–12	WOR–1–WOH–1	0 9	3	17"	SILT & CLAY: br gray w/pale red varves, dense, v plastic, wet.	MH/CH
12–20					Total Depth: 12.0'.	

Well Construction Graphic



Well Construction Details

- 4" Locking Royer cap w/2" expansion plug
- 4" protective steel casing
- Concrete pad
- Hydrated granular bentonite
- 2" Sch 40 PVC riser
- 8" HSA borehole
- 2" Sch 40 10–slot PVC screen (5.0'–10.0')
- No. 00N sand
- Bottom end cap
- Collapsed/swelled formation
- 2" split–spoon borehole

Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–26–96
Drilling Completed: 7–26–96
Well Construction: 7–26–96
Well Developed: 8–2–96
Well Coords.: N717308.011
E592242.278

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.
WOH = Weight of Hammer
WOR = Weight of Rods
Measured DTB: 12.50' (from TOC).
SWL 8.63' (8/1/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–305S

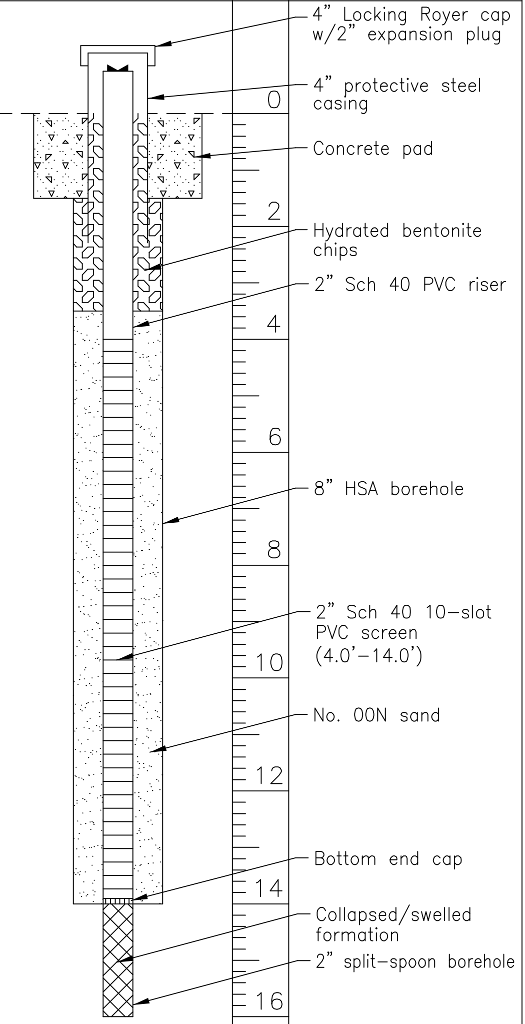
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-306S
Location ~50'NW of NE corner B031

TOC Elev. 182.79'
GS Elev. 180.12'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Sod 0-3". SAND: dk yel br, f-m w/vf, tr c, tr silt, loose, moist.	SW
6–8	1-1-WOH/1'	0 0	1	18"	SAND: as above, top 2". SILT & CLAY: mod yel br & br gray, varved and contorted, dense, plastic, occ vf-m sand lam. SAND & SILT: at 8", dk yel br, f-m w/vf, tr silt, lit c, tr vc, w/contorted clay layers & clay rip-up masses, silty finer sand layer 12-15", cohesive, wet below 8".	MH/CH SM
8–10	1-WOH-1-WOH	0 0	2	10"	SAND: mod yel br, f-m w/vf, w/silt, sl flowing, w/br gray rip-up masses 5-7" & 8-14", dense, cohesive, contacts and ripped up, v wet.	SM
10–12	1-WOH-1-WOH	0 12	3	12"	SAND: as above 0-2". SILT & CLAY: 2-10", lt br to br gray w/mod yel br to yel orange oxidation, dense, plastic, varved. SAND: below 10" f-vf w/some silt, tr m, loose, wet.	MH/CH SP
12–14	1-2-3-3	0 12	4	16"	SAND: f-m w/vf 0-3". SILT & CLAY: 3-8" becoming sand, vf layer 3", varved, dense. SAND: below 10".	MH/CH SP
14–16	WOR-1-6-6	0 24	5	12"	SILT & CLAY: br gray, dense, plastic, occ. pale red varves, top 3" is oxidized yellow orange.	MH/CH
16–20					Total Depth: 16.0'.	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7-25-96
Drilling Completed: 7-25-96
Well Construction: 7-25-96
Well Developed: 8-2-96
Well Coords.: N717280.150
E592280.002

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer
WOR = Weight of Rods

Measured DTB: 16.41' (from TOC).

SWL 9.22' (8/2/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-306S

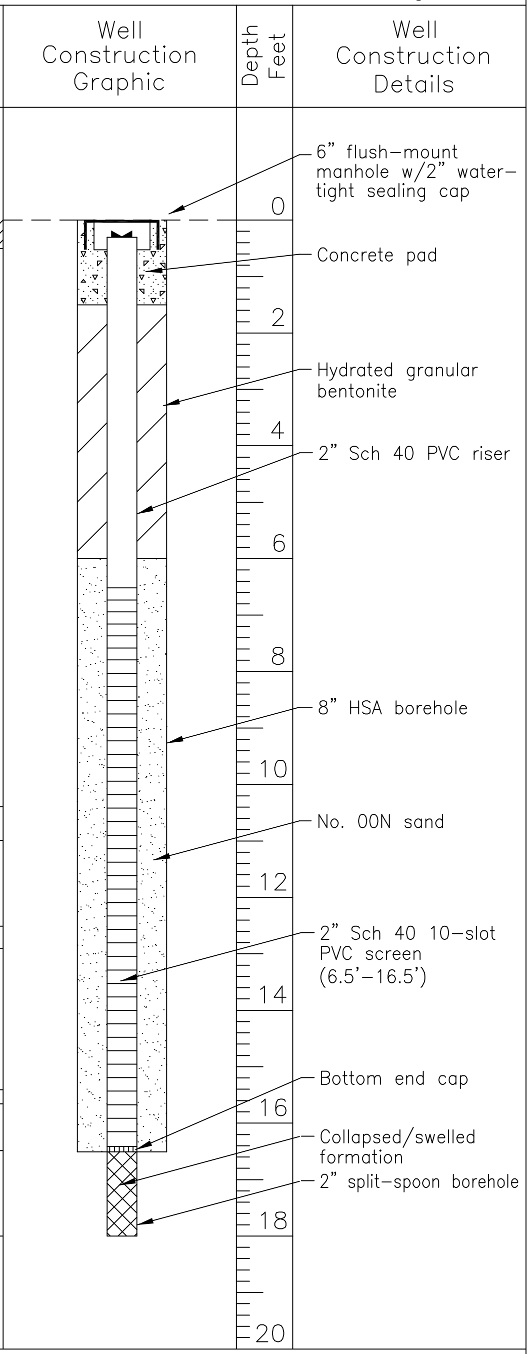
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–307S
Location Inside Building 051

TOC Elev. 184.35'
GS Elev. 184.70'
Page 1 of 1

Depth Feet	Blow Counts**	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
	AUGERED				Concrete floor 0–6" w/gravel base below.	▨
2 4 6	HAND AUGERED					
8	NA	0 0	1	14"	SAND: dk yel br, f–m w/vf, some c, lit–tr silt, tr f gravel, loose, dry to moist, 0–6"; dusky yel br to grayish black organic (?) staining w/some horizontal color banding 6–14", loose, crumbly, moist.	SW
10	NA	0 0	2	17"	SAND: as above top 3", dk br, staining absent below 3", pred f–m w/vf, tr silt below 3" w/c sand 3–13", turning wet at 14".	
12	NA	0 2	3	17"	SAND: as above top 4" w/incr silt content, wet. SILT: at 4–12", br gray, dense, plastic with clay, varved, wet top 0.5", oxidized yel orange lower 4", oxidized in layers, organic–rich, dusky yel br. SAND: below 12", dk olive gray to dk yel br, f–m w/vf, tr silt, silty at top, tr color laminations, wet.	MH/CH SP
14	NA	0 0	4	24"	SAND: as above top 6". SILT: 6–10", varved br gray, oxidized lams, dusky br organic–rich lam at base, plastic w/clay, wet. SAND: dk yel br, f–m w/vf, tr silt below 10", homogeneous, silty lower 2".	MH/CH SM
16	NA	0 0	5	24"	SAND: as above top 17" w/lt gray silt layer 9–11", wet throughout. SILT: at 17" w/some vf sand 17–19", mod yel br, turning to br gray color at 19". SAND: at 22", dk gray, f–m w/vf, tr silt, loose, wet.	ML
18	NA	0 0	6	12"	SAND: dk gray (as above) top 6". SILT: br gray w/clay, dense, laminated, plastic, wet.	SP MH/CH
20						



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 8–10–96
Drilling Completed: 8–10–96
Well Construction: 8–10–96
Well Developed: 8–19–96
Well Coords.: N717348.712
E592485.517

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

**No blow counts – could not get representative throw.

NA = Not Applicable

Measured DTB: 15.70' (from TOC).

SWL approx. 9' (8/10/96; from grade).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–307S

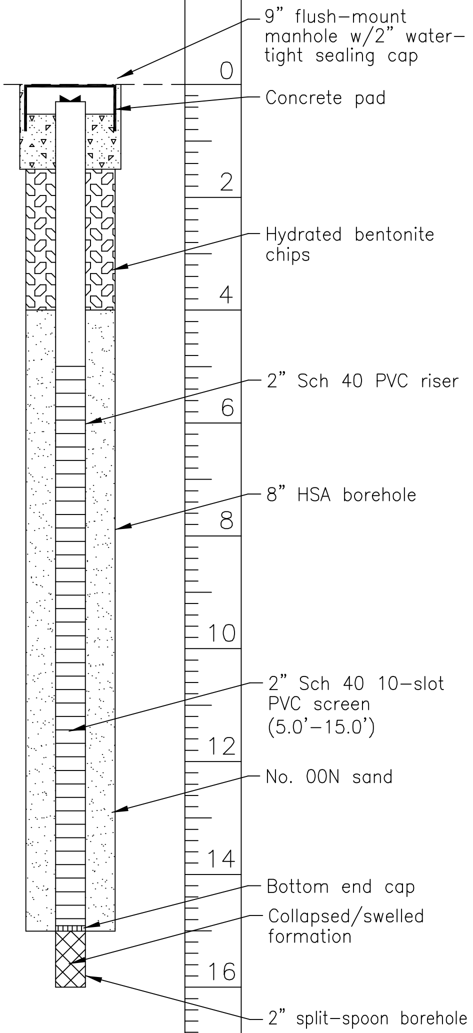
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–310S
Location Inside Building 051

TOC Elev. 184.31'
GS Elev. 184.60'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Cement to 0.6'. SAND: brown, mostly f w/some A gravel, dry to 4.1'. GRAVEL: 4.1'–6.0'.	▨ FILL
6–8		0 / 0	1	12"	GRAVEL: top 5". SAND: brownish orange, heavily iron–stained, m, laminated, loose, saturated.	SP
8–10		0 / 0	2	13"	SAND/SILT: grayish brown, m some/c–vc, inter–layered with f sand and silt, finely laminated.	SP/SM
10–12		0 / 0	3	8"	SAND: as above top 1". SILTY CLAY: brownish gray, finely laminated, soft, saturated, 1–7". SAND: grayish brown, f–m, v loose, saturated.	ML/CL SP/SM
12–14		0 / 0	4	24"	SAND: grayish brown w/some orange brown, f–m, loose, finely laminated, saturated.	SP/SM
14–16		0 / 0	5	24"	SAND: grayish brown, m, loose, occ clay clasts and silty clay laminations, saturated, top 10". SILTY CLAY: orange at top, grayish brown at base, laminated, med stiff, saturated.	ML/CL
16					Total Depth: 16.0'	

Well Construction Graphic — Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–8–96
Drilling Completed: 8–9–96
Well Construction: 8–9–96
Well Developed: 8–19–96
Well Coords.: N717325.029
E592529.171

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Blow counts not available because hammer could not be thrown properly.

Length of well material: 14.8'.

SWL 6.83' (8/9/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–310S

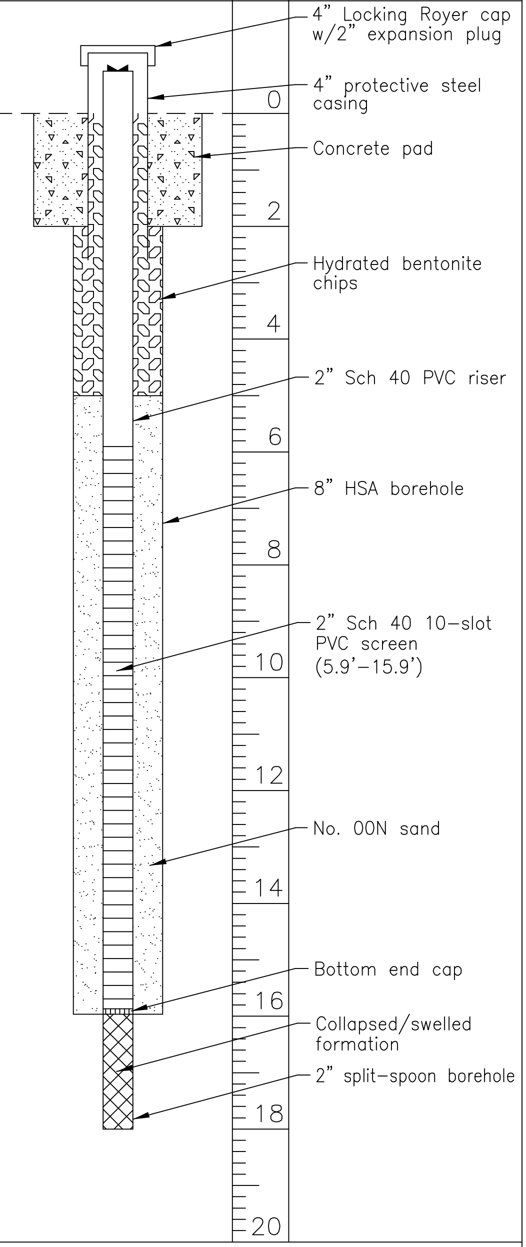
Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-313S
Location ~65'W of SW corner of B005N

TOC Elev. 180.05'
GS Elev. 177.60'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Sod 0-3". SAND: dk yel br, f-m w/vf, tr c, occ f-m gravel top 2", tr-lit silt, loose, moist. : turning med gray to olive gray & coarsening to c-m w/f, some vf, homogeneous, loose, turning wet.	
8	3-4-4-4	0/0	1	15"	SAND: olive gray, c w/m, tr-lit vc, tr-lit f, tr vf top 3", grades to f-m w/vf, tr silt, pred vf-f 12-15", tr wthrd silt rip-up masses, homogeneous, tr f SR-SA gravel top 4", loose to sl cohesive, wet.	
10	1-1-1-1	0/0	2	17"	SAND: as above, m-c w/lit vc, some-lit m, yel br silt top 5", then fining to pred f-vf below 11" w/occ wthrd silt/clay lamination (dipping orientation), loose, sl flowing.	
12	2-3-3-3	0/0	3	21"	SAND: as above w/lit vc, some vf-f, tr silt, mod yel silty zone 10-12", then fining to vf-f, some-lit silt below 14", sl flowing, wet.	
14	1-1-1-1	3/0	4	12"	SAND: c-m, tr vc top 6", grades to f-m w/vf, lit silt, then br gray f-vf sand, some silt lower 3", iron-stained (oxidized) layer in sand at 9", occ silt rip-up mass about 9", wet.	
16	2-3-2-1	3/3	4	17"	SAND: dk yel br to olive gray, f-m w/vf, tr silt, some c 4-10", then fining to f-m w/vf, lit silt, sl cohesive, sl flowing, wet. SILT: br gray, some vf sand, dense, plastic, wet.	
18	4-6-8-5	0/0	5	12"	SILT: as above, tr clay w/varves 6-9", dense, wet.	
20					Total Depth: 18.0'.	

Well Construction Graphic / Depth Feet / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7-16-96
Drilling Completed: 7-16-96
Well Construction: 7-16-96
Well Developed: 7-19-96
Well Coords.: N718056.188
E591947.352

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Measured Depth to Bottom: 18.44' (from TOC).

SWL 8.21' (7/16/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-313S

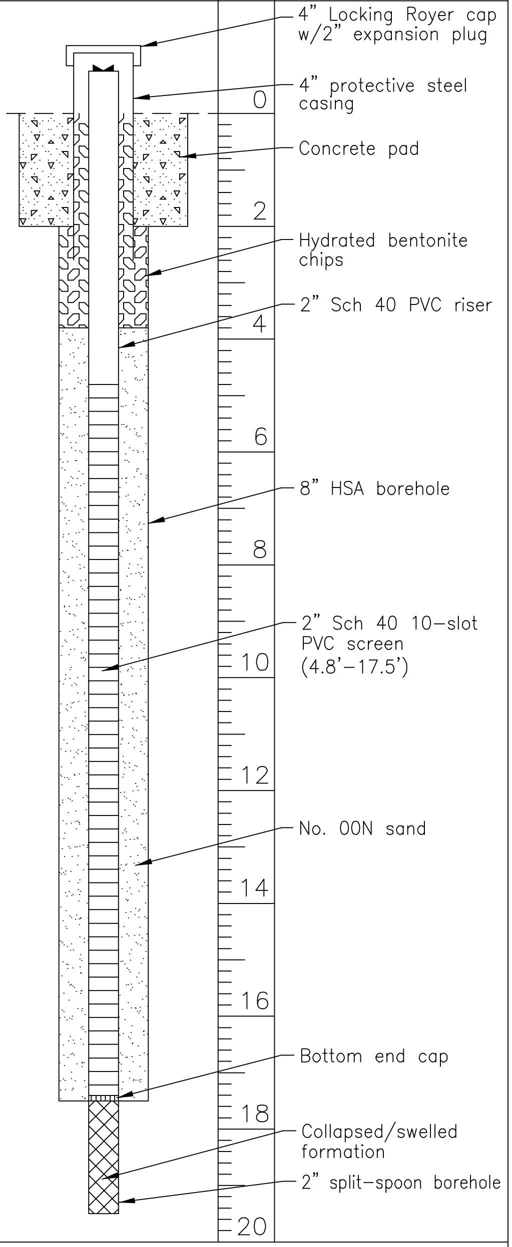
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–314S
Location ~12'E and ~25'N of SE corner B031

TOC Elev. 183.52'
GS Elev. 181.18'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2	HAND AUGERED				Gravel 0–3". SAND: dk yel br, f–m w/vf, some c, tr–lit vc, tr gravel, loose, moist.	FILL
4					: gray gravel at end, c–vc sand 2–2.5'.	
6					SAND, SILT & GRAVEL: mod yel br to dk yel br, f–c w/vf, silty w/vc and f–m SA–SR gravel (fill), loose, wet at 5.1'.	
8	1–WOH–2–3	0 30	1	12"	SAND: as above top 4", wthrd black shale frag at 4", loose, wet (fill). SAND: dk yel br, f–m w/vf, lit–tr silt, occ lams w/c, tr vc 7–8", organic–rich lams below 7", cohesive, faint horizontal layering, wet.	
10	WOR–1–2–2	0 20	2	18"	SAND: dk yel br, f–m w/vf, tr silt, some–lit c, tr vc, occ f gravel, gravelly zone 2–5" SR–R, broken yel clay pipe frags betw 9–14" w/dk br to black residue, no odor, occ broken shale frag, lg SR shale pebble, ~1" dia. at base, wet.	
12	WOR–2–3–2	0 8	3	24"	SAND: as above top 18", broken yel clay pipe frag at 9" and 12", wet. SAND: at 18", pred mod yel br to dk yel br, f–vf, w/some silt lower 2", v homogeneous, cohesive to sl flowing, no gravel, wet.	
14	4–5–7–7	0 15	4	16"	SAND: as above, v homogeneous, massive, flowing 10–16", SA shale frag at 15", wet.	SW
16	WOR–1–WOH–1	0 7.5	5	24"	SAND: dk yel br, f–m w/vf, tr silt, some–lit c, tr vc below 7", incr c–vc betw 12–17" with silt/clay rip–up masses, fining to pred f–m w/vf below 18", clay lams at 19", cohesive throughout, wet.	
18	4–4–3–2	0 9	6	18"	SAND: dk yel br, f w/m & vf, few small clay rip–up masses at 13", v homogeneous, cohesive, wet. SILT & CLAY: at 15.5", mod yel br to yel orange oxidized, dense, plastic, varved silt & clay, thinly laminated, turning br gray at 17.5", moist to wet.	
	1–2–4	0 0	7	1"	SILT & CLAY: br gray, dense, plastic, wet.	MH/CH
20					Total Depth: 19.5'.	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 7–24–96
Drilling Completed: 7–24–96
Well Construction: 7–25–96
Well Developed: 8–8–96
Well Coords.: N717044.369
E592347.476

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Measured Depth to Bottom: 19.15' (from TOC).

SWL 7.62' (8/8/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–314S

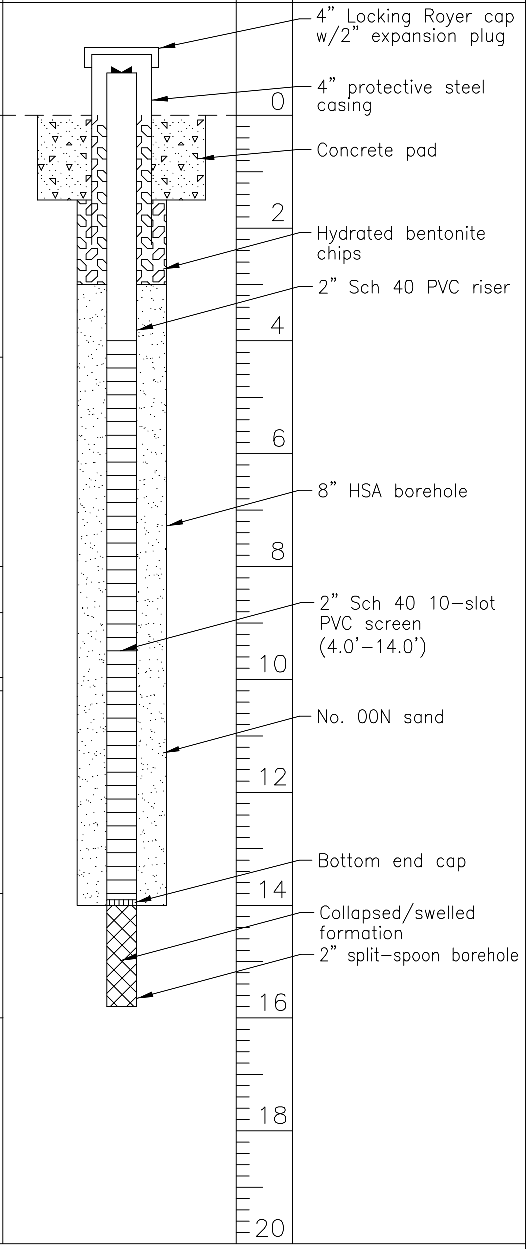
Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW–315S
Location ~68'W of SW corner of B005N

TOC Elev. 179.22'
GS Elev. 176.80'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–2	AUGERED					
2–4	2–3–3–4	0 / 0.05	1	16"	FILL: brown, m sand w/some organics, vc grains and gravel.	FILL
4–6	3–3–3–3	0 / 0.1	2	16"	FILL: as above, top 4". SILTY SAND: 4–16", grayish brown, mostly f w/some silt, laminated, iron–stained at transition from fill to silty sand, some organics near base, loose, saturated.	SM
6–8	2–3–3–2	0 / 0	3	16"	SILTY SAND: grayish brown, mostly f sand w/some silt, laminated, occ iron–stained zone (1/2" thick), loose, saturated.	
8–10	2–3–3–3	0 / 0	4	12"	SAND & SILTY CLAY: grayish brown, f–m sand interbedded with grayish brown laminated, med stiff silty clay, saturated. SILTY SAND: grayish, mostly f w/some silt, v loose, saturated.	SP/CL SM
10–12	2–2–3–1	0 / 0	5	12"	SILTY SAND/CLAY: small layer (~1"), grading to: SAND: brown, m, loose, 1/4" silty clay lam at 14" w/iron–staining above and below lam, organic traces near base, fines toward base, saturated.	SM/CL SP
12–14	2–3–3–4	0.1 / 0.2	6	13"	SAND: grayish brown, m, loose w/iron–stained, organic–rich layer (1/2" thick) near base, saturated. SILTY CLAY: small amount at base, gray, med stiff, laminated.	
14–16	3–2–2–3	0 / 0	7	12"	SILTY CLAY: as above.	ML/CL
16–20					Total Depth: 16.0'	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7–24–96
Drilling Completed: 7–24–96
Well Construction: 7–24–96
Well Developed: 8–8–96
Well Coords.: N717438.855
E591972.385

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

Length of well material: 16.5'.

SWL 6.26' (8/2/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–315S

Soil Augering Log

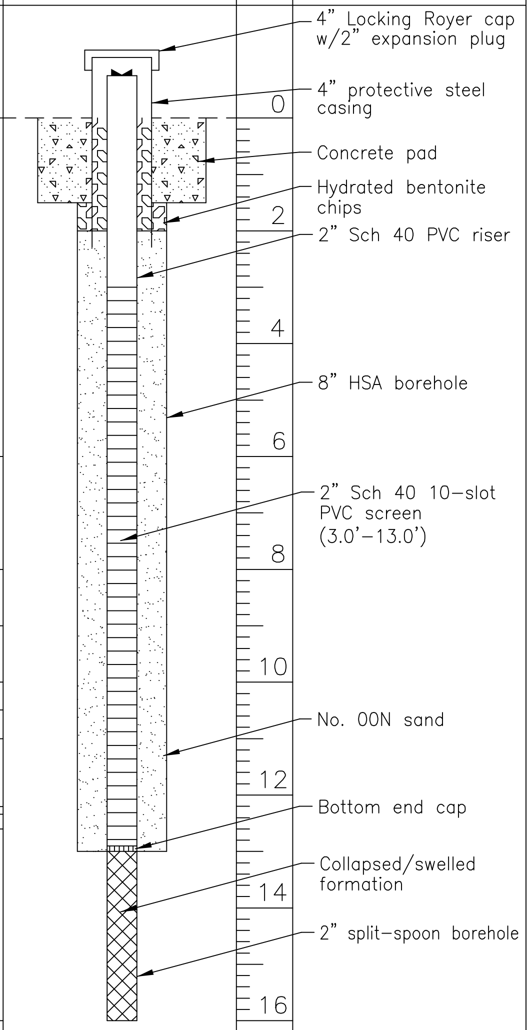
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 96011.01

Boring No. MW-320S
Location ~68'W of SW corner of B005N

TOC Elev. 181.62'
GS Elev. 179.16'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				SAND: dark brown, m-c, SR-SA w/some A gravel and cobbles.	FILL
8	WOH/.5'-1/1.5'	0 0	1	5"	SAND: brown, m-c, SR-SA, loosely packed, saturated.	SP
10	WOH/1'-1/1'	0 0	2	22"	SAND: top 12", brown, m-c, SR-SA, some vc, some organics, occ rip-up clasts, asphalt cobble at base. SILTY CLAY: 12-22", mostly gray throughout w/iron-stained (orange brown) zone at top, laminated, stiff, saturated.	SW ML/CL
12	2-2-4-3	0 0	3	18"	SAND: top 5", brownish gray to gray, m-c w/ some vc and thin silty clay lams (~1/4" to 1/2" thick) top 5". SILTY CLAY: 5-12", iron-stained (orange brown) layer at top to gray silt at base, stiff. SAND: 12-18", brown, f-m, loose, saturated.	SP/SM ML/CL SP
14	3-5-5-5	0 0	4	13"	SAND: as above, top 1". SILTY CLAY: 1-2", brown gray, soft, saturated. SAND: 2-5", brown, f-m, loose, saturated. SILTY CLAY: 5-13", grayish brown, lam, med stiff, saturated.	ML/CL SP
16	5-4-4-4	0 0.8	5	14"	SILTY CLAY: grayish brown, pink laminations, stiff, saturated.	ML/CL
18 20					Total Depth: 16.0'	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 7-18-96
Drilling Completed: 7-18-96
Well Construction: 7-18-96
Well Developed: 7-23-96
Well Coords.: N717935.078
E592293.710

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

WOH = Weight of Hammer

Length of well material: 15.4'.

SWL 7.55' (7/23/96; from TOC).

GROUNDWATER SCIENCES CORPORATION

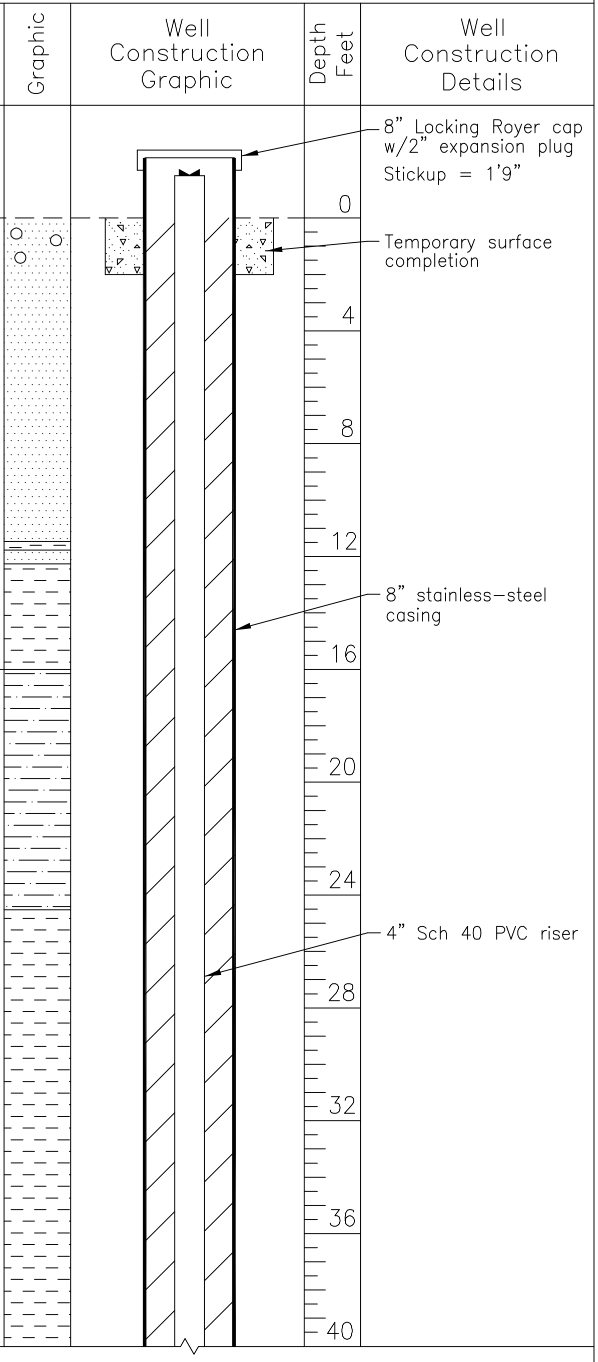
Well Log: MW-320S

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 321-R
Location South of B005

TOC Elev. 177.5’
GS Elev. ~175.5’
Page 1 of 2

Depth Feet		Overburden/Lithologic Description
0	Ground Surface	
	Northstar Drilling, Inc.: 7/5-6/00.	SAND: dark yellow brown, m-c, tr gravel near top, moist.
4		SAND: as above.
8		SAND: as above, saturated.
		SAND: as above, light brown to orange at 18”, saturated.
12		CLAY & SILT: at 19”, med gray, saturated. SAND: at 20”, med gray, f, saturated. SAND: dky ellow brown, f-m, saturated. CLAY: at 4”, med dark gray and light red, varved, tr silt, saturated
		CLAY: as above.
16	CLAY & SILT: varved, occasional sand zones.	
20		
24		
	CLAY: at 25’, med dark gray to dark gray, varved, tr silt.	
28		
32		
36		
40		



Driller: Eichelbergers, Inc.
Logged by: C.E. Stoner, GSC
Drilling Started: 10-24-00
Drilling Completed: 10-25-00
Well Coords.: N717403.1
E592191.7

Notes:

Scale interval changes on following page.

Measured DTW: 43.7’ from grade.

Estimated Blown Yield: >20 gpm.

GROUNDWATER SCIENCES CORPORATION

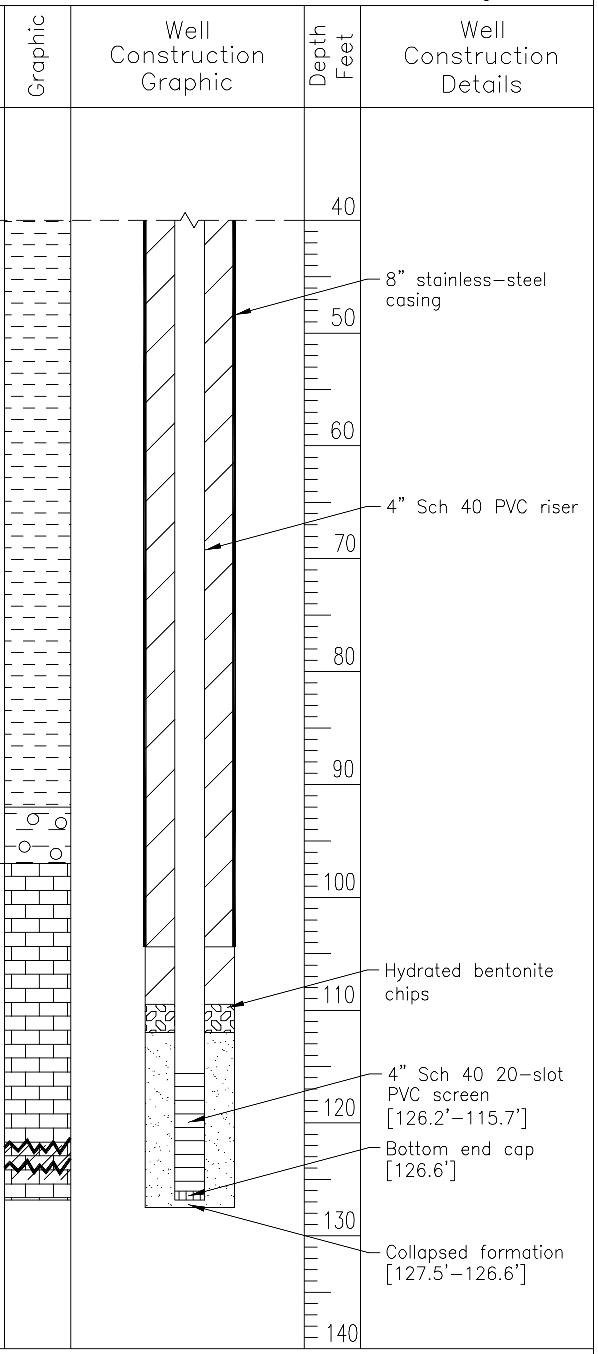
Well Log: 321-R

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 321-R
Location South of B005

TOC Elev. 177.5
GS Elev. ~175.5'
Page 2 of 2

Depth Feet	Overburden/Lithologic Description
40	CLAY: med dark gray to dark gray, varved, tr. silt
90	GLACIAL TILL/GRAVEL: at 92', dusky yellow green quartzite, dk gray shale (matrix) –some w/calcite veins, tr dusky red shale, some gravel, well to v well rounded.
100	BEDROCK: at 97', dk gray to gray black limestone, tr med gray to light gray limestone, small calcite veins (tr).
	: limestone, as above, at 105'.
120	: water-bearing zone (~4") at 122'; smaller WBZ at 124' (yield: ~20–40 gpm).
	WEATHERED BEDROCK: from ~122–125', dusky yellow clay and brittle limestone, two coral species present.
	BEDROCK: at 125', limestone, as above.



8" stainless-steel casing

4" Sch 40 PVC riser

Hydrated bentonite chips

4" Sch 40 20-slot PVC screen [126.2'–115.7']

Bottom end cap [126.6']

Collapsed formation [127.5'–126.6']

Note: Scale inverval changes on this page.

GROUNDWATER SCIENCES CORPORATION

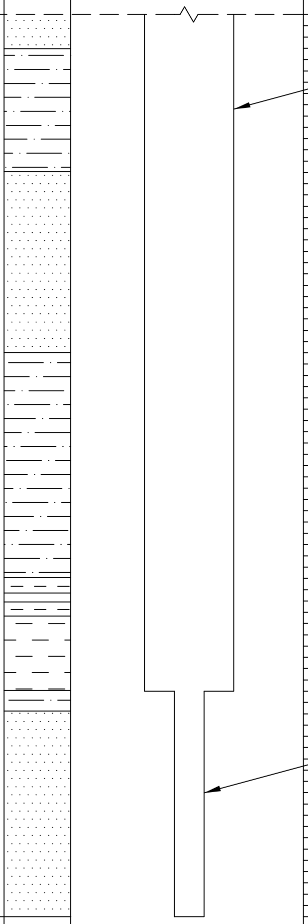
Well Log: 321-R

Soil Auger Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 322 Preliminary
Location North of B003

TOC Elev. __'
GS Elev. ~172'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Sample #	Overburden/Lithologic Description	Well Construction Details
20						
22	2-7-8-10	0 / 0	15"	11☆	SAND: as above. CLAY & SILT: dark gray, light brown lens near top, cohesive, v faint petroloeum odor, saturated.	8" HSA borehole
24	3-5-5-11	0 / NA	11"	12	CLAY & SILT: as above. SAND: at 10", dark gray, vf, saturated.	
26	3-4-4-3	0 / NA	12"	13	SAND: as above, varved, less cohesive at base, saturated.	
28	1-2-3-3	0 / NA	11"	14	CLAY & SILT: dark gray, varved, clay with tr silt in top half, bottom half is clayey silt, saturated.	
30	2-2-3-4	0 / NA	9"	15	CLAY & SILT: dark gray, top 3" clayey silt, 3"-9" clay with some silt, saturated.	
32	2-2-4-3	0 / NA	15"	16	CLAY: dk gray & lt red, varved, firm, tr silt, sat. SILT: at 3", dark gray, clayey, saturated. CLAY: at 4", as above, saturated. SILT: at 7", dark gray, tr clay, less cohesive at base, saturated.	
34	3-3-3-4	0 / NA	12"	17	CLAY & SILT: dark gray, mix of clayey silt and silty clay, v firm clay lens at 1", clayey silt grading to vf sand at base. SAND: at 4", dark gray, vf.	2" split-spoon borehole
36	WOH	0 / 0	NR	18☆	SAND: as above.	
38					Total Depth: 36.0'.	
40						



GROUNDWATER SCIENCES CORPORATION

Well Log: 322 Preliminary

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 323-R
Location B023/B001 Alcove

TOC Elev. ~175'
GS Elev. ~172'
Page 1 of 3

Depth Feet | Overburden/Lithologic Description

0 Ground Surface

Northstar Drilling, Inc.: 7/6/00.

SAND: dark yellow brown, m–c, crushed limestone at 9", moist.

SAND: as above, moist.

SAND: dk yel brown, f–m, tr c sand, tr clay, tr gravel, poorly sorted, clay–rich lens at 11", fewer fines & tr organics 11"–20", moist.

SAND: as above, crushed gravel layer 6"–7", moist to saturated; water table at 7.5'.

SAND & GRAVEL: sand and concrete chunks.
SAND: at 5", dk yel brown, tr fines, iron staining near top, saturated.

SAND: dark yellow brown, f–m, tr clay frags, saturated.

SAND: as above, no clay fragments.

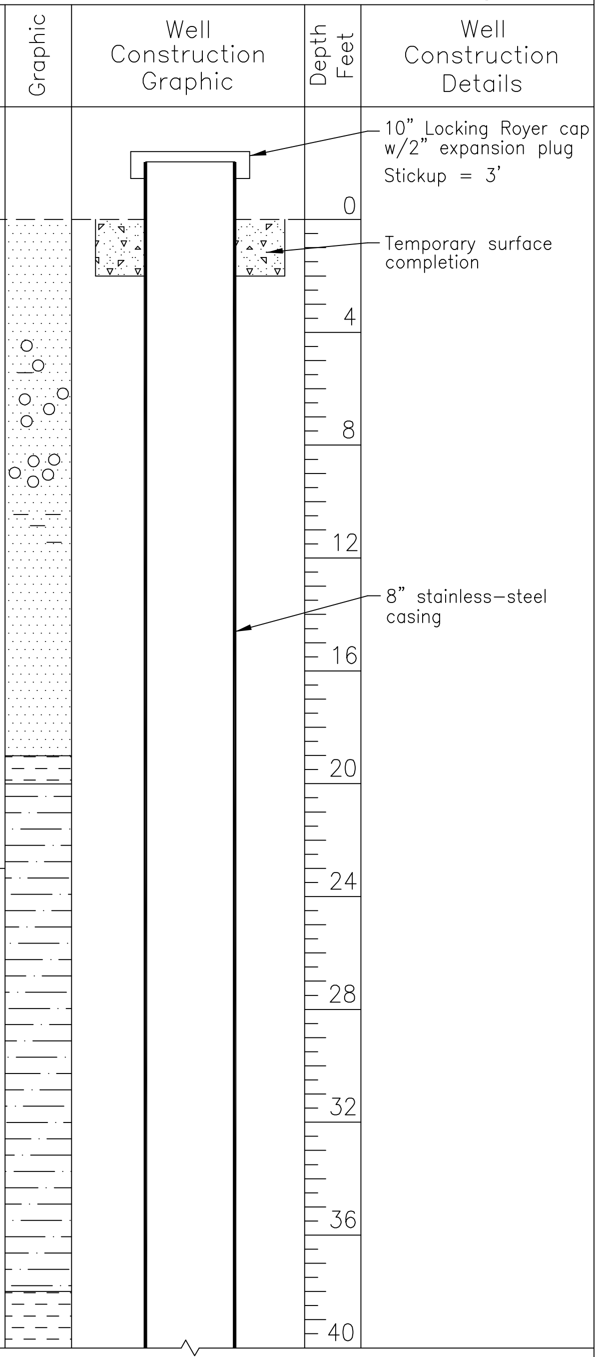
SAND: as above.

SAND: as above, some iron laminations.

CLAY: at 7", mod dark gray, some silt, varved.
CLAY & SILT: dk gray/light red, interbedded clay & silt, varved, firm.

CLAY & SILT: as above.

CLAY.



Driller: Eichelbergers, Inc.
Logged by: CES/DAB, GSC
Drilling Started: 10–28–00
Drilling Completed: 10–29–00
Well Coords.: N718114.4
E591207.9

Notes:
Scale interval changes on page 2.

Measured DTW: 25.96' from grade.
Estimated Blown Yield: <0.2 gpm.

GROUNDWATER SCIENCES CORPORATION

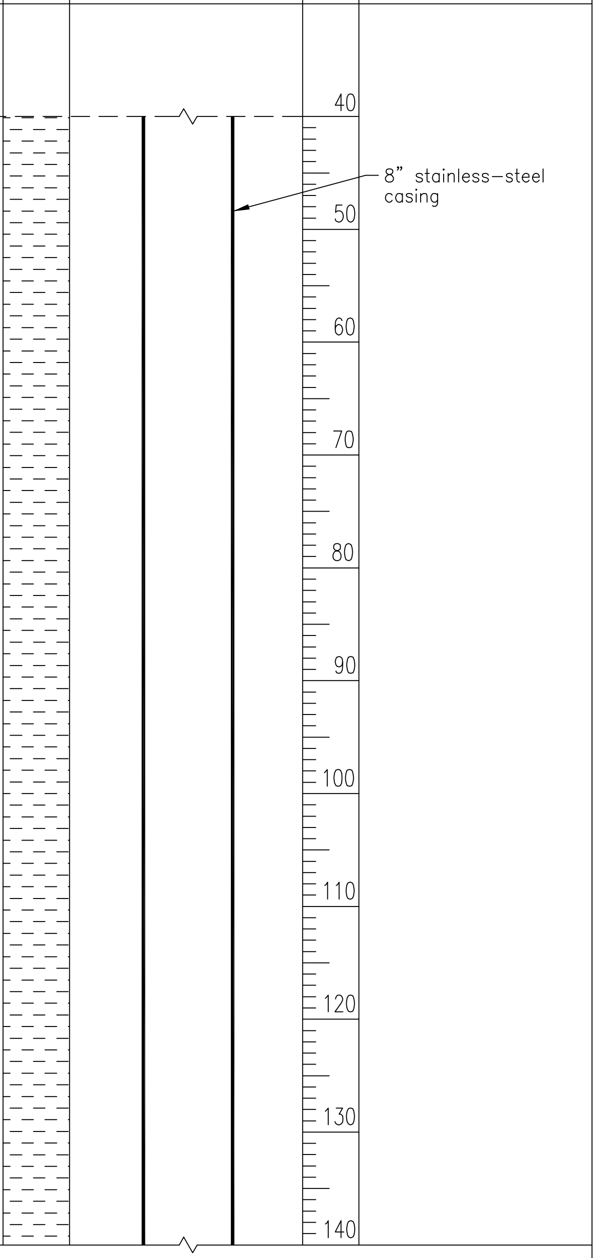
Well Log: 323–R

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 323-R
Location B023/B001 Alcove

TOC Elev. ~175'
GS Elev. ~172'
Page 2 of 3

Depth Feet	Overburden/Lithologic Description	Depth Feet	Well Construction Details
40	CLAY.	40	8" stainless-steel casing
50		50	
60		60	
70		70	
80		80	
90		90	
100		100	
110	CLAY: at 110' with limestone shale, SR/A inclusions.	110	
120	CLAY.	120	
130		130	
140		140	



Note: Scale inverval changes on this page.

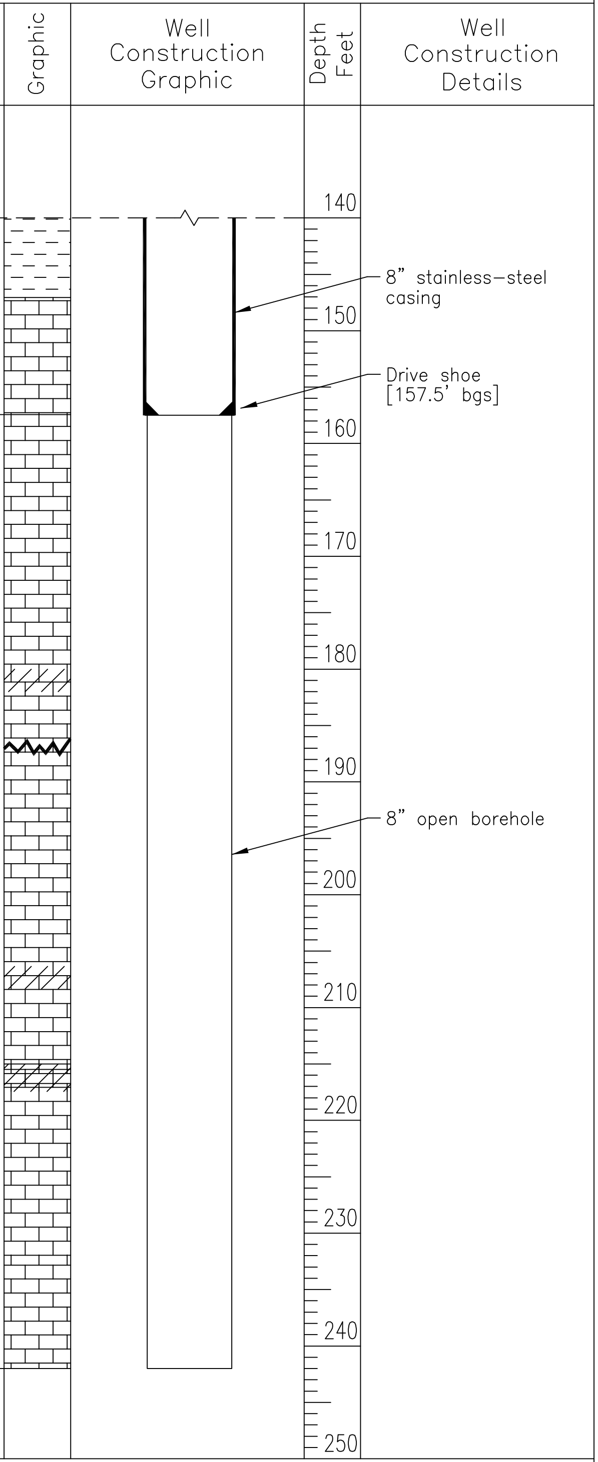
GROUNDWATER SCIENCES CORPORATION

Well Log: 323-R

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 323-R
Location B023/B001 Alcove
TOC Elev. ~175'
GS Elev. ~172'
Page 3 of 3

Depth Feet	Overburden/Lithologic Description
140	
	CLAY: at 142', gray-brown, very dry, plastic.
	SHALE: at 147' with SR/SA erratics.
150	SHALE: with clay at 148'. SHALE: at 149'.
	SHALE: at 155', black, SR/SA calcareous limestone/argilaceous dolostone.
160	BEDROCK: at 157.5', grayish-black calcareous shale.
170	: as above, black.
180	: as above, black, limestone calcite veins.
	SHALE: as above; calcite infilling, softer from 181–182'. : fines.
	: water-bearing zone at 187'.
190	SHALE: at 189', black.
	: trace calcite crystals. : trace calcite. : trace calcite, softer zone, including fines in returns.
200	
	: as above, black shale with calcite.
210	: calcite infilling at 208'.
220	
230	
240	
	Total Depth: 242' (bgs).
250	



GROUNDWATER SCIENCES CORPORATION

Well Log: 323-R

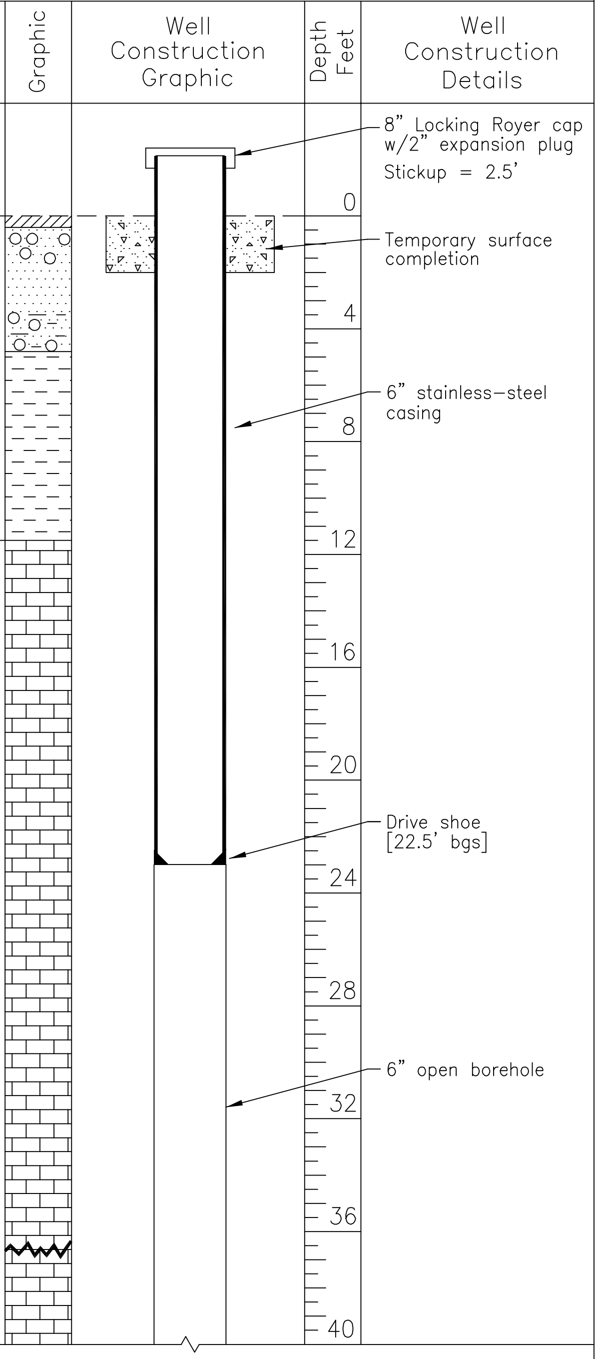
Air Rotary Drilling Log

Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 324-R
Location Parking Lot NW of B023
Near Enterprise Drive

TOC Elev. 175'
GS Elev. 172.5'
Page 1 of 2

Depth Feet		Overburden/Lithologic Description
0	Ground Surface	
	Northstar Drilling, Inc.: 7/6/00.	Asphalt, top 5".
		SAND: dark yellow brown, some fines, tr gravel.
4		
		SAND/SILT/CLAY/GRAVEL: top 8".
		CLAY: pale yel br, tr silt, some med red lenses w/med sand in center.
		CLAY: as above, orange redox layers present.
8		
		CLAY: as above.
		CLAY: as above, shale (?) fragment at base of spoon.
12	BEDROCK: at 11.5', grayish-black calcareous shale.	
	: dry to 15'.	
16	: moist at 16.5'.	
20		
24		
28		
32		
36		
	: possible water-bearing zone at 37'.	
40		



Driller: Eichelbergers, Inc.
Logged by: C.E. Stoner, GSC
Drilling Started: 10-26-00
Drilling Completed: 10-26-00
Well Coords.: N718528.5
E590854.4

Notes:

Measured DTW: 25.96' from grade.

Estimated Blown Yield: <0.25 gpm.

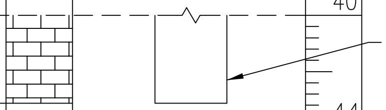
GROUNDWATER SCIENCES CORPORATION

Well Log: 324-R

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 324-R
Location Parking Lot NW of B023
Near Enterprise Drive
TOC Elev. 175'
GS Elev. 172.5'
Page 2 of 2

Depth Feet	Overburden/Lithologic Description	Graphic	Well Construction Graphic	Depth Feet	Well Construction Details
40	BEDROCK: grayish-black calcareous shale.			40	6" open borehole
44	Total Depth: 43.15'.			44	
48				48	
52				52	
56				56	
60				60	
64				64	
68				68	
72				72	
76				76	
80				80	

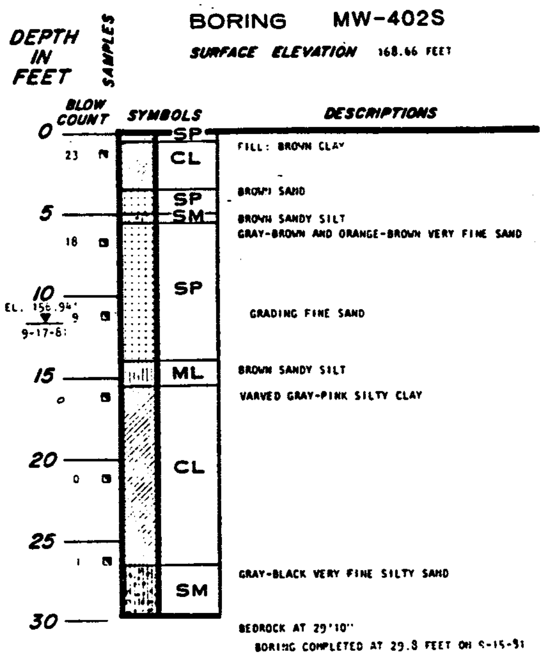


GROUNDWATER SCIENCES CORPORATION

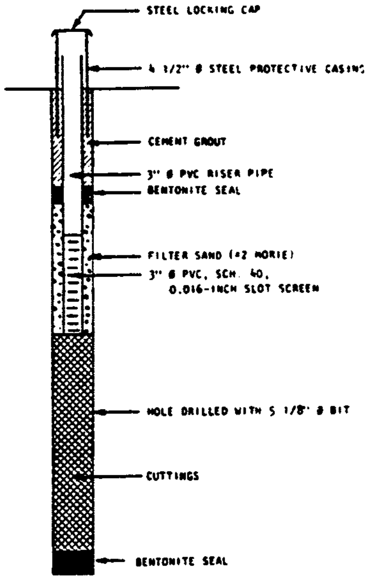
Well Log: 324-R

MONITORING WELL MW-402S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-15-81
- Well Type: Shallow-Overburden
- Location: Neighborhood Road
- Top of casing elevation at date of installation from IBM Datum: 171.27'
- Top of screen elevation at date of installation from IBM Datum: 158.66'
- Bottom of screen elevation at date of installation from IBM Datum: 153.66'
- Protective casing material: Steel
  Diameter: 4.5"
- Inner casing and screen material: PVC-schedule 40
  Diameter: 3" Slot size: 0.016

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-402S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Installation of water tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-15-80	Brinnier & Larios	171.27'	---
10-2-92	Brinnier & Larios	174.13'	173.24'

MONITORING WELL MW-402S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 153.66'

- Depth prior to development: 155.82' Depth after development: 155.82'
- Difference in depth from installation: 2.16' Difference in depth from installation: 2.16'

Change in depth (in feet): no change

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 153.66'

- Depth prior to development: 155.93' Depth after development: 155.93'
- Difference in depth from installation: 2.27' Difference in depth from installation: 2.27'

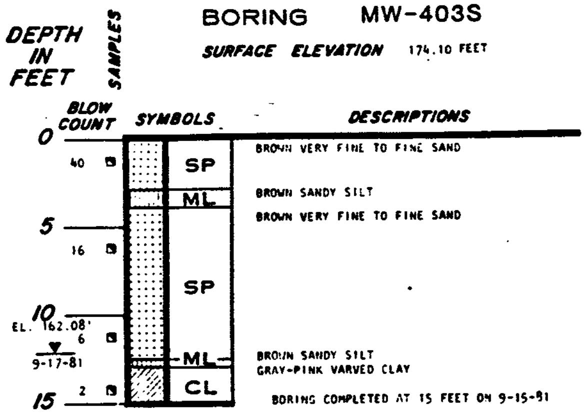
Change in depth (in feet): no change

- Redevelopment method: Centrifugal Pump

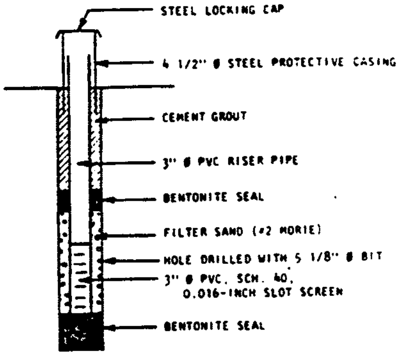
- Performed by: Dames & Moore

MONITORING WELL MW-403S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 9-15-81
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 176.91'
- Top of screen elevation at date of installation from IBM Datum: 166.10'
- Bottom of screen elevation at date of installation from IBM Datum: 161.10'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.016

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-403S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-15-81	Brinnier & Larios	176.91'	---
10-2-92	Brinnier & Larios	177.22'	176.35'

MONITORING WELL MW-403S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

- Total well depth at date of installation: __________

- Depth prior to development: __________ Depth after development: __________
- Difference in depth from installation: __________ Difference in depth from installation: __________

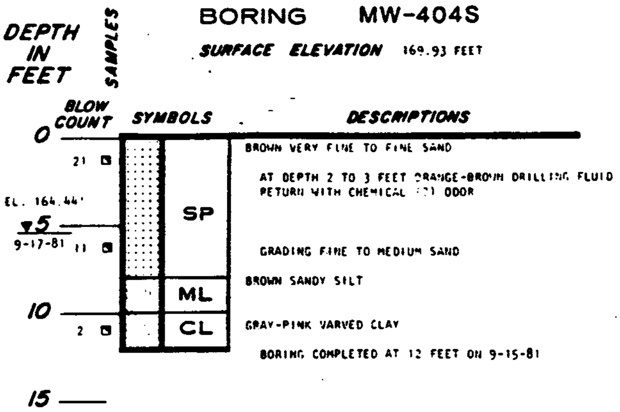
Change in depth (in feet): __________

- Redevelopment method: __________

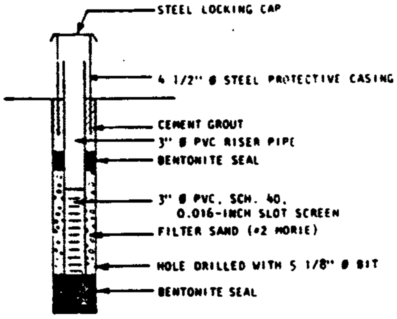
- Performed by: __________

MONITORING WELL MW-404S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 9-15-81
- Well Type: Shallow-Overburden
- Location: North Parking Lot & Old Neighborhood Road
- Top of casing elevation at date of installation from IBM Datum: 172.67'
- Top of screen elevation at date of installation from IBM Datum: 164.93'
- Bottom of screen elevation at date of installation from IBM Datum: 159.93'
- Protective casing material: Steel
  Diameter: 4.5"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.016

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-404S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Labelling of curb box and lock replacement

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Installation of curb box rubber seal and water-tight cap and extension of PVC casing (1')

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-15-81	Brinnier & Larios	172.67'	---
10-2-92	Brinnier & Larios	170.90'	170.50'

MONITORING WELL MW-404S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

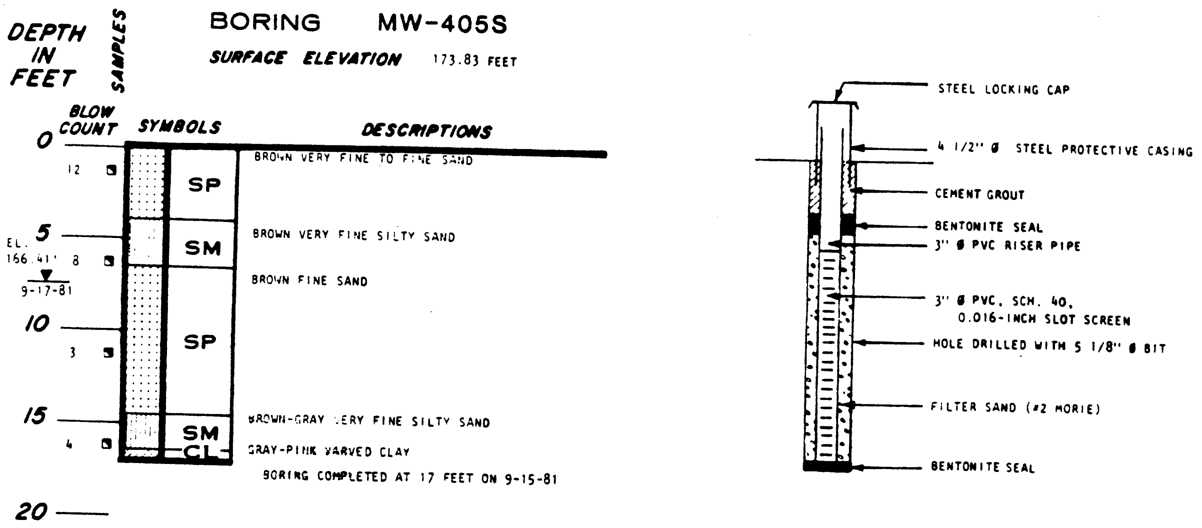
- Total well depth at date of installation: 159.93'

- Depth prior to development: 159.70' Depth after development: 159.09'
- Difference in depth from installation: 0.23' (deeper) Difference in depth from installation: 0.84' (deeper)

Change in depth (in feet): 0.61'

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore



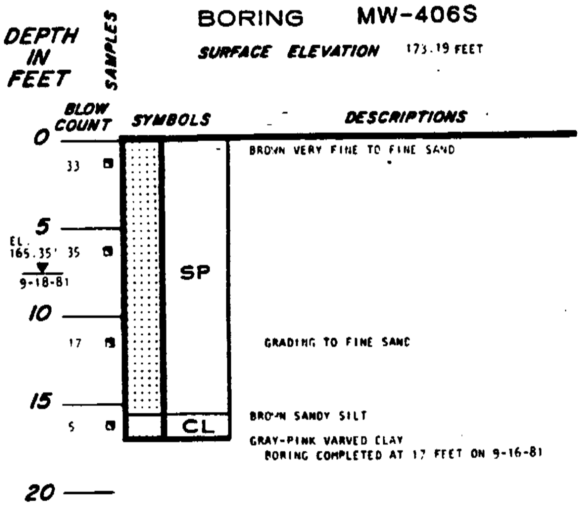
LOG AND MONITORING WELL DETAILS

Dames & Moore

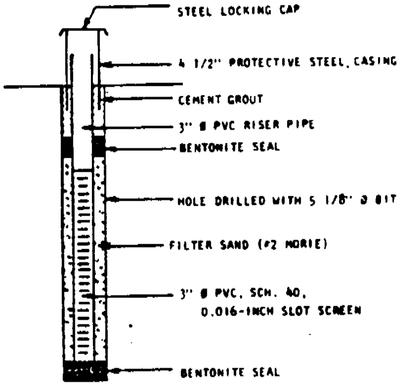
FIGURE 4

MONITORING WELL MW-406S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 9-16-81
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 174.70'
- Top of screen elevation at date of installation from IBM Datum: 167.19'
- Bottom of screen elevation at date of installation from IBM Datum: 157.19'
- Protective casing material: Steel
  Diameter: 4.5"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.016

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

AAW02E38

MONITORING WELL MW-406S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair, installation of water-tight cap, and lock replacement

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-16-81	Brinnier & Larios	174.70'	---
10-2-92	Brinnier & Larios	175.97'	174.94'

MONITORING WELL MW-406S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92 (not needed)

- Total well depth at date of installation: 157.19'

- Depth prior to development: 156.85'
- Difference in depth from installation: 0.34'

Depth after development: --
Difference in depth from installation: --

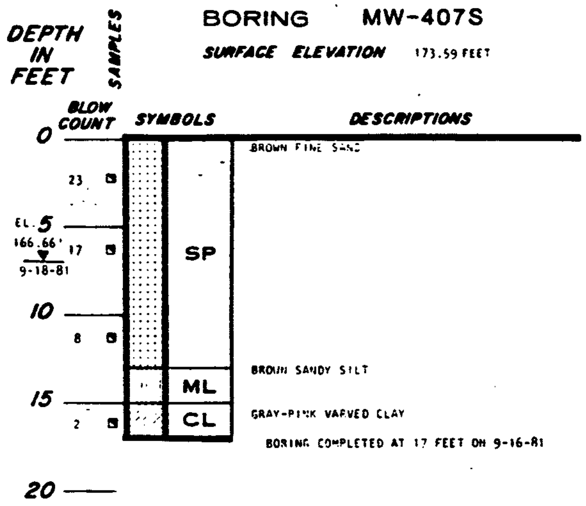
Change in depth (in feet): --

- Redevelopment method: --

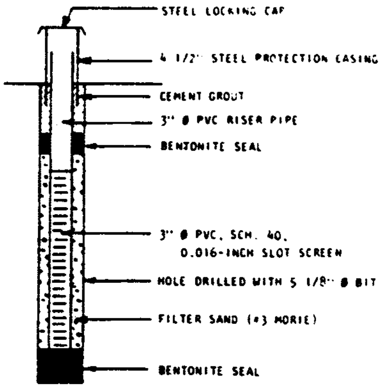
- Performed by: Dames & Moore

MONITORING WELL MW-407S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 9-16-81
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 176.60'
- Top of screen elevation at date of installation from IBM Datum: 168.59'
- Bottom of screen elevation at date of installation from IBM Datum: 158.59'
- Protective casing material: Steel
  Diameter: 4.5"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.016

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-407S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair, installation of water-tight cap, and lock replacement

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
9-16-81	Brinnier & Larios	176.60'	---
10-2-92	Brinnier & Larios	176.93'	176.71'

MONITORING WELL MW-407S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

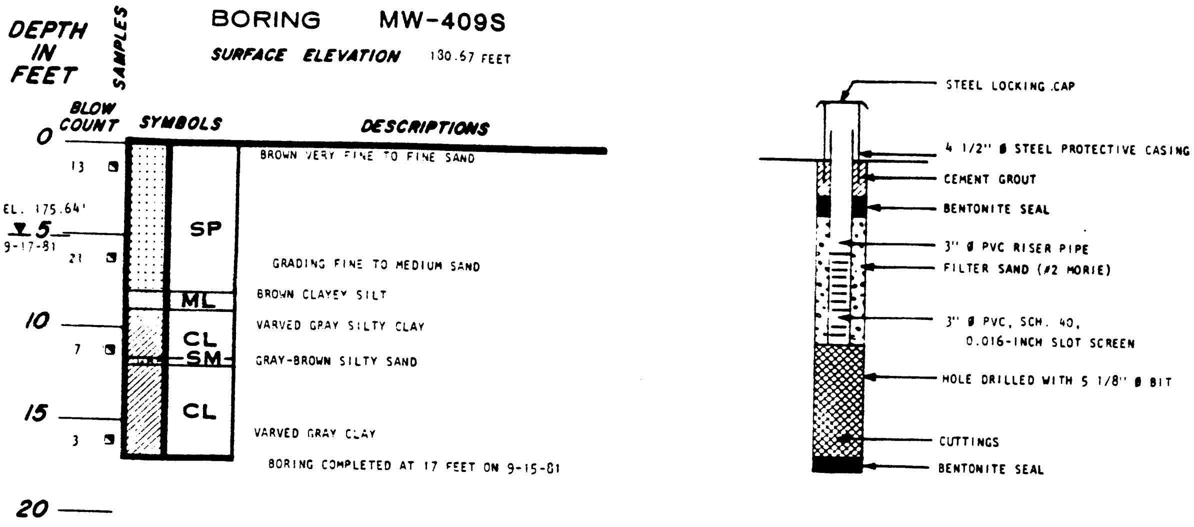
- Total well depth at date of installation:____________

- Depth prior to development:____________ Depth after development:____________
- Difference in depth from installation:____________ Difference in depth from installation:____________

Change in depth (in feet):____________

- Redevelopment method:____________

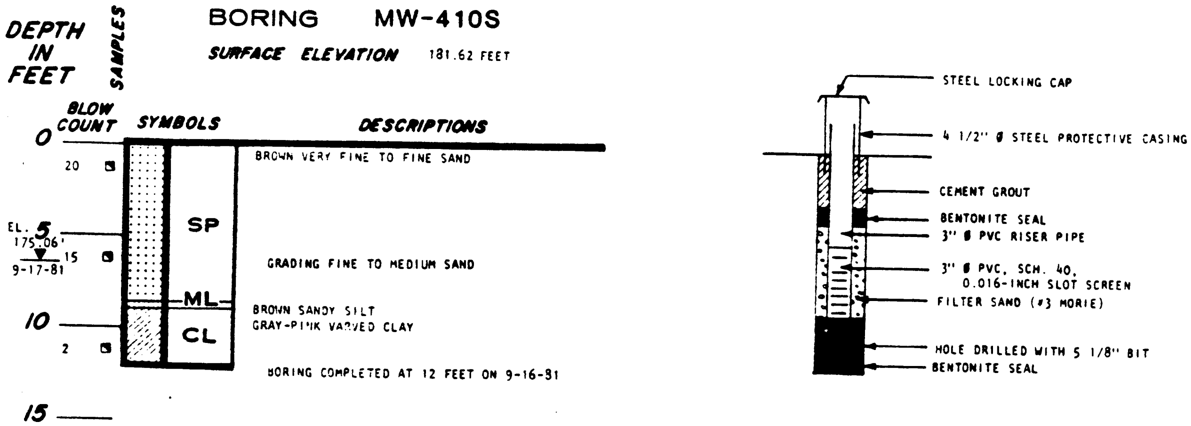
- Performed by:____________



LOG AND MONITORING WELL DETAILS

Dames & Moore

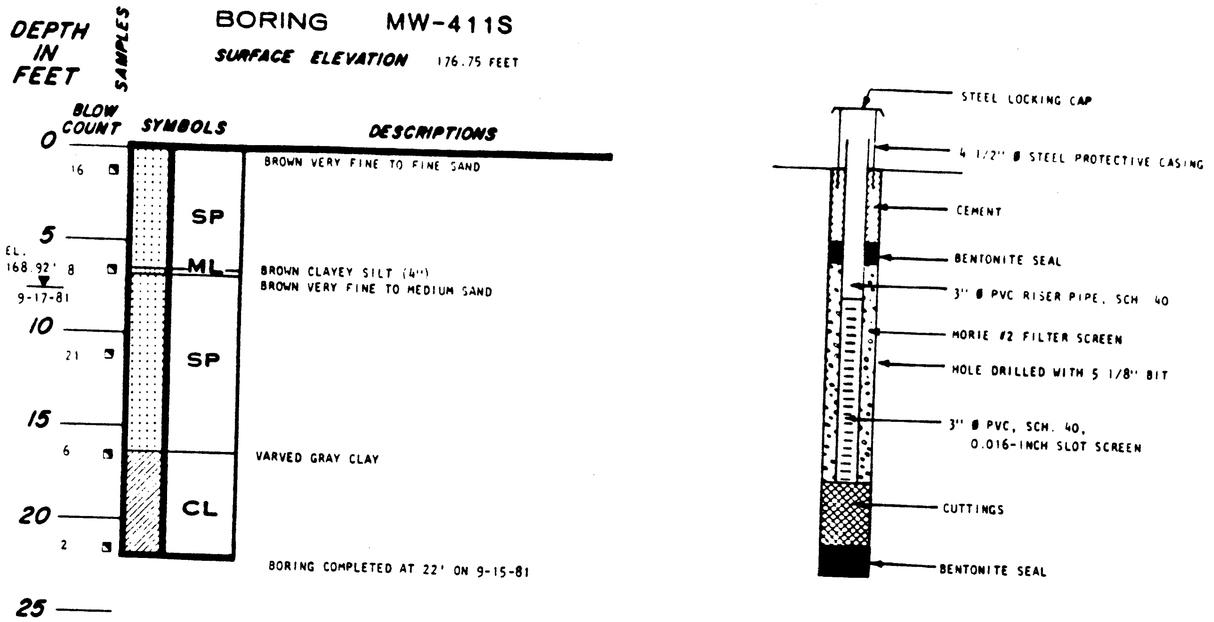
FIGURE 5



LOG AND MONITORING WELL DETAILS

Dames & Moore

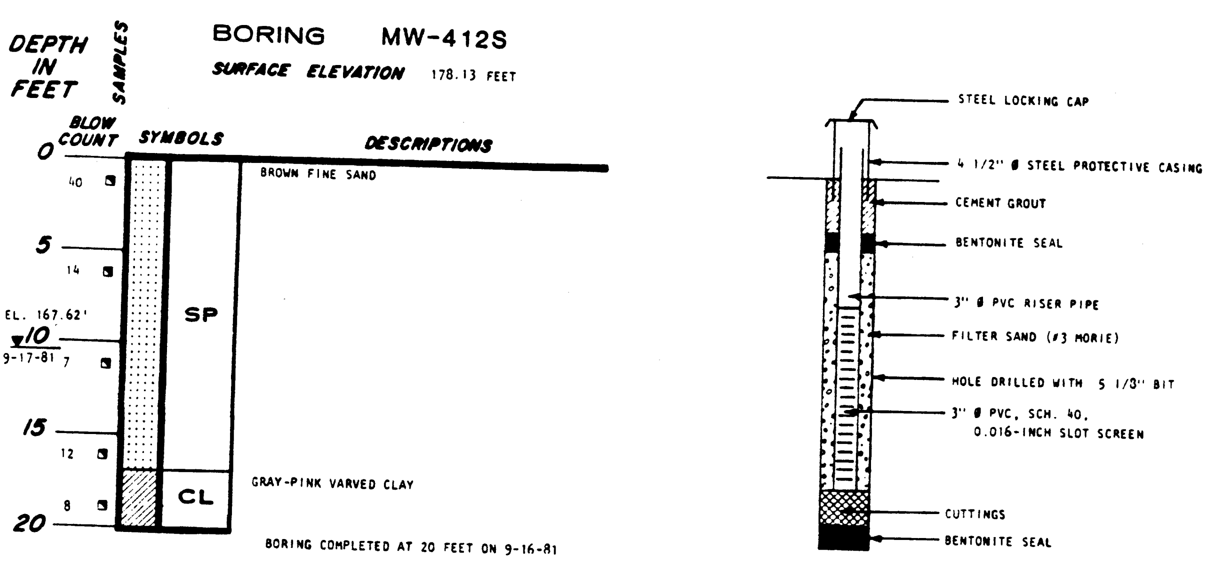
FIGURE 5



LOG AND MONITORING WELL DETAILS

Dames & Moore

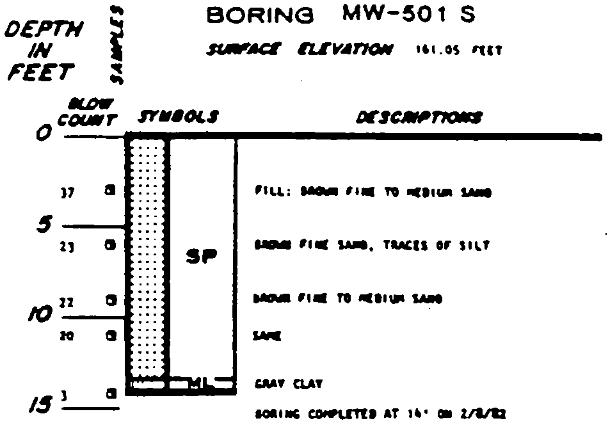
FIGURE 6

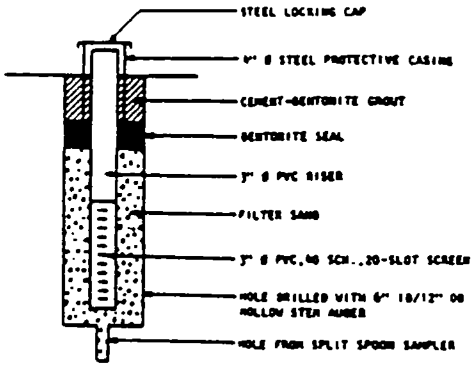


LOG AND MONITORING WELL DETAILS

Dames & Moore

FIGURE 6





LOG AND MONITORING WELL DETAILS

NOTES:

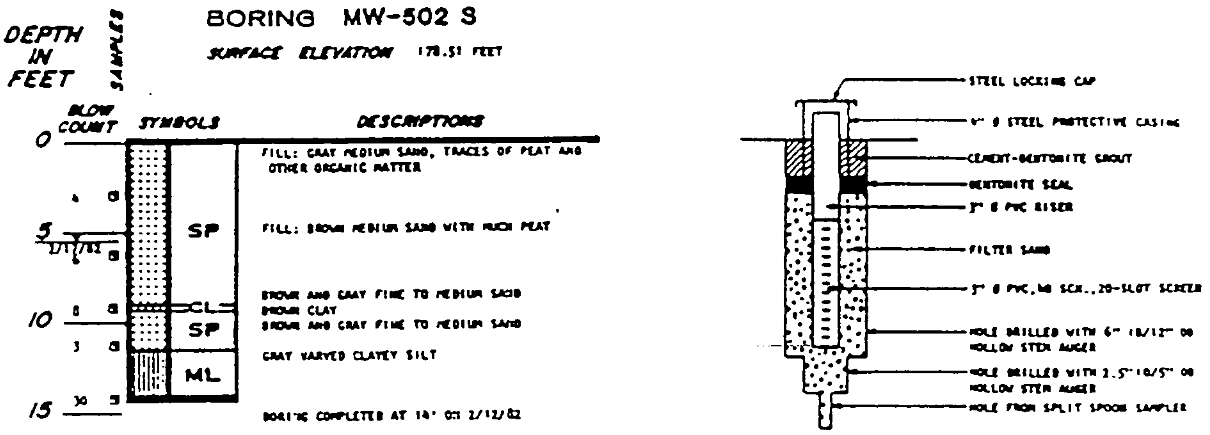
1. THE FIGURES IN THE COLUMN LABELED "BLOW COUNT" REFER TO THE NUMBER OF BLOWS REQUIRED TO DRIVE A STANDARD SPLIT-SPOON SAMPLER A DISTANCE OF ONE FOOT USING A 140 POUND DRIVE WEIGHT FALLING 30 INCHES. THE STANDARD SPLIT-SPOON SAMPLER IS 2 INCHES O.D. AND 1-3/8 INCHES I.D.

2. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM.

3. THE DISCUSSION IN THE TEXT OF THE REPORT IS NECESSARY FOR A PROPER UNDERSTANDING OF THE NATURE OF THE SUBSURFACE MATERIALS.

Dames & Moore

FIGURE 25/33



LOG AND MONITORING WELL DETAILS

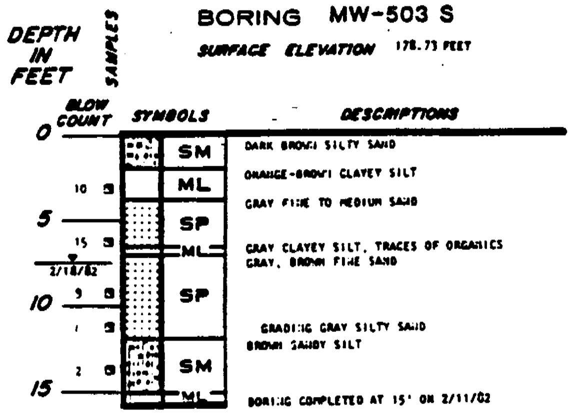
NOTES:

1. THE FIGURES IN THE COLUMN LABELED "BLOW COUNT" REFER TO THE NUMBER OF BLOWS REQUIRED TO DRIVE A STANDARD SPLIT-SPOON SAMPLER A DISTANCE OF ONE FOOT USING A 140 POUND DRIVE WEIGHT FALLING 30 INCHES. THE STANDARD SPLIT-SPOON SAMPLER IS 2 INCHES O.D. AND 1-3/8 INCHES I.D.
2. ELEVATIONS REFER TO MEAN SEA LEVEL DATUM.
3. THE DISCUSSION IN THE TEXT OF THE REPORT IS NECESSARY FOR A PROPER UNDERSTANDING OF THE NATURE OF THE SUBSURFACE MATERIALS.

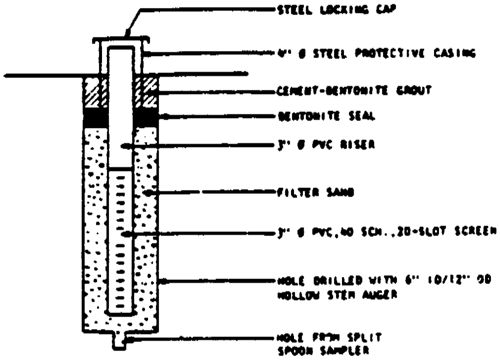
Dames & Moore

MONITORING WELL MW-503S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 2-11-82
- Well Type: Shallow-Overburden
- Location: Building 005
- Top of casing elevation at date of installation from IBM Datum: 180.86′
- Top of screen elevation at date of installation from IBM Datum: 174.73′
- Bottom of screen elevation at date of installation from IBM Datum: 164.73′
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-503S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
2-11-82	Brinnier & Larios	180.86'	---
10-2-92	Brinnier & Larios	180.92'	180.67'

MONITORING WELL MW-503S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 164.73'

- Depth prior to development: 164.85'

- Difference in depth from installation: 0.12'

Depth after development: 164.05'

Difference in depth from installation: 0.68' (deeper)

Change in depth (in feet): 0.80'

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 164.73'

- Depth prior to development: 166.31'

- Difference in depth from installation: 1.58'

Depth after development: 164.16'

Difference in depth from installation: 0.57' (deeper)

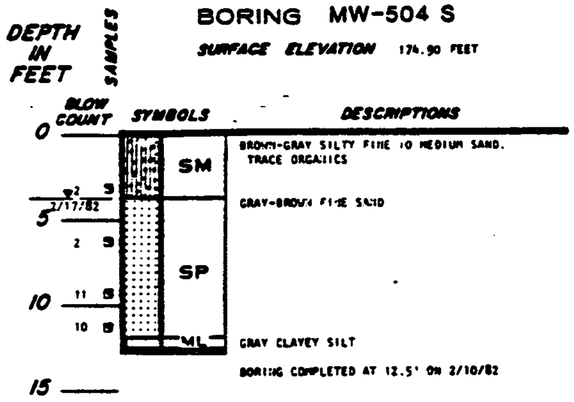
Change in depth (in feet): 1.01'

- Redevelopment method: Bladder Pump

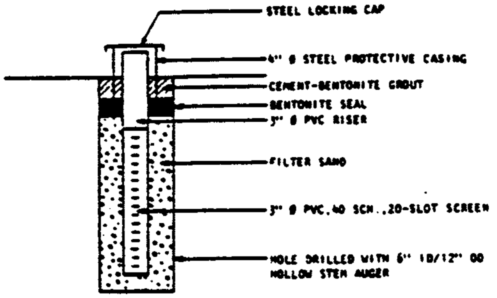
- Performed by: CTM Analytical Laboratories, Ltd.

MONITORING WELL MW-504S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 2-10-82
- Well Type: Shallow-Overburden
- Location: Building 005
- Top of casing elevation at date of installation from IBM Datum: 176.65'
- Top of screen elevation at date of installation from IBM Datum: 171.40'
- Bottom of screen elevation at date of installation from IBM Datum: 163.40'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Monthly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-504S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
2-10-82	Brinnier & Larios	176.65'	---
10-2-92	Brinnier & Larios	177.12'	172.94'

MONITORING WELL MW-504S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

- Total well depth at date of installation:

- Depth prior to development:
- Difference in depth from installation:

Depth after development:
Difference in depth from installation:

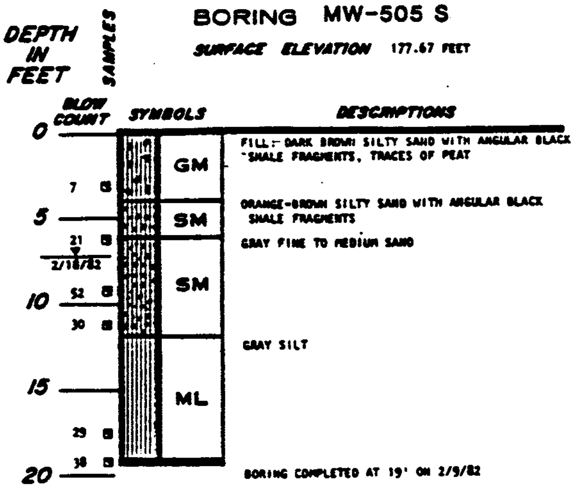
Change in depth (in feet):

- Redevelopment method:

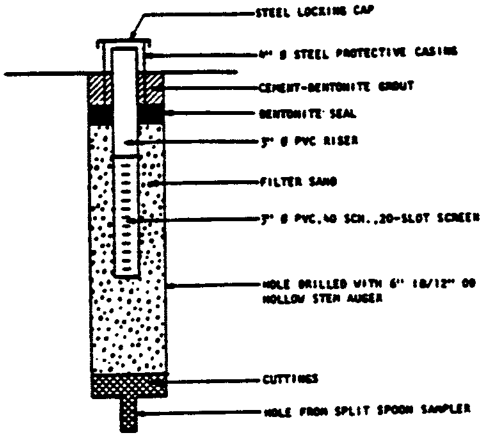
- Performed by:

MONITORING WELL MW-505S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 2-9-82
- Well Type: Shallow-Overburden
- Location: Buildings 004 & 005N
- Top of casing elevation at date of installation from IBM Datum: 179.22'
- Top of screen elevation at date of installation from IBM Datum: 172.67'
- Bottom of screen elevation at date of installation from IBM Datum: 165.67'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-505S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair, installation of water-tight cap, and inscription of reference mark

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
2-9-82	Brinnier & Larios	179.22'	---
10-2-92	Brinnier & Larios	179.57'	179.17'

MONITORING WELL MW-505S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

- Total well depth at date of installation: ____________

- Depth prior to development: ____________ ____________

- Difference in depth from installation: ____________

Depth after development: ____________

Difference in depth from installation: ____________

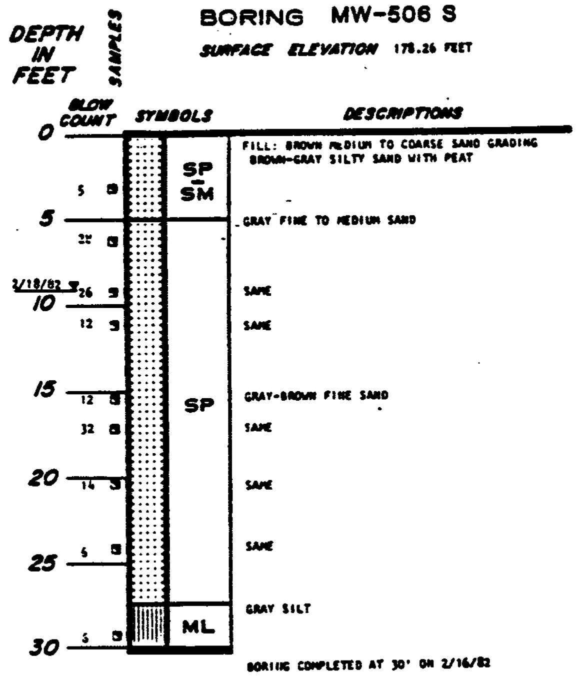
Change in depth (in feet): ____________

- Redevelopment method: ____________

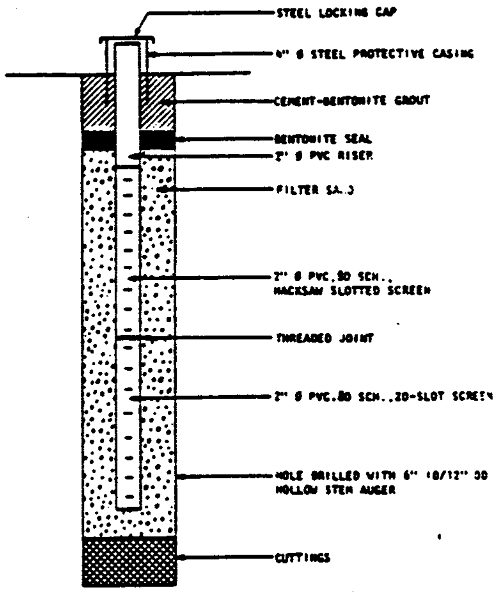
- Performed by: ____________

MONITORING WELL MW-506S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 2-16-82
- Well Type: Shallow-Overburden
- Location: Buildings 003 & 034
- Top of casing elevation at date of installation from IBM Datum: 180.26'
- Top of screen elevation at date of installation from IBM Datum: 167.76'
- Bottom of screen elevation at date of installation from IBM Datum: 152.76'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 2" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Annual
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-506S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92
  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92
  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
2-16-82	Brinnier & Larios	180.26'	---
10-2-92	Brinnier & Larios	180.43'	180.18'

MONITORING WELL MW-506S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 152.76'

- Depth prior to development: 154.68'
- Difference in depth from installation: 1.92'

Depth after development: 151.86'
Difference in depth from installation: 0.90' (deeper)

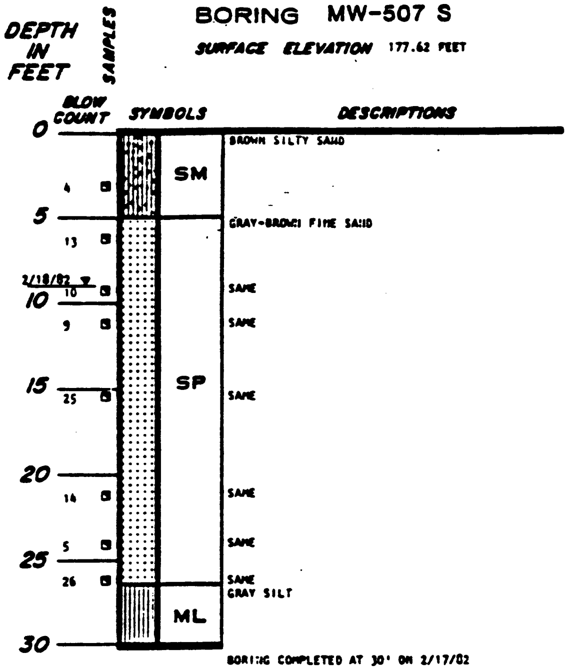
Change in depth (in feet): 1.02'

- Redevelopment method: Bladder Pump

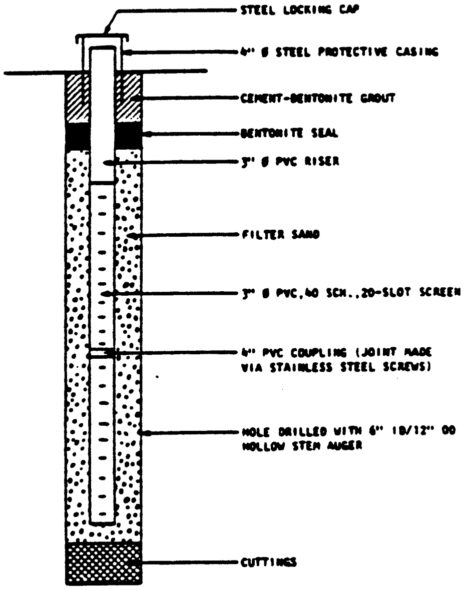
- Performed by: CTM Analytical Laboratories, Ltd.

MONITORING WELL MW-507S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 2-17-82
- Well Type: Shallow-Overburden
- Location: Inside Building 002
- Top of casing elevation at date of installation from IBM Datum: 179.79'
- Top of screen elevation at date of installation from IBM Datum: 171.12'
- Bottom of screen elevation at date of installation from IBM Datum: 151.12'
- Protective casing material: Steel (curb box)
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40 (gray)
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010
- Sampling Frequency: Annual
- Analytical Parameters: Limited NYSDEC Appendix 33 Parameters (volatiles, semi-volatiles, selected metals)

MONITORING WELL MW-507S

V. MODIFICATION DETAILS

- Modification Date: 9-30-92

- Modifications involved the following activities:

Labelling of casing, installation of water-tight cap, and inscription of reference mark

- Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
2-17-82	Brinnier & Larios	179.79'	---
10-2-92	Brinnier & Larios	178.88'	178.58'

MONITORING WELL MW-507S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 151.12'

- Depth prior to development: 151.88'
- Difference in depth from installation: 0.76'

Depth after development: 151.72'
Difference in depth from installation: 0.60'

Change in depth (in feet): 0.16'

- Redevelopment method: Bladder Pump

- Performed by: CTM Analytical Laboratories, Ltd.

MONITORING WELL MW-508S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
2-15-82	Brinnier & Larios	169.98'	---
10-2-92	Brinnier & Larios	170.27'	169.85'

MONITORING WELL MW-508S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

- Total well depth at date of installation:__________

- Depth prior to development:__________ Depth after development:__________
- Difference in depth from installation:__________ Difference in depth from installation:__________

Change in depth (in feet):__________

- Redevelopment method:__________

- Performed by:__________

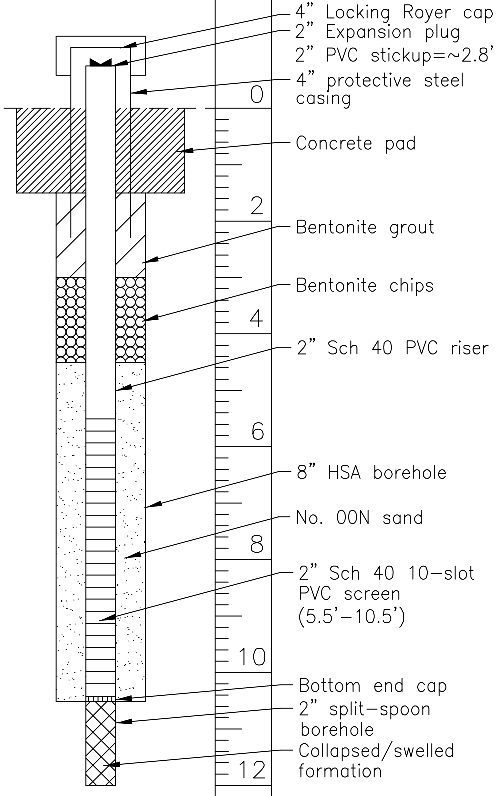
Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 93002.05

Boring No. MW–508SA
TOC Elev. 169.89
Location N side of GWCS
between MH7 and MH8
Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Sod 0–3". SAND: dk yel br, f–m w/vf, lit c & silt, tr f–m gravel, occ black asphalt frags, loose, moist black organic frags throughout. SILT & SAND: at 3', dusky yel br, organic–rich silt & vf–m sand, tr c, tr f gravel, organic frags throughout, cohesive, moist. : occ cobble below 4'. : soft formation at 5.5' w/some grass frags in auger returns.	FILL SM
8	2–4–10–8	0	1	9"	SAND & SILT: dusk yel to grayish br silt, vf–f, some m, tr c, cohesive, organic–rich w/plant frags throughout, moist to wet, 0–5". PEAT: 5–9", dusky yel br to blk w/organic–rich silt w/wood frags, loose, moist to wet.	Pt Pt/OL
10	7–8–7–4	0	2	12"	: large wood frag top 3". SAND: at 3" ol to med gray, m–c w/f, lit–tr vf, tr vc, tr silt, roots throughout, sand grains composed of white qtz, red shale and sand & gray shale, homogeneous overall, sl cohesive, wet.	SW
12	5–7–6–6	0	3	16"	SILT & SAND: dusky yel br, f–m w/vf, some c, silty, tr f SA–SR gravel & organic frags throughout, lg fibrous wood frag 5–7", cohesive, wet. SILT: at 7", br gray w/pale red varves, clay–rich lams., dense, plastic, w/rootlets throughout, tr vf sand lams., moist to wet.	SM MH/CH
14 16 18 20					Total Depth: 12.0'.	

Well Construction Graphic / Well Construction Details



4" Locking Royer cap
2" Expansion plug
2" PVC stickup=~2.8'
4" protective steel casing
Concrete pad
Bentonite grout
Bentonite chips
2" Sch 40 PVC riser
8" HSA borehole
No. 00N sand
2" Sch 40 10–slot PVC screen (5.5'–10.5')
Bottom end cap
2" split–spoon borehole
Collapsed/swelled formation

Driller: North Star Drilling
Logged by: S. Fisher, GSC
Drilling Started: 11–30–95
Drilling Completed: 11–30–95
Well Construction: 11–30–95
Well Developed: 12–5–95
Well Coords.: N719510.20
E591198.11

Notes:

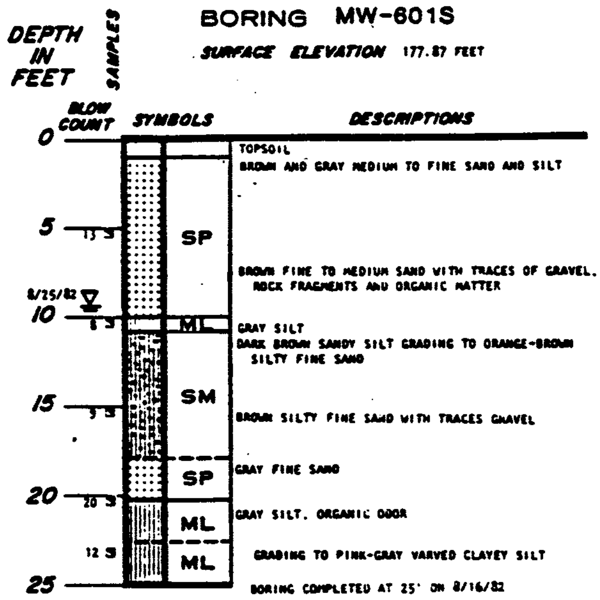
SAA = Same As Above
Measured DTB 13.36' (from TOC).
SWL 8.65' (12/1/95; from TOC).

GROUNDWATER SCIENCES CORPORATION

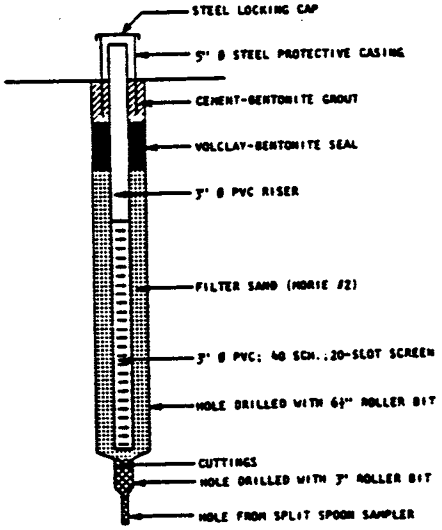
Geologic Log: MW–508SA

MONITORING WELL MW-601S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-16-82
- Well Type: Shallow-Overburden
- Location: Buildings 001 & 021
- Top of casing elevation at date of installation from IBM Datum: 179.82'
- Top of screen elevation at date of installation from IBM Datum: 169.87'
- Bottom of screen elevation at date of installation from IBM Datum: 156.87'
- Protective casing material: Steel (curb box)
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-601S

V. MODIFICATION DETAILS

- Modification Date: 9-30-92

- Modifications involved the following activities:

Labelling of curb box, installation of water-tight cap and rubber curb box seal, inscription of reference mark, and lock replacement

- Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
8-16-82	Brinnier & Larios	179.82'	---
10-2-92	Brinnier & Larios	177.91'	177.74'

MONITORING WELL MW-601S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 156.87'

- Depth prior to development: 157.84'
- Difference in depth from installation: 0.97'

Depth after development: 156.59
Difference in depth from installation: 0.28' (deeper)

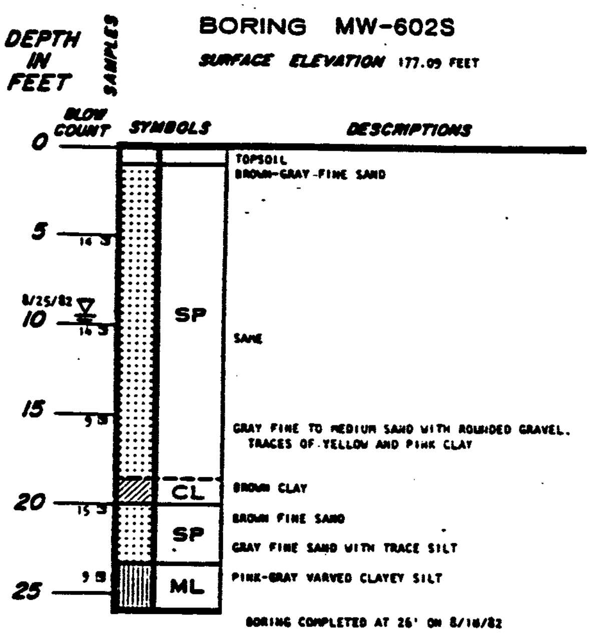
Change in depth (in feet): 0.69'

- Redevelopment method: Centrifugal Pump

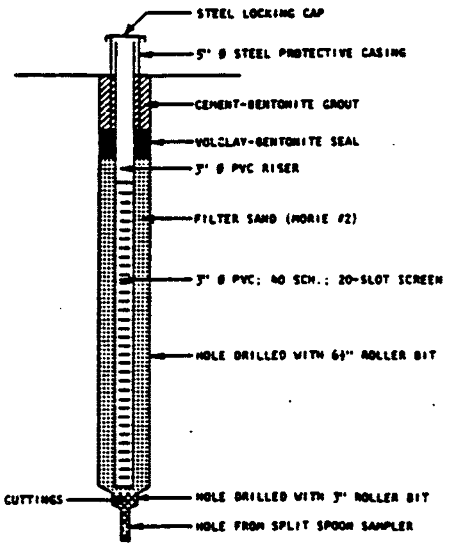
- Performed by: Dames & Moore

MONITORING WELL MW-602S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-18-82
- Well Type: Shallow-Overburden
- Location: Building 021
- Top of casing elevation at date of installation from IBM Datum: 179.19'
- Top of screen elevation at date of installation from IBM Datum: 171.09'
- Bottom of screen elevation at date of installation from IBM Datum: 154.09'
- Protective casing material: Steel
  Diameter: 5"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-602S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
8-18-82	Brinnier & Larios	179.19'	---
10-2-92	Brinnier & Larios	180.49'	180.24'

MONITORING WELL MW-602S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 154.09'

- Depth prior to development: 155.87' Depth after development: 155.09'
- Difference in depth from installation: 1.78' Difference in depth from installation: 1.00'

Change in depth (in feet): 0.78'

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 154.09'

- Depth prior to development: 155.87' Depth after development: 155.17'
- Difference in depth from installation: 1.78' Difference in depth from installation: 1.08'

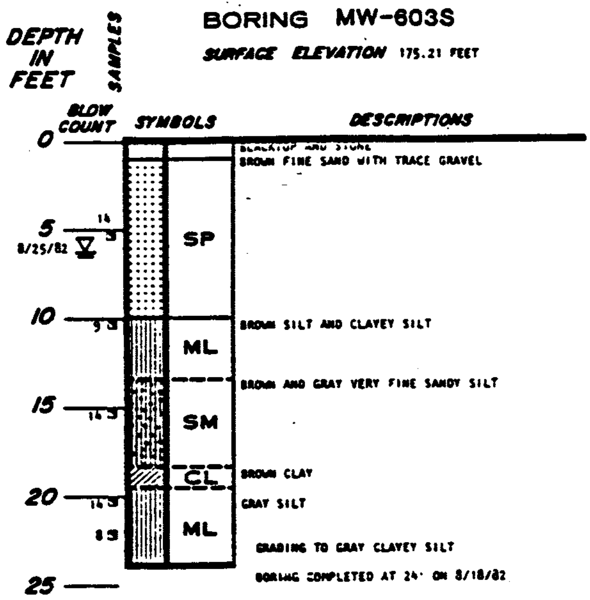
Change in depth (in feet): 0.70'

- Redevelopment method: Bladder Pump

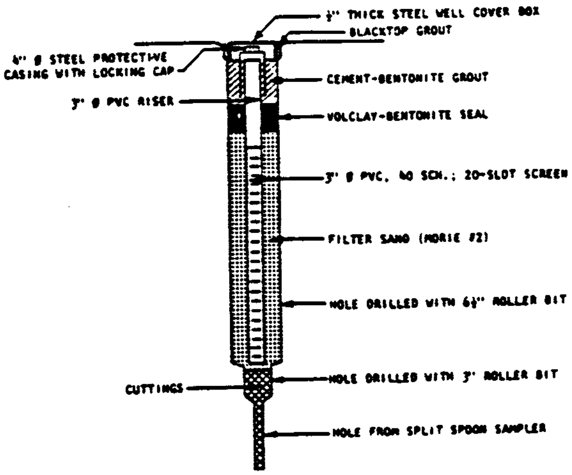
- Performed by: CTM Analytical Laboratories, Ltd.

MONITORING WELL MW-603S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-18-82
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 174.91'
- Top of screen elevation at date of installation from IBM Datum: 169.21'
- Bottom of screen elevation at date of installation from IBM Datum: 157.21'
- Protective casing material: Steel (curb box)
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-603S

V. MODIFICATION DETAILS

- Modification Date: 9-30-92

- Modifications involved the following activities:

Labelling of curb box, curb box extension, installation of water-tight cap and rubber curb box seal, inscription of reference mark, and lock replacement

- Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
8-18-82	Brinnier & Larios	174.91'	---
10-2-92	Brinnier & Larios	175.29'	174.83'

MONITORING WELL MW-603S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 157.21'

- Depth prior to development: 161.14' Depth after development: 157.97
- Difference in depth from installation: 3.93' Difference in depth from installation: 0.76'

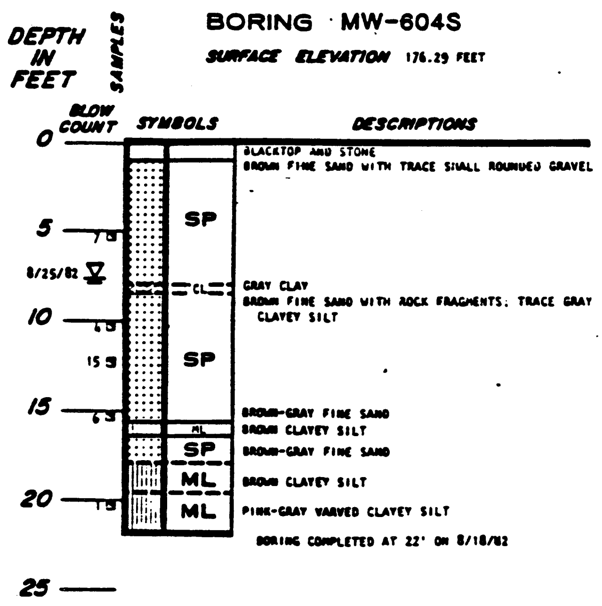
Change in depth (in feet): 3.17'

- Redevelopment method: Centrifugal Pump

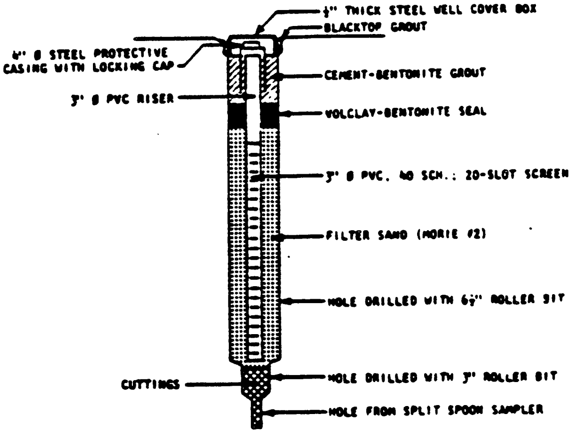
- Performed by: Dames & Moore

MONITORING WELL MW-604S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-18-82
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 175.99'
- Top of screen elevation at date of installation from IBM Datum: 170.29'
- Bottom of screen elevation at date of installation from IBM Datum: 158.29'
- Protective casing material: Steel (curb box)
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010
- Sampling Frequency: Annual
- Analytical Parameters: Limited Appendix 33 Parameters (volatiles, semi-volatiles, selected metals)

MONITORING WELL MW-604S

V. MODIFICATION DETAILS

- Modification Date: 9-30-92

- Modifications involved the following activities:

Labelling of curb box, curb box extension, installation of water-tight cap and rubber curb box seal inscription of reference mark, and lock replacement

- Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
8-18-82	Brinnier & Larios	175.99'	---
10-2-92	Brinnier & Larios	176.35'	176.01'

MONITORING WELL MW-604S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 158.29'

- Depth prior to development: 160.22' Depth after development: 160.07'
- Difference in depth from installation: 1.93' Difference in depth from installation: 1.78'

Change in depth (in feet): 0.15'

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 158.29'

- Depth prior to development: 160.45' Depth after development: 160.29'
- Difference in depth from installation: 2 16' Difference in depth from installation: 2.00'

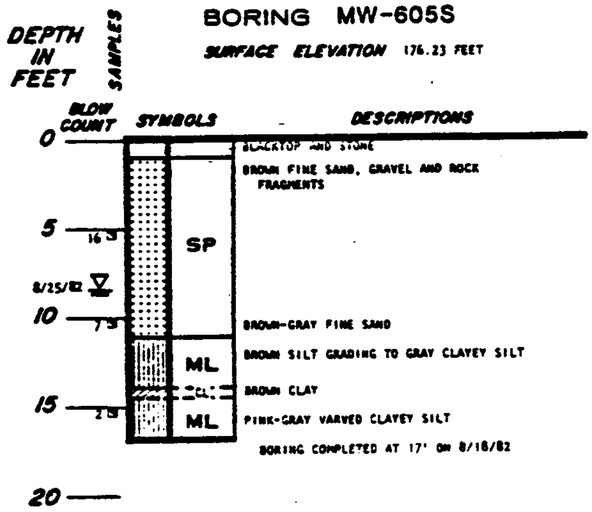
Change in depth (in feet): 0.16'

- Redevelopment method: Centrifugal Pump

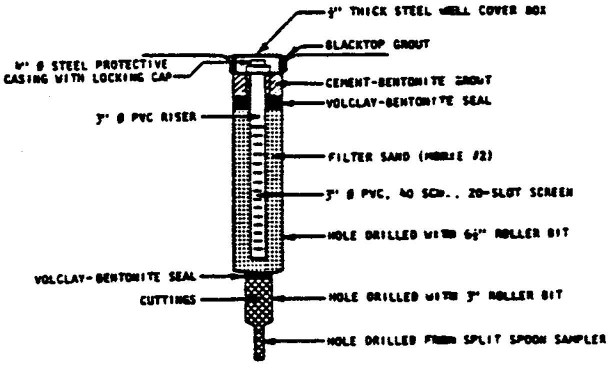
- Performed by: Dames & Moore

MONITORING WELL MW-605S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-18-82
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 176.03'
- Top of screen elevation at date of installation from IBM Datum: 172.23'
- Bottom of screen elevation at date of installation from IBM Datum: 165.23'
- Protective casing material: Steel (curb box)
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-605S

V. MODIFICATION DETAILS

- Modification Date: 9-30-92

- Modifications involved the following activities:

Labelling of curb box, curb box extension, installation of water-tight cap and rubber curb box seal, inscription of reference mark, and lock replacement

- Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
8-18-82	Brinnier & Larios	176.03'	---
10-2-92	Brinnier & Larios	176.28'	176.15'

MONITORING WELL MW-605S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 165.23'

- Depth prior to development: 166.20' Depth after development: 165.99'
- Difference in depth from installation: 0.97' Difference in depth from installation: 0.76'

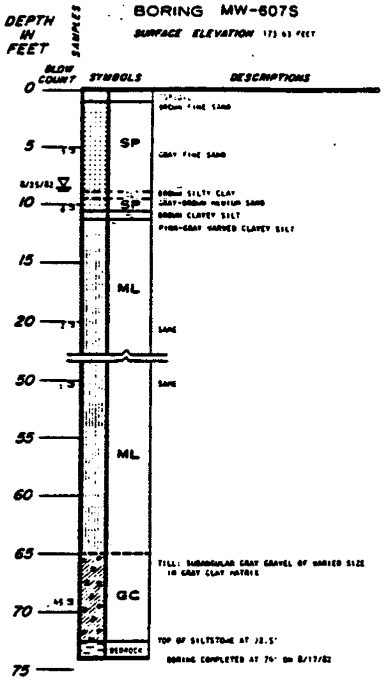
Change in depth (in feet): 0.21'

- Redevelopment method: Centrifugal Pump

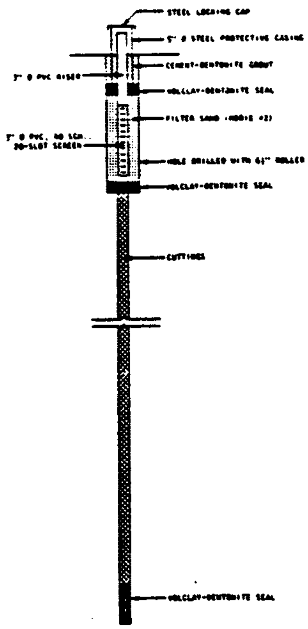
- Performed by: Dames & Moore

MONITORING WELL MW-607S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-17-82
- Well Type: Shallow-Overburden
- Location: North Parking Lot
- Top of casing elevation at date of installation from IBM Datum: 176.03'
- Top of screen elevation at date of installation from IBM Datum: 169.13'
- Bottom of screen elevation at date of installation from IBM Datum: 163.13'
- Protective casing material: Steel
  Diameter: 4"
- Inner casing and screen material: PVC-Scnedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-607S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

- Modifications involved the following activities:

Painting and labelling of casing

- Performed by: Dames & Moore

- Modification Date: 9-30-92

- Modifications involved the following activities:

Surface seal repair and installation of water-tight cap

- Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
8-17-82	Brinnier & Larios	176.03'	---
10-2-92	Brinnier & Larios	176.36'	175.84'

MONITORING WELL MW-607S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: None

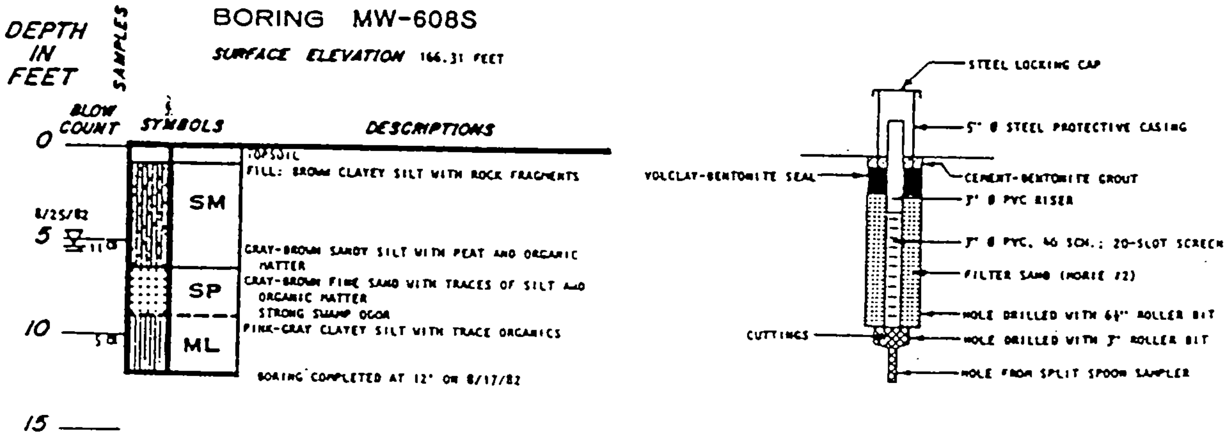
- Total well depth at date of installation:

- Depth prior to development: Depth after development:
- Difference in depth from installation: Difference in depth from installation:

Change in depth (in feet):

- Redevelopment method:

- Performed by:



LOG AND MONITORING WELL DETAILS

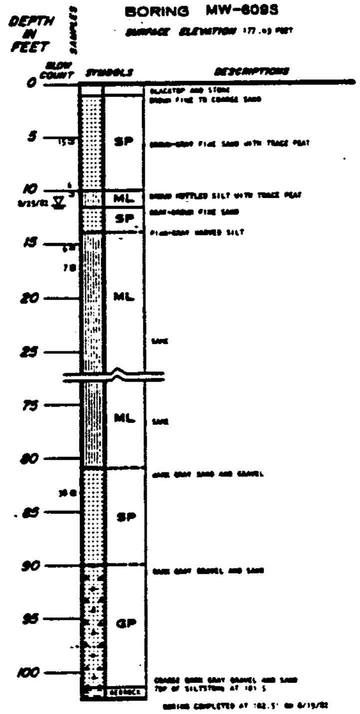
CONFIDENTIAL

Dames & Moore

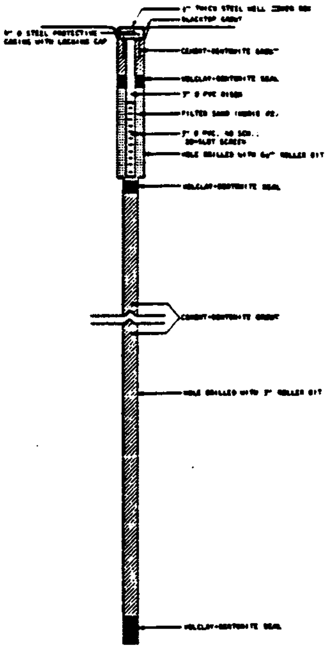
FIGURE B-10

MONITORING WELL MW-609S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-19-82
- Well Type: Shallow-Overburden
- Location: Building 201 Parking Lot and Neighborhood Road
- Top of casing elevation at date of installation from IBM Datum: 176.93'
- Top of screen elevation at date of installation from IBM Datum: 170.43'
- Bottom of screen elevation at date of installation from IBM Datum: 163.43'
- Protective casing material: Steel
  Diameter: 6"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-609S

V. MODIFICATION DETAILS

- Modification Date: 9-30-92

- Modifications involved the following activities:

Installation, painting, and labelling of protective casing, extension of PVC casing (1.5'), installation of water-tight cap, and lock replacement

- Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
8-19-82	Brinnier & Larios	176.93'	---
10-2-92	Brinnier & Larios	179.36'	178.63'

MONITORING WELL MW-609S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 163.43′

- Depth prior to development: 165.76′

Depth after development: 163.56′

- Difference in depth from installation: 2.33′

Difference in depth from installation: 0.13′

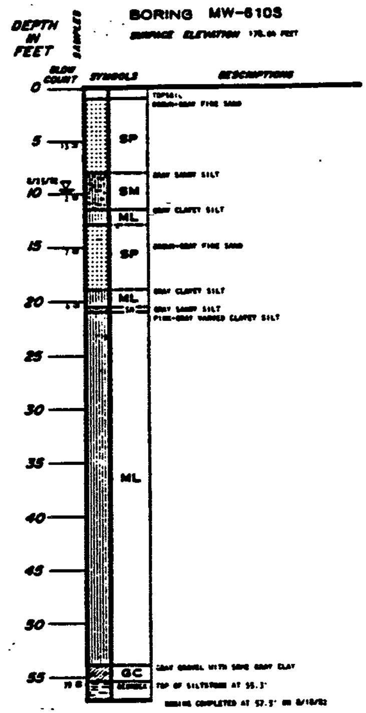
Change in depth (in feet): 2.20′

- Redevelopment method: Centrifugal Pump

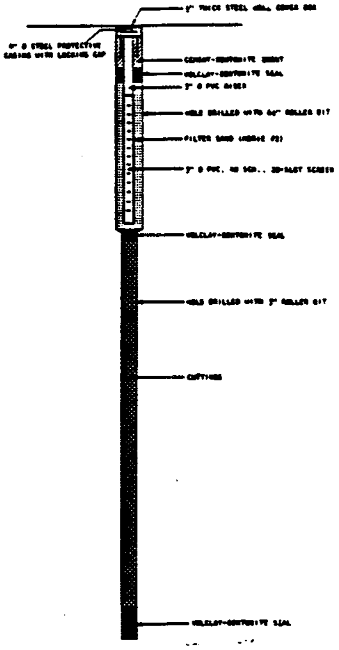
- Performed by: Dames & Moore

MONITORING WELL MW-610S

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 8-18-82
- Well Type: Shallow-Overburden
- Location: Building 022 and Neighborhood Road
- Top of casing elevation at date of installation from IBM Datum: 177.64'
- Top of screen elevation at date of installation from IBM Datum: 171.54'
- Bottom of screen elevation at date of installation from IBM Datum: 159.54'
- Protective casing material: Steel (curb box)
  Diameter: 4"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 3" Slot size: 0.020

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

AAW02E44

MONITORING WELL MW-610S

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

  Labelling of curb box

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

  Installation of rubber curb box seal and water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
8-18-82	Brinnier & Larios	177.64'	---
10-2-92	Brinnier & Larios	178.00'	177.81'

MONITORING WELL MW-610S

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 7-22-92

- Total well depth at date of installation: 159.54'

- Depth prior to development: 160.91' Depth after development: 160.72'
- Difference in depth from installation: 1.37' Difference in depth from installation: 1.18'

Change in depth (in feet): 0.19'

- Redevelopment method: Centrifugal Pump

- Performed by: Dames & Moore

- Redevelopment Date: 10-2-92

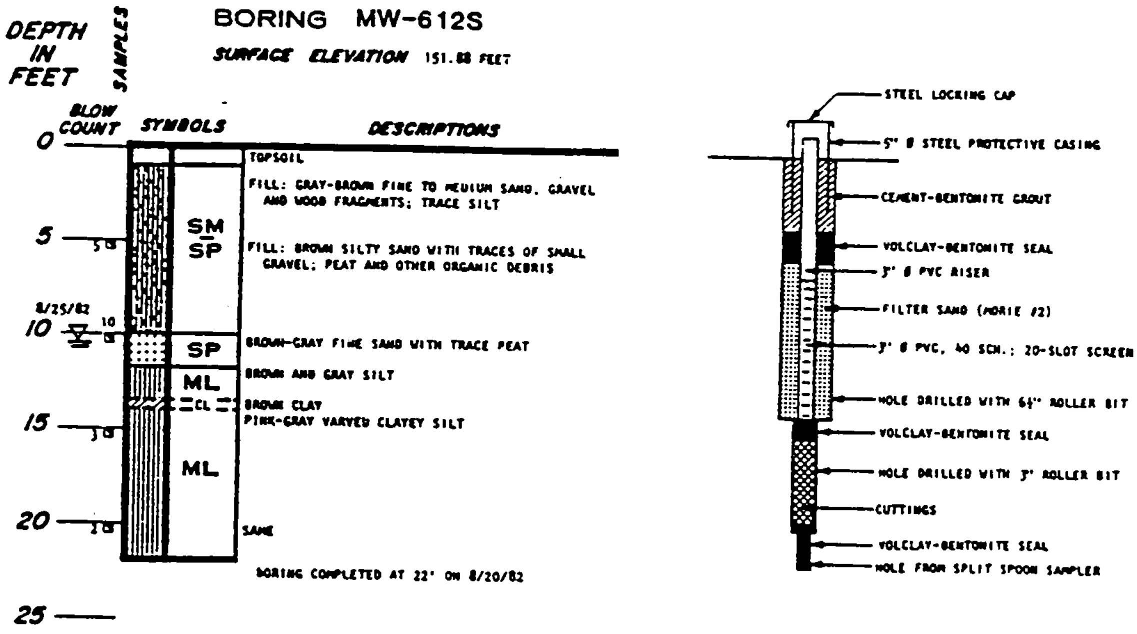
- Total well depth at date of installation: 159.54'

- Depth prior to development: 161.21' Depth after development: 161.12'
- Difference in depth from installation: 1.67' Difference in depth from installation: 1.58'

Change in depth (in feet): 0.09'

- Redevelopment method: Bladder Pump

- Performed by: CTM Analytical Laboratories, Ltd.

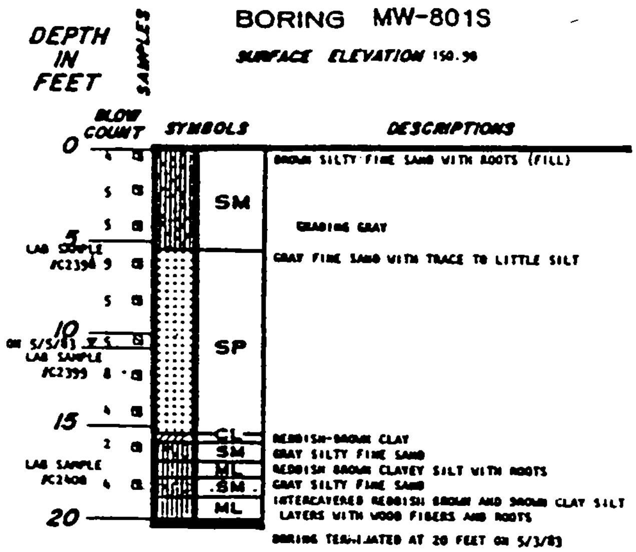


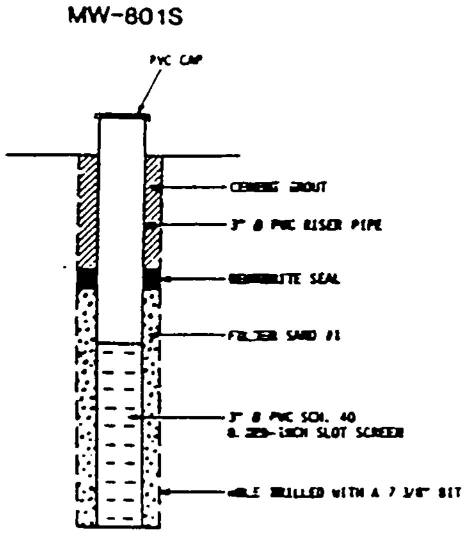
LOG AND MONITORING WELL DETAILS

CONFIDENTIAL

Dames & Moore

FIGURE B-1G

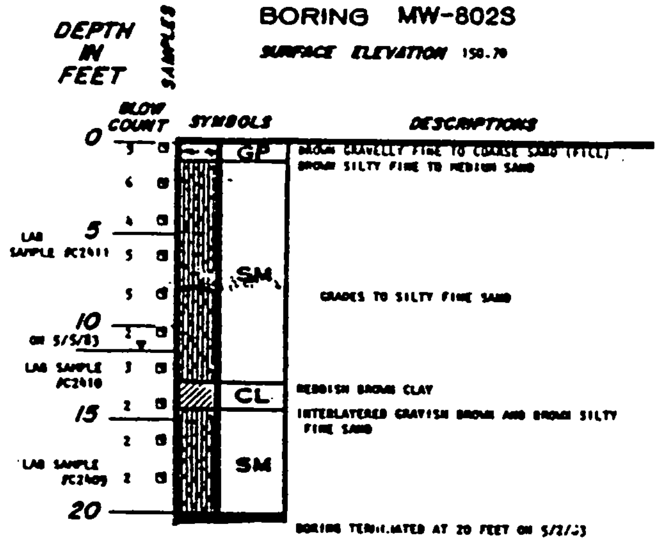


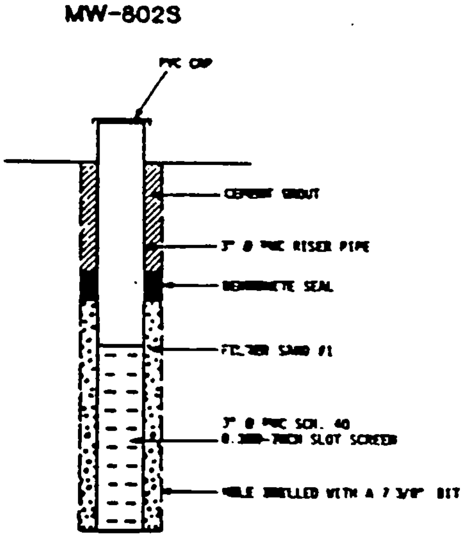


LOG OF BORINGS
AND MONITORING WELL DETAILS

Dames & Moore

FIGURE 8-3A





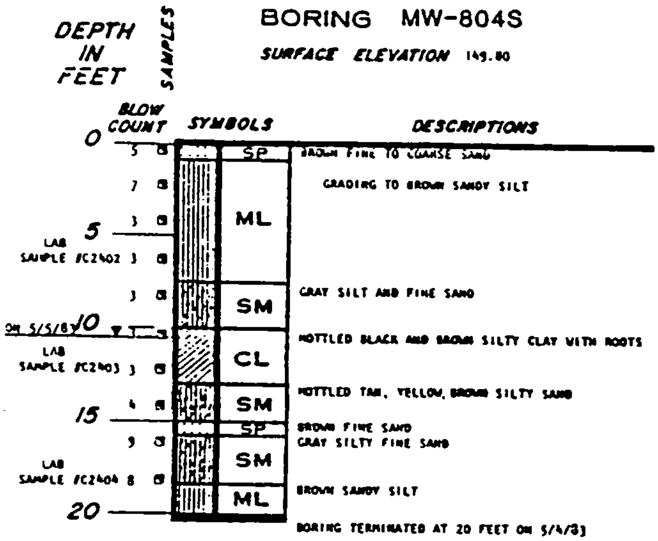
NOTE:

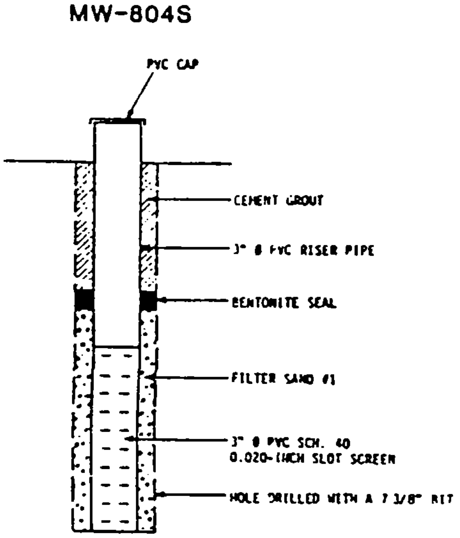
THE FIGURES IN THE COLUMN LABELED "BLOW COUNT" REFER TO THE NUMBER OF BLOWS REQUIRED TO DRIVE THE SOIL SAMPLER A DISTANCE OF ONE FOOT USING A 300-POUND HAMMER FALLING 30 INCHES. THE DIAMETER OF THE SAMPLER VARIED FROM 2½ TO 3½ INCHES.

LOG OF BORINGS AND MONITORING WELL DETAILS

Dames & Moore

FIGURE 8-3A





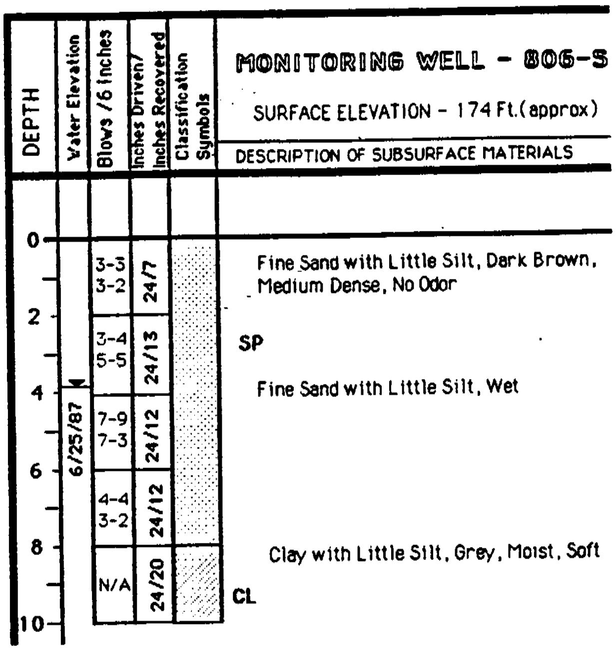
LOG OF BORINGS
AND MONITORING WELL DETAILS

DAMES & MOORE

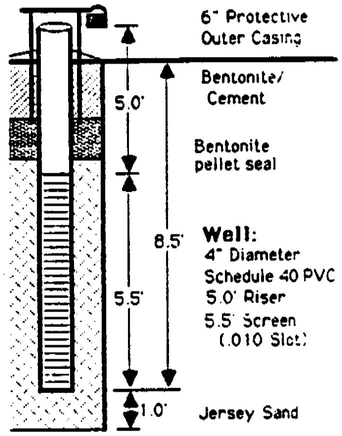
FIGURE B-38

MONITORING WELL MW-806

I. BORING LOG



II. WELL CONSTRUCTION LOG



III. CONSTRUCTION DETAILS

- Installation Date: 6-25-87
- Well Type: Shallow-Overburden
- Location: Building 005
- Top of casing elevation at date of installation from IBM Datum: *176.99'
- Top of screen elevation at date of installation from IBM Datum: *172.04'
- Bottom of screen elevation at date of installation from IBM Datum: *166.54'
- Protective casing material: Steel
  Diameter: 6"
- Inner casing and screen material: PVC-Schedule 40
  Diameter: 4" Slot size: 0.010

Note:

- * = Installation survey information for MW-806 is not available. The elevations are based on well construction logs and the 10/2/92 survey data.

IV. GROUND WATER SAMPLING INFORMATION

- Sampling Frequency: Quarterly
- Analytical Parameters: Volatile organic compounds (VOCs) by 8010

MONITORING WELL MW-806

V. MODIFICATION DETAILS

- Modification Date: 7-22-92

  - Modifications involved the following activities:

    Painting and labelling of casing

  - Performed by: Dames & Moore

- Modification Date: 9-30-92

  - Modifications involved the following activities:

    Surface seal repair and installation of water-tight cap

  - Performed by: Dames & Moore

VI. SURVEY DATA

SURVEY DATE	PERFORMED BY	TOP OF STEEL PROTECTIVE CASING ELEVATION	TOP OF PVC CASING ELEVATION
10-2-92	Brinnier & Larios	176.99′	176.50′

MONITORING WELL MW-806

VI. DEVELOPMENT HISTORY

- Redevelopment Date: 10-2-92

- Total well depth at date of installation: 166.54'

- Depth prior to development: 165.85' Depth after development: 165.92'
- Difference in depth from installation: 0.69' Difference in depth from installation: 0.62' (deeper)

Change in depth (in feet): 0.07'

- Redevelopment method: Bladder Pump

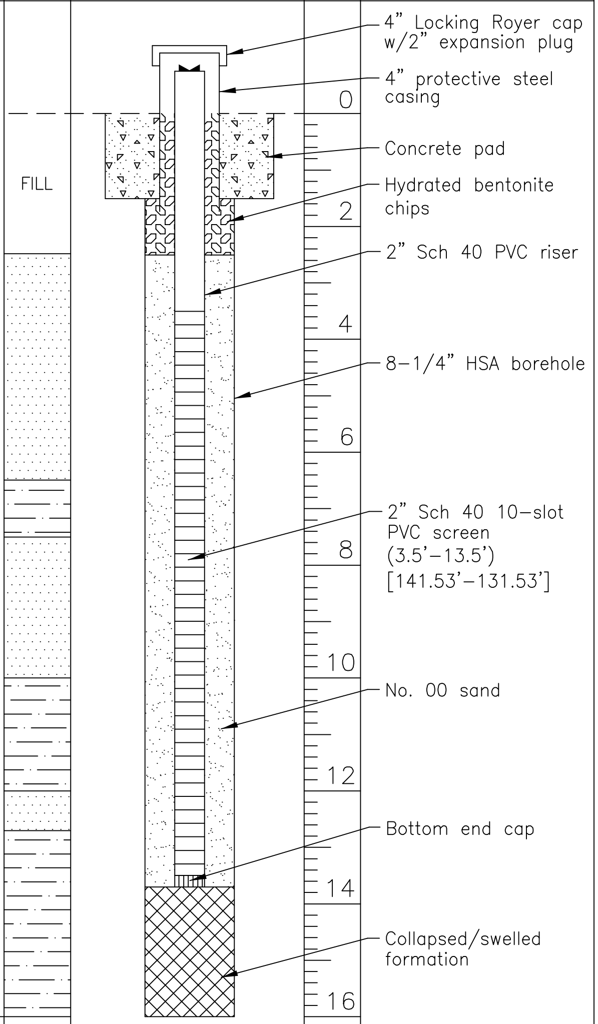
- Performed by: CTM Analytical Laboratories, Ltd.

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–810
Location Northwest of former IWSL lagoon

TOC Elev. 147.63'
GS Elev. 145.03'
Page 1 of 1

Depth Feet	Blow Counts	FID * (ppm)	Recovery	Overburden/Lithologic Description
0	Ground Surface			
0–6	HAND AUGERED			FILL: dark brown, loamy sand, metal debris at 2.5'. SAND: light brown, m–c, loose, dry.
6–8	1–2–2–3	0.5	24"	: as above (0–6"), transitions to grayish brown f sand (6–9"). SILTY CLAY: brown, mostly clay w/tr sit (9–20"). SAND: brownish gray, med, loose, sl moist (20–24").
8–10	1–2–2–1	0	19"	: as above w/silty clay lams (1/4–1/2" thick) at 9", 12", 14".
10–12	1/1'–1/1'	0	19"	SILTY CLAY: brown w/ roots at top of spoon.
12–14	1–1–1–1	0	15"	SAND: brownish gray, f–m, loose, saturated (0–8"). SILTY CLAY: brown, varved, soft w/tr roots, organic material throughout (8–15").
14–16	1–1–1–2	0	17"	SILTY CLAY: as above, varved w/organics throughout.
16–20				Total Depth: 16.0'.



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–25–98
Drilling Completed: 8–25–98
Well Construction: 8–25–98
Well Developed: 9–25–98
Well Coords.: N718819.49
E590095.57

Notes:
*Instrument reading denotes volatile scan of split spoon.

SWL 5.65' (9/25/98,14:48; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–810

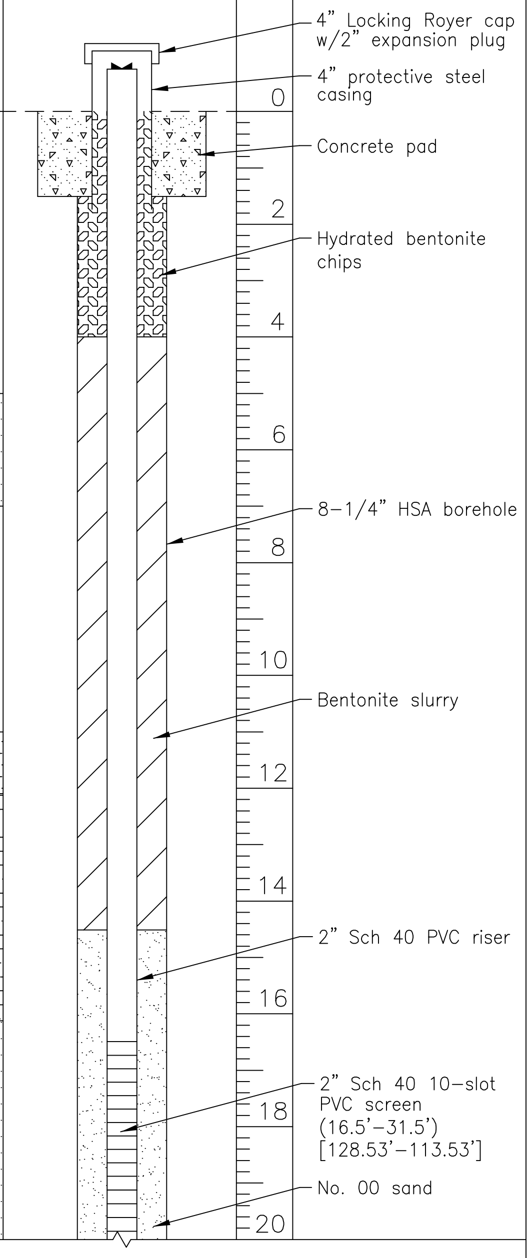
Soil Auger Drilling Log

Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–811D
Location Northwest of former IWSL lagoon

TOC Elev. 147.39'
GS Elev. 145.03'
Page 1 of 2

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Graphic
0	Ground Surface				
0–5	HAND AUGERED & AUGERED			FILL: brown loamy sand w/brick, concrete, clinker, tile and iron debris; 6–wire galvanized steel cable at 4'.	FILL
5–7	2–3–2–1	0	7"	SAND & GRAVEL.	
7–9	2–7–2–2	NA	0"	: large wood chip lodged in shoe of spoon.	?
9–11	2–2–2–2	NA	0"		
11–13	3–3–3–3	0	17"	SILT: gray w/tr f sand, saturated (0–15"). SILTY CLAY: grayish pink, v soft (15–17").	
13–15	2–2–3–3	0	11"	: as above w/wood chips and roots throughout.	
15–17	4–4–6–6	0	19"	: as above, large wood chip at 13" (0–15"). SAND: gray, c, loose, saturated.	
17–19	3–2–2–3	0	15"	: as above.	
19–20	4–4	0	2"	: as above.	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–25–98
Drilling Completed: 8–25–98
Well Construction: 8–25–98
Well Developed: 9–28–98
Well Coords.: N718761.95
E590068.37

Notes:
*Instrument reading denotes volatile scan of split spoon.

SWL ~1.1 below grade until drilled through silty clay unit in shallow section (12.5–16.5'). Water level declined to 12'.
SWL 12.72' (9/28/98, 11:41; from TOC).

GROUNDWATER SCIENCES CORPORATION

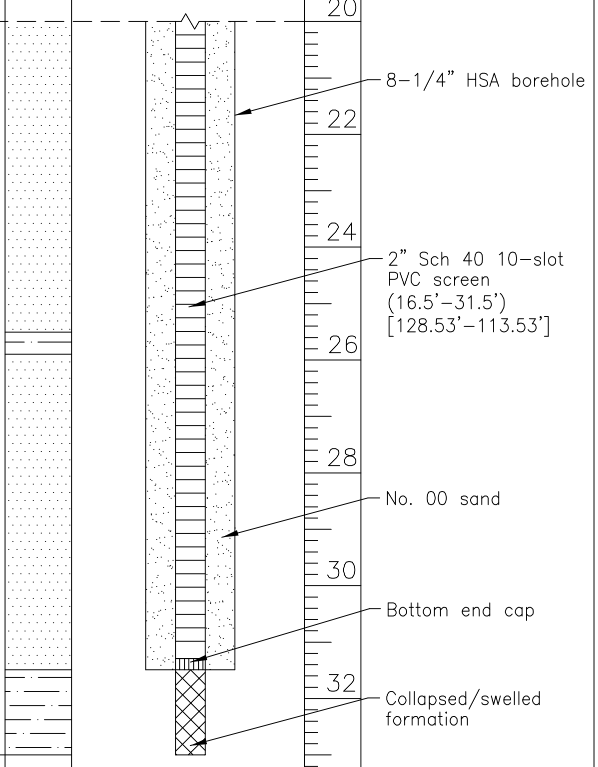
Well Log: MW–811D

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–811D
Location West of former IWSL lagoon

TOC Elev. 147.39'
GS Elev. 145.03'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description
20	3–3			
22	3–3–3–3	0	9"	: as above.
24	4–4–3–4	0	8"	: as above.
26	4–4–4–4	0	14"	: as above (0–6"). SILTY CLAY: brownish gray (6–10"). SAND: grayish brown, c w/some vc, clay lam (1/2" thick) at 13" (10–14").
28	3–4–5–4	0	12"	SAND: grayish brown, c, loose, saturated.
30	2–3–4–5	0	11"	: as above.
32	5–8–8–10	0	18"	: as above (0–5"). SILTY CLAY: grayish brown with pink laminations.
34				Total Depth: 33.0'.
36				
38				
40				



GROUNDWATER SCIENCES CORPORATION

Well Log: MW–811D

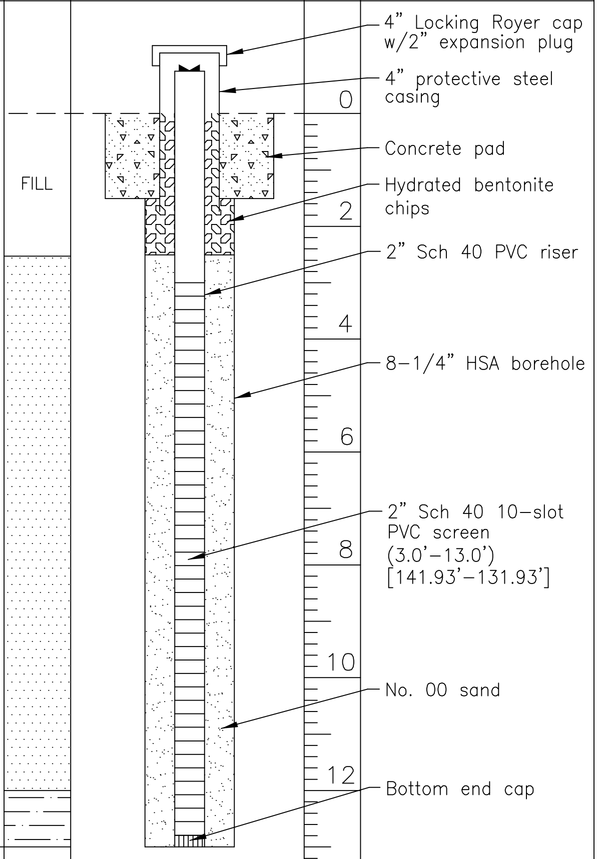
Soil Auger Drilling Log
Client: IBM Mid-Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW-811S
Location West of former IWSL lagoon

TOC Elev. 147.53'
GS Elev. 144.93'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Graphic
0	Ground Surface				
0–6	HAND AUGERED			FILL: brown loamy sand with gravel and debris. SAND: gray, m, saturated.	FILL
6–8	2-2-2-2	0	9"	: as above w/metal debris at 5", wood chips at 6". : as above w/wood at base of spoon (10-14").	
8–10	7-4-2-1	0.2	14"	: as above with wood.	
10–12	2-2-3-3	0	3"	: as above; gray silty clay at base of spoon.	
12–13	2-2	NA	0"		
				Total Depth: 13.0'.	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-27-98
Drilling Completed: 8-27-98
Well Construction: 8-27-98
Well Developed: 9-25-98
Well Coords.: N718765.99
E590066.94

Notes:

*Instrument reading denotes volatile scan of split spoon.

SWL ~2.5' below grade until augers penetrated borehole to 9'. Water level declined to ~12'.

SWL 5.17' (9/25/98, 15:07; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-811S

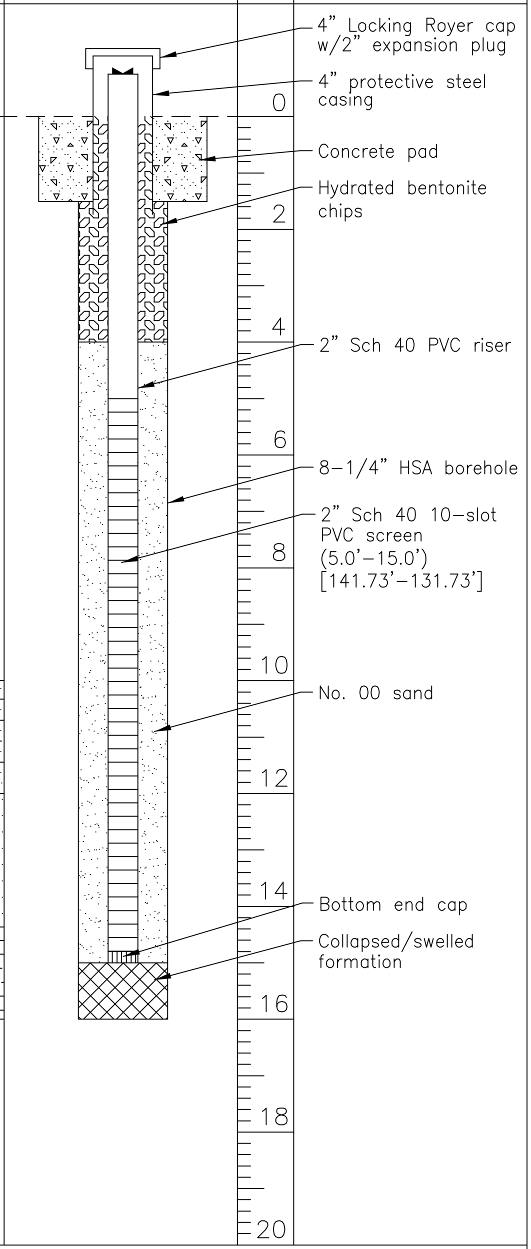
Soil Auger Drilling Log

Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–812
Location West of former IWSL lagoon

TOC Elev. 149.31'
GS Elev. 146.73'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Graphic
0	Ground Surface				
2	HAND AUGERED & AUGERED			FILL; brown, silty sand (loamy), loose w/tile frags. and gravel, dry.	
4					
6					FILL
8	44–15–12–8	0	15"	: as above.	
10	4–4–8–8	0	11"	: as above, large wood chip at 6" , large cobble at base of shoe.	
12	5–11–12–11	0	0"	SILTY SAND: saturated and running.	
14	14–15–12–11	0	11"	SAND: grayish brown, m, v loose w/grayish brown silty clay lams (~1/2–1" thick) w/organics (roots, wood chips) at 6" and 10", saturated.	
16	12–8–7–8	0	13"	SAND: grayish brown, m, v loose, soft (0–2"). SILTY CLAY: brown, soft (2–13"), varved.	
18				Total Depth: 16.0'.	
20					



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–26–98
Drilling Completed: 8–26–98
Well Construction: 8–26–98
Well Developed: 9–28–98
Well Coords.: N718691.45
E590070.42

Notes:

*Instrument reading denotes volatile scan of split spoon.

SWL 7.71' (9/28/98, 13:20; from TOC).

GROUNDWATER SCIENCES CORPORATION

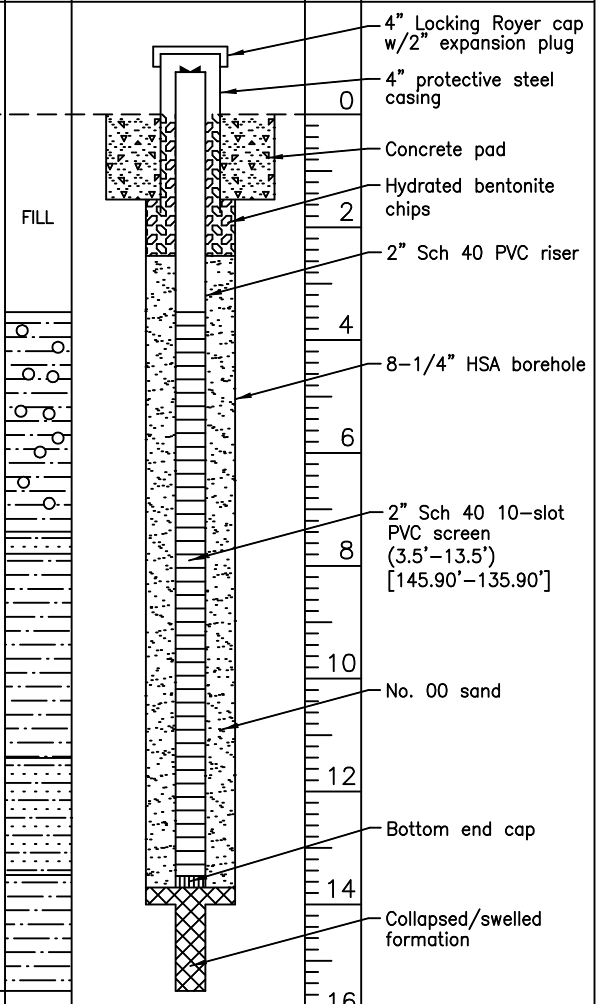
Well Log: MW–812

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston ISWL
Project No. 93003.05

Boring No. MW–813
Location South of former IWSL lagoon

TOC Elev. 151.79'
GS Elev. 149.4'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description
0	Ground Surface			
0	HAND AUGERED			FILL: mix of sand, silt, clay & gravel, tr laminated clay. GRAVEL/SILTY CLAY: at 3.5' to 6'.
4	AUGERED			
6	3–3–3–3	0	10"	: as above (0–3"). SAND/SILTY CLAY: f sand w/silty clay lams (3–6"). SILTY CLAY: brown, mostly silt w/tr clay, organics throughout, saturated (6–10").
8	2–2–3–2	0	14"	: as above, saturated.
10	2–3–3–2	0	10"	: as above, saturated (0–6"). SAND/SILTY CLAY: brown, f sand w/silty clay lams (1/4–1/2" thick) saturated (6–10").
12	3–2–2–3	0	15"	: as above (0–12"). SILTY CLAY: gray w/pink laminations (12–15").
14	3–4–45	0	6"	: as above.
16				Total Depth: 15.5'.
18				
20				



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–26–98
Drilling Completed: 8–26–98
Well Construction: 8–26–98
Well Developed: 9–25–98
Well Coords.: N718583.17
E590150.33

Notes:
*Instrument reading denotes volatile scan of split spoon.

SWL 10.24' (9/25/98, 09:48; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–813

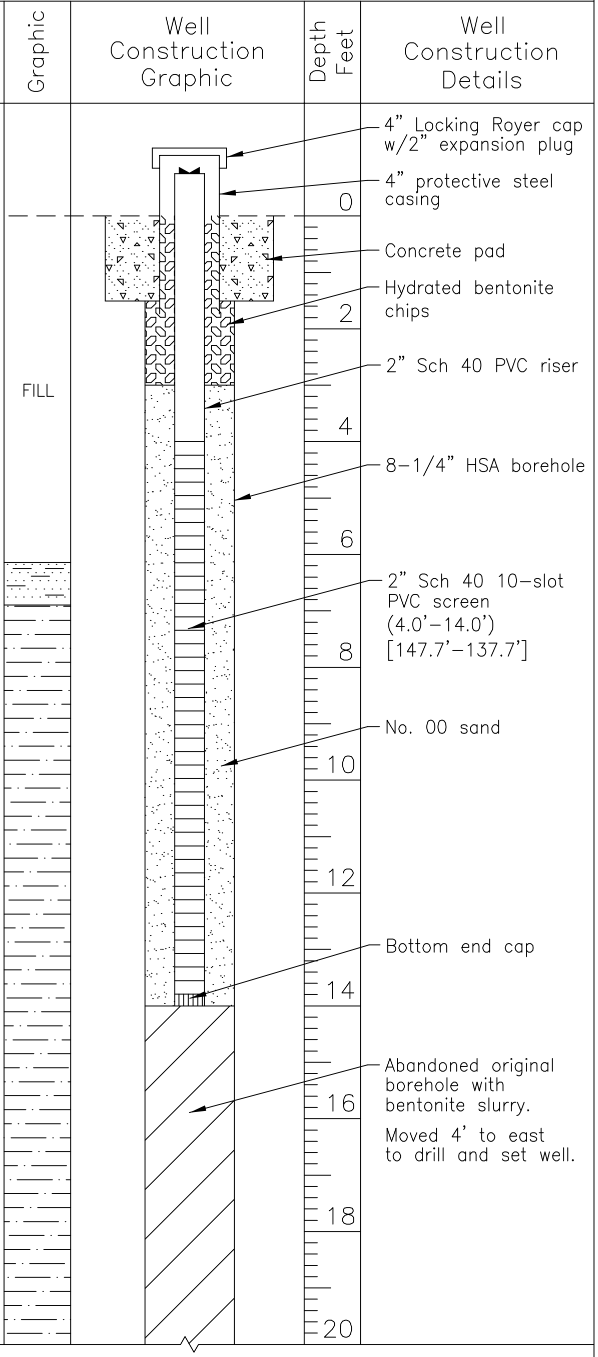
Soil Auger Drilling Log

Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–814
Location South of former IWSL lagoon

TOC Elev. 154.10'
GS Elev. 151.7'
Page 1 of 2

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description
0	Ground Surface			
2 4 6	HAND AUGERED & AUGERED			FILL: brown loamy sand with gravel (0–2"). : laminated silty clay (2–3"). : f–m sand and silty clay (3–6").
8	2–2–2–2	0	17"	: as above (top 2"). SAND/SILTY CLAY: brownish gray f sand w/silty clay laminations (2–5"). SILTY CLAY: grayish brown, laminated (5–17").
10	2–2–2–2	NA	12"	: as above.
12	2–2–2–2	NA	12"	: as above.
14	1–1–2–2	0	9"	: as above.
16	1–1–1–2	0	13"	: as above.
18	1–2–1–2	0	14"	: as above.
20	2–1–2–1	0	13"	: as above.



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–26–98
Drilling Completed: 8–27–98
Well Construction: 8–27–98
Well Developed: 9–25–98
Well Coords.: N718549.60
E590068.37

Notes:

*Instrument reading denotes volatile scan of split spoon.

SWL 9.84' (9/25/98, 09:26; from TOC).

GROUNDWATER SCIENCES CORPORATION

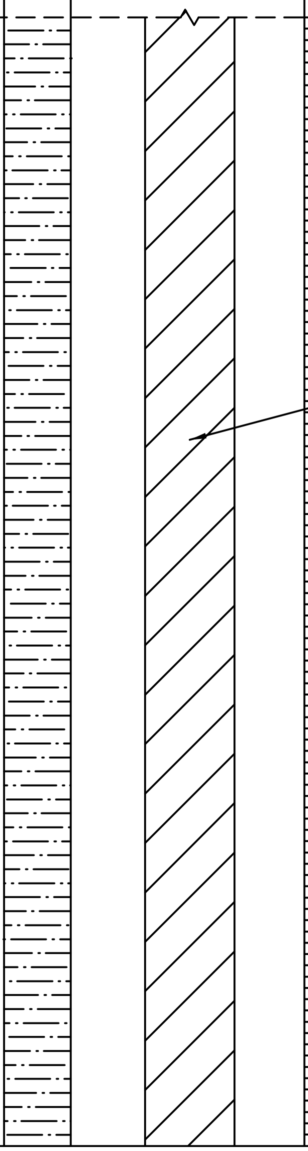
Well Log: MW–814

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–814
Location South of former IWSL lagoon

TOC Elev. 154.10'
GS Elev. 151.7'
Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Depth Feet	Well Construction Details
20–22	2–2–2–2	0	14"	: as above.	20–22	
22–24	2–2–1–1	0	18"	: as above.	22–24	
24–26	3–2–3–3	0	14"	: as above.	24–26	
26–28	3–2–3–3	0	8"	: as above.	26–28	Abandoned original borehole with bentonite slurry. Moved 4' to east to drill and set well.
28–30	1–1–1–1	0	16"	: as above.	28–30	
30–32	3–3–2–2	0	16"	: as above.	30–32	
32–34	3–2–2–2	0	14"	: as above.	32–34	
34–36	3–3–4–4	0	8"	: as above.	34–36	
36–38	2–3–3–3	0	10"	: as above.	36–38	
38–40	2–3–2–3	0	12"	: as above.	38–40	



Total Depth: 40.0'.

GROUNDWATER SCIENCES CORPORATION

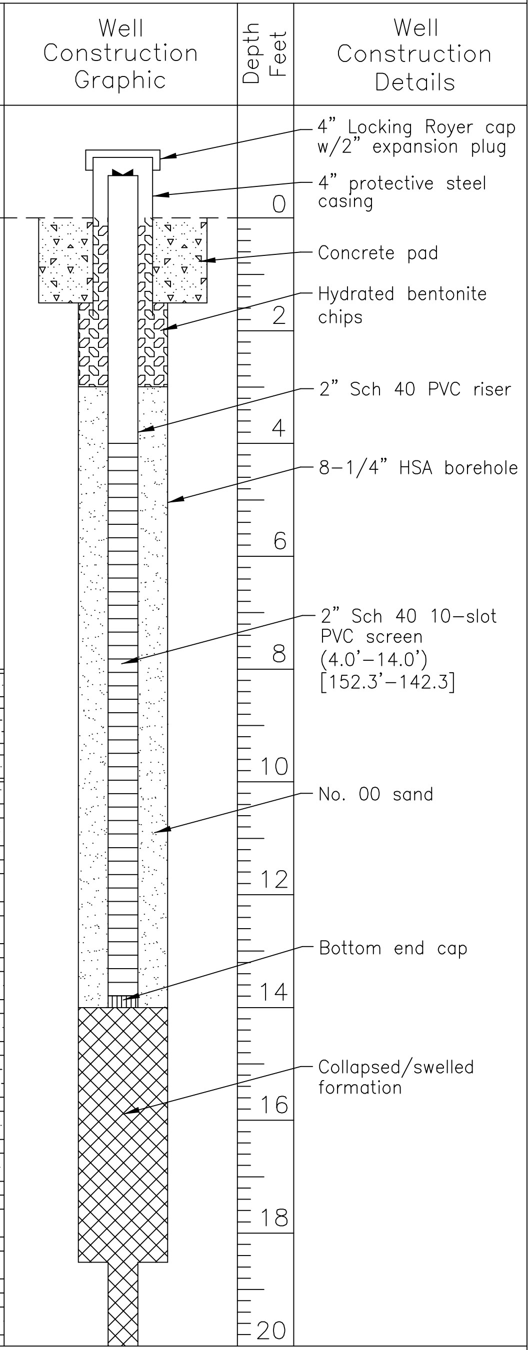
Well Log: MW–814

Soil Auger Drilling Log
Client: IBM Mid-Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW-815
Location Southeast of former IWSL lagoon

TOC Elev. 158.65'
GS Elev. 156.3'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Graphic
0	Ground Surface				
2 4 6	HAND AUGERED			FILL: loamy silty sand with gravel. : large cobble at 3'.	FILL
8	1-2-2-2	0	16"	: as above, with wood chip at base.	
10	2-4-3-3	0.2	7"	SILTY CLAY/SILTY SAND: brownish gray silty clay and silty sand with gravel.	
12	2-3-3-2	0	7"	SILTY CLAY: brownish gray w/m sand laminations (1/2" thick) dry.	
14	2-2-2-1	0	7"	: as above, saturated at base of spoon.	
16	WOH/1'-1-2	NA	0"		
18	1-1-2-2	0	12"	SILTY CLAY: gray w/pink laminations, saturated.	
20	1-2-2-1	0	11"	: as above.	



Total Depth: 20.0'.

Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-27-98
Drilling Completed: 8-27-98
Well Construction: 8-27-98
Well Developed: 9-25-98
Well Coords.: N718607.77
E590229.10

Notes:
*Instrument reading denotes volatile scan of split spoon.

WOH = Weight of Hammer

SWL 12.72' (9/25/98, 09:06; from TOC).

GROUNDWATER SCIENCES CORPORATION

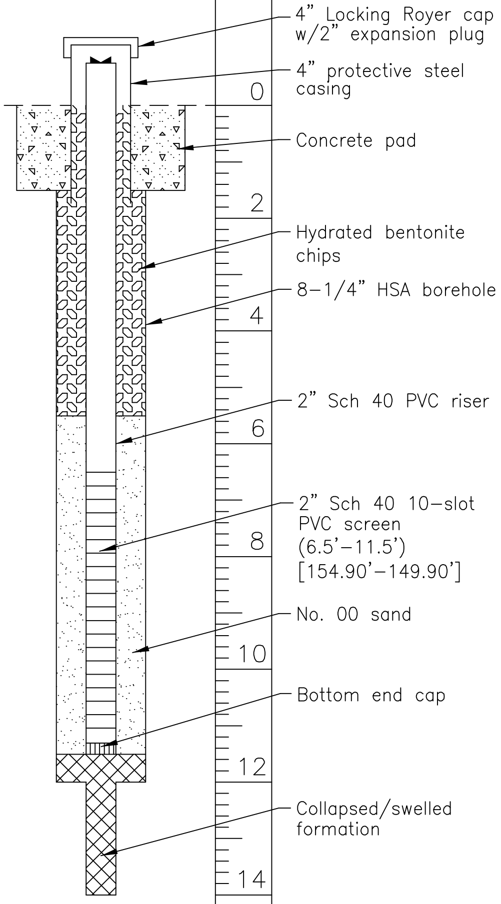
Well Log: MW-815

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–816
Location East of former IWSL lagoon

TOC Elev. 163.97'
GS Elev. 161.4'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Graphic
0	Ground Surface				
0–6	HAND AUGERED			FILL: brown to brownish orange loamy sand with gravel and cobbles.	FILL
6–8	7–11–19–14	0	15"	SAND: brown to brownish orange, c, loamy w/tr clay throughout, tr gravel. (probably fill).	
8–10	11–7–7–4	0	10"	: as above w/cobble at top (0–5"). SAND: brown, m, loose, dry (5–10").	
10–12	2–2–2–3	0	12"	: as above, (0–7") saturated. SILTY CLAY: gray, laminated (7–12").	
12–14	2–3–3–4	0	7"	: as above.	
14–20				Total Depth: 14.0'.	



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 9–1–98
Drilling Completed: 9–1–98
Well Construction: 9–1–98
Well Developed: 10–30–98
Well Coords.: N718620.96
E590294.79

Notes:

*Instrument reading denotes volatile scan of split spoon.

SWL 13.04' (10/30/98, 10:38; from TOC).

GROUNDWATER SCIENCES CORPORATION

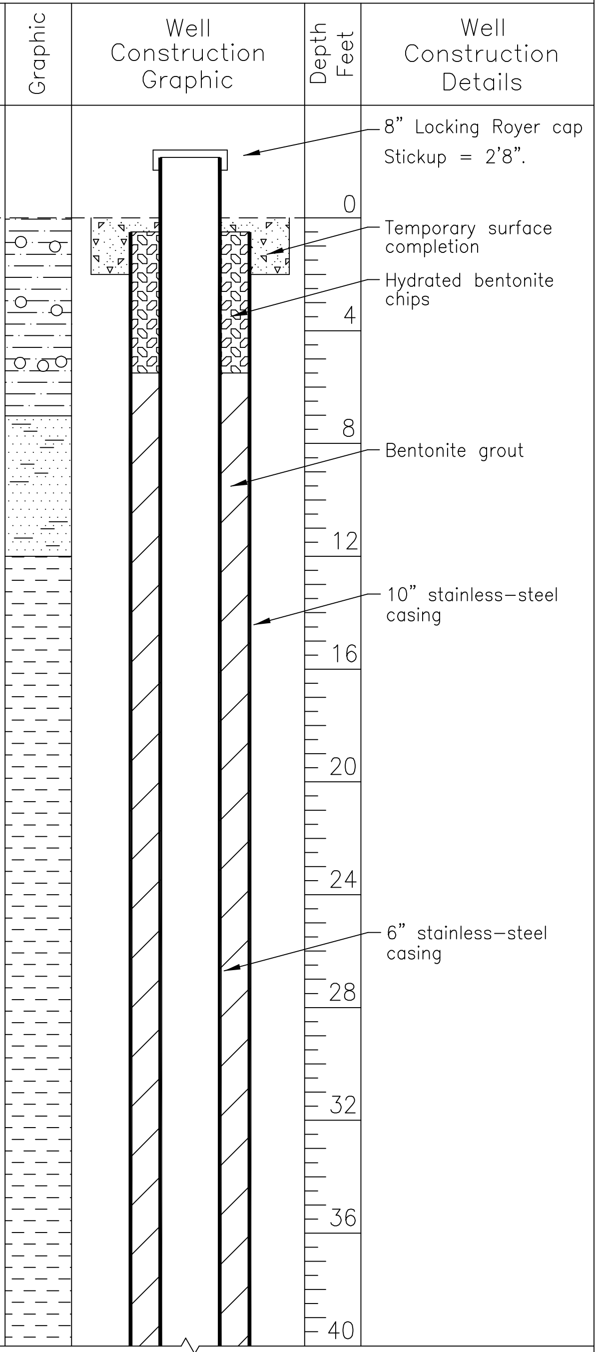
Well Log: MW–816

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 816-R
Location Former IWSL Area
~15'E of 816S

TOC Elev. 161.4'
GS Elev. 158.7'
Page 1 of 3

Depth Feet	Overburden/Lithologic Description
0	Ground Surface
	SAND/SILT/CLAY/GRAVEL: mix, top 7', woodchips, gravel layers present.
7	SAND: at 7', dark yellow brown, f-med, tr silt and clay.
12	CLAY: at 12', gray brown to dark gray, varved clay, tr silt (site varved clay).



Driller: Eichelbergers, Inc.
Logged by: C.E. Stoner, GSC
Drilling Started: 10-17-00
Drilling Completed: 10-23-00
Well Coords.: N718620.9
E590309.6

Notes:

Scale interval changes on page 3.

Measured DTW: 91.9' from grade.

Estimated Blown Yield: <0.2 gpm.

GROUNDWATER SCIENCES CORPORATION

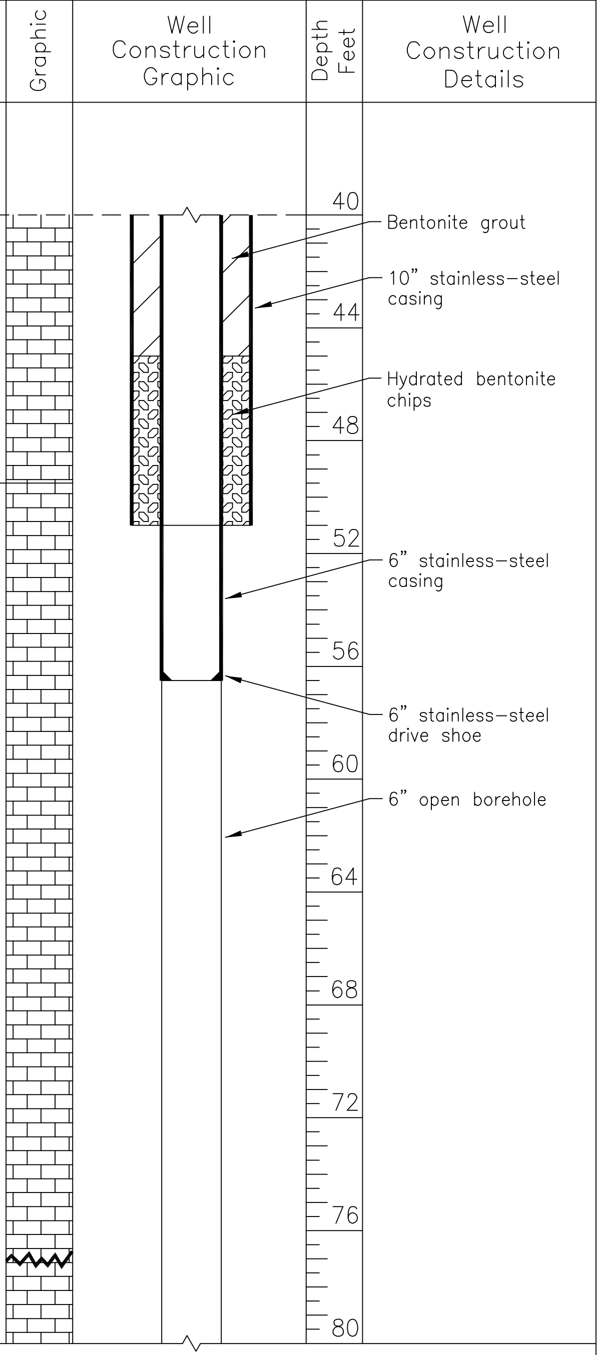
Well Log: 816-R

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 816-R
Location Former IWSL Area
~15'E of 816S

TOC Elev. 161.4'
GS Elev. 158.7'
Page 2 of 3

Depth Feet	Overburden/Lithologic Description
40	
44	
48	SHALE: at 49', grayish black pieces.
	BEDROCK: at 49.5', grayish black calcareous shale, appears massive.
52	
56	
60	SHALE: as above.
64	
68	
72	
76	: possible water-bearing zone at 77'.
80	



Note: Scale inverval changes on page 3.

GROUNDWATER SCIENCES CORPORATION

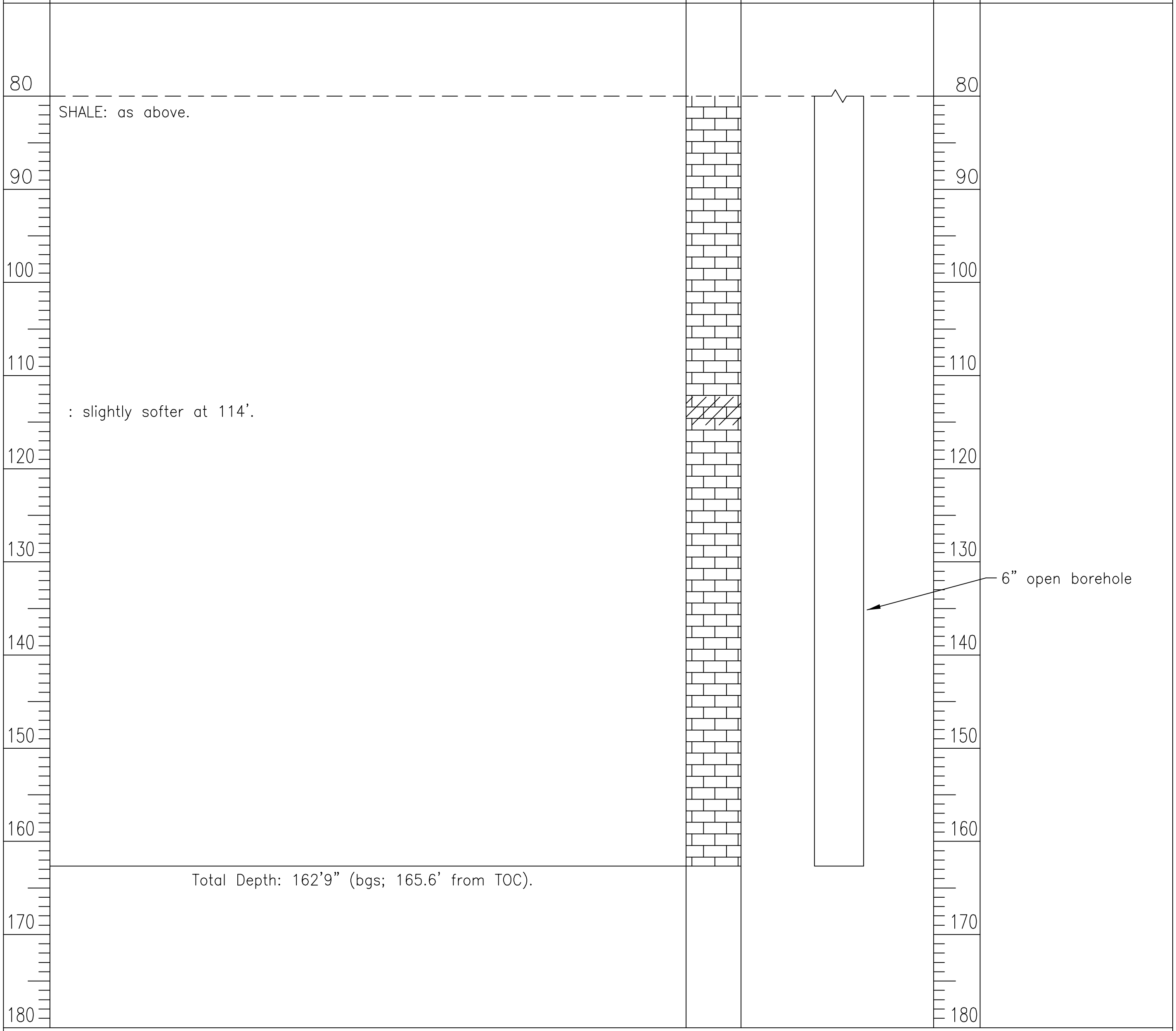
Well Log: 816-R

Air Rotary Drilling Log
Client: IBM Kingston
Project No. 93002.33.0002

Boring No. 816-R
Location Former IWSL Area
~15'E of 816S

TOC Elev. 161.4'
GS Elev. 158.7'
Page 3 of 3

Depth Feet	Overburden/Lithologic Description
80	SHALE: as above.
114	: slightly softer at 114'.
162'9"	Total Depth: 162'9" (bgs; 165.6' from TOC).



Note: Scale inverval changes on this page.

GROUNDWATER SCIENCES CORPORATION

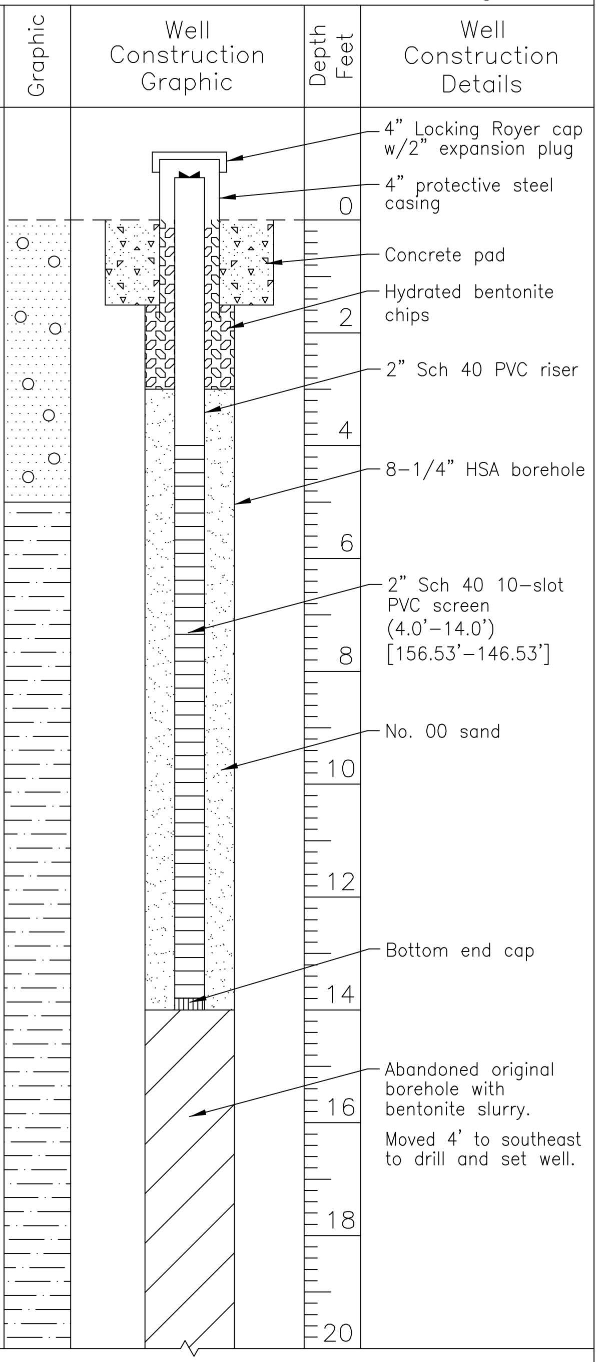
Well Log: 816-R

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–817
Location East of former IWSL lagoon

TOC Elev. 162.72'
GS Elev. 160.53'
Page 1 of 2

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description
0	Ground Surface			
2	HAND AUGERED			SAND: brown to dark brown, m w/gravel throughout.
4				
6				SILTY CLAY: gray, soft (5–6').
8	1–2–2–2	0	3"	: as above, varved, saturated.
10	2–2–2–3	0	9"	: as above.
12	1–1–1–2	0	12"	: as above with orange staining (7–8").
14	1–2–2–2	0	12"	: as above.
16	1–2–1–1	0	11"	: as above.
18	2–2–2–2	0	12"	: as above.
20	1–2–1–2	0	14"	: as above.



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 9–1–98
Drilling Completed: 9–1–98
Well Construction: 9–1–98
Well Developed: 9–25–98
Well Coords.: N718636.88
E590263.03

Notes:

*Instrument reading denotes volatile scan of split spoon.

SWL 13.83' (9/25/98, 08:44; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–817

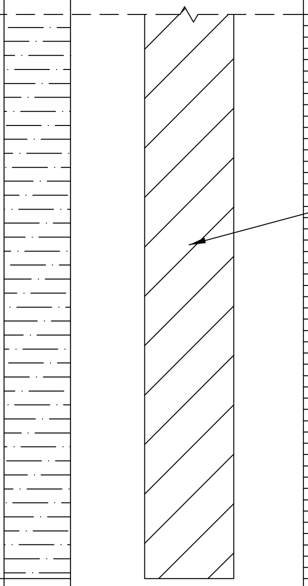
Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–817
Location East of former IWSL lagoon

TOC Elev. 162.72'
GS Elev. 160.53'

Page 2 of 2

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description
20–22	2–2–2–2	0	12"	: as above.
22–24	1–2–1–2	0	12"	: as above.
24–26	3–2–1–2	0	12"	: as above.
26–28	3–3–2–2	0	8"	: as above.
28–30	3–2–3–3	0	6"	: as above.
30–40				Total Depth: 30.0'.



Well Construction Details:
Abandoned original borehole with bentonite slurry.
Moved 4' to southeast to drill and set well.

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–817

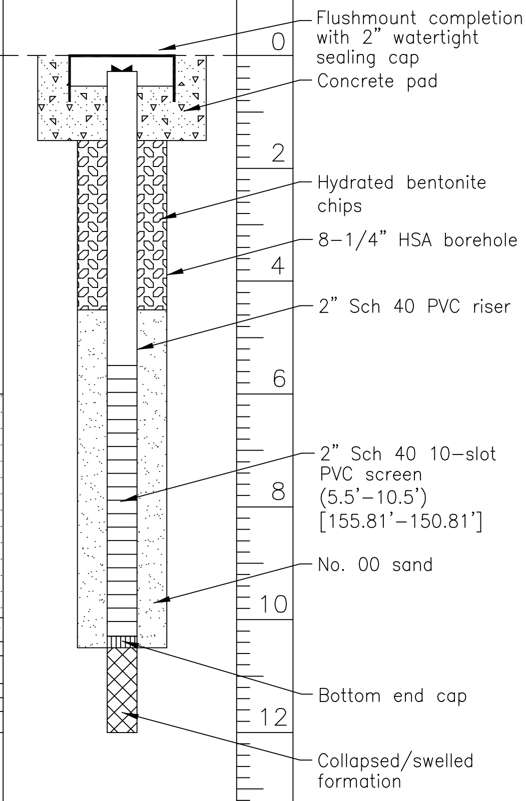
Soil Auger Drilling Log
Client: IBM Mid-Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW-818
Location East of former IWSL lagoon

TOC Elev. 160.94'
GS Elev. 161.31'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Graphic
0	Ground Surface				
2 4 6	HAND AUGERED			FILL: brown sand, m, loose w/occ cobbles, cinder fragments, dry.	FILL ?
8	4-4-4-7	0	12"	SAND: brown, m, loose, dry.	
10	5-6-4-6	0	18"	: as above.	
12	1-2-2-2	0	14"	: as above (0-4"). SILTY CLAY: brown, soft, laminated.	
14 16 18 20				Total Depth: 12.0'.	

Well Construction Graphic / Well Construction Details



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 9-1-98
Drilling Completed: 9-1-98
Well Construction: 9-1-98
Well Developed: NA
Well Coords.: N718734.05
E590299.03

Notes:
*Instrument reading denotes volatile scan of split spoon.

SWL: Dry.

GROUNDWATER SCIENCES CORPORATION

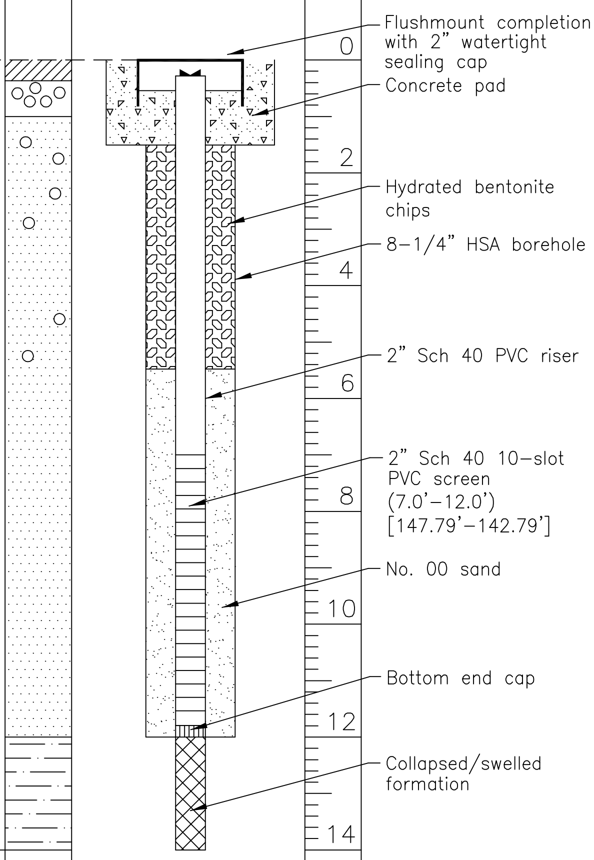
Well Log: MW-818

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–819
Location Northeast of former IWSL lagoon

TOC Elev. 154.24'
GS Elev. 154.79'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description
0	Ground Surface			
2 4 6	HAND AUGERED			Asphalt (0–0.3'). Cobble subbase (0.3–1.0'). SAND: brown, m, loose w/gravel, dry.
8	2–2–3–9	0	13"	: as above without gravel, moist.
10	6–12–12–12	0	12"	: as above, saturated.
12	6–5–4–3	0	13"	: as above.
14	2–3–3–3	0	15"	SILTY CLAY: brownish gray, laminated.
16 18 20				Total Depth: 14.0'.



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–28–98
Drilling Completed: 8–28–98
Well Construction: 8–28–98
Well Developed: 9–25–98
Well Coords.: N718788.90
E590263.25

Notes:

*Instrument reading denotes volatile scan of split spoon.

SWL 8.22' (9/25/98, 13:59; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW–819

Soil Auger Drilling Log

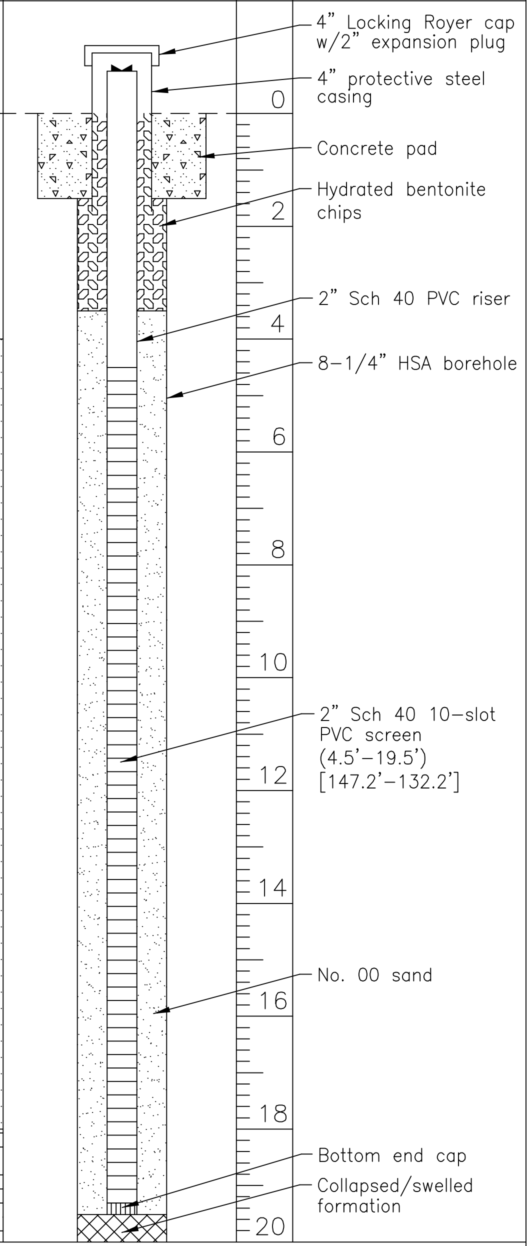
Client: IBM Mid-Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW-820
Location North of former IWSL lagoon

TOC Elev. 153.97'
GS Elev. 151.7'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Graphic
0	Ground Surface				
2	HAND AUGERED			FILL: brown clayey loam w/gravel and cobbles; brick fragment at 2'.	FILL
4				SAND: brown, f-m w/some silt, soft, loose.	
6					
8	1-2-1-2	0	16"	: as above, black wood chip at 12", moist at base of spoon.	
10	1-1-2-2	0	9"	: as above with gravel fragments at base of spoon, thin lens of clay (1/2" thick) at 5", moist.	
12	1-1-1-1	0	8"	: as above, saturated.	
14	1-2-2-2	0	10"	: as above w/gravel fragment at base, silty clay lens (1/2" thick) at 6".	
16	2-4-4-5	0	13"	: as above with large black wood chip at base of spoon.	
18	3-2-1-2	0	4"	: as above.	
20	2-3-4-5	0	7"	SILTY CLAY: dark gray, soft.	

Total Depth: 20.0'.



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8-25-98
Drilling Completed: 8-25-98
Well Construction: 8-25-98
Well Developed: 9-25-98
Well Coords.: N718839.06
E590219.88

Notes:

*Instrument reading denotes volatile scan of split spoon.

WOH = Weight of Hammer

SWL 7.32' (9/25/98, 10:45; from TOC).

GROUNDWATER SCIENCES CORPORATION

Well Log: MW-820

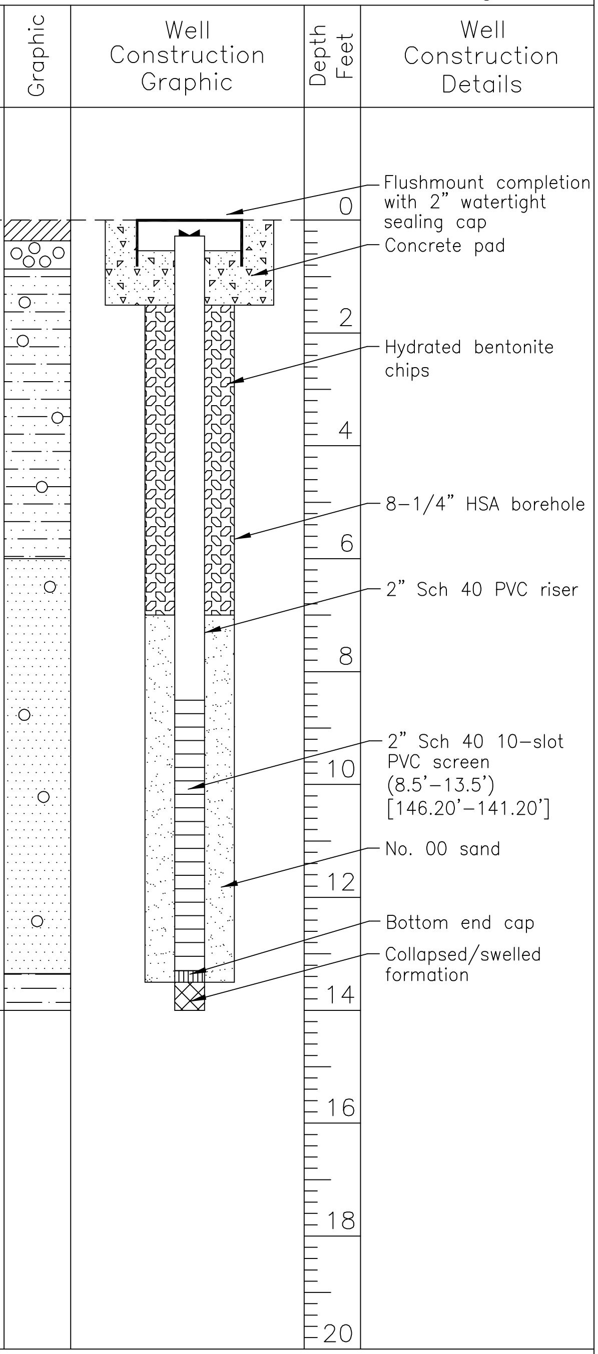
Soil Auger Drilling Log

Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–821
Location East of former IWSL lagoon

TOC Elev. 154.37'
GS Elev. 154.70'
Page 1 of 1

Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description
0	Ground Surface			
2 4 6	HAND AUGERED			Asphalt (0–0.3'). Cobble subbase (0.3–0.8'). SAND/SANDY SILT: brown, mostly sand w/some sandy silt, loose, tr gravel, sl moist.
8	3–4–4–4	0	24"	SAND: brown, m w/tr gravel, 1/4"–thick silty clay lamination at 15".
10	3–3–4–4	0	12"	: as above, saturated at base.
12	1–1–1–1	0	8"	: as above, saturated.
14	2–3–4–3	0	14"	: as above, 0–10", with wood at 6" and 9". SILTY CLAY: brown w/organics (10–14").
16 18 20				Total Depth: 14.0'.



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–28–98
Drilling Completed: 8–28–98
Well Construction: 8–28–98
Well Developed: 9–25–98
Well Coords.: N718748.77
E590238.59

Notes:

*Instrument reading denotes volatile scan of split spoon.

SWL 9.31' (9/25/98, 13:44; from TOC).

GROUNDWATER SCIENCES CORPORATION

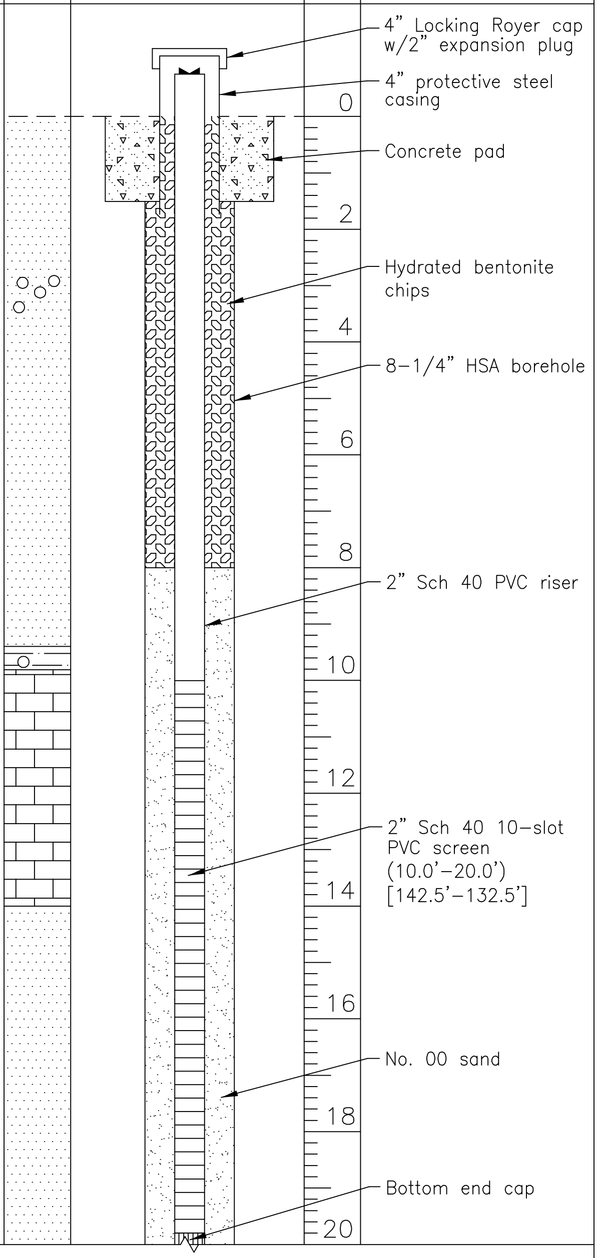
Well Log: MW–821

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–822
Location Within boundary of former IWSL lagoon

TOC Elev. 154.84'
GS Elev. 152.5'
Page 1 of 2

Depth Feet	Blow Counts	FID * (ppm)	Recovery	Overburden/Lithologic Description
0	Ground Surface			
0–6	HAND AUGERED			Silty sandy loam. brown, loose, dry (0–1.5'). SAND: brown, f loose, dry. : trace gravel 3–3.5'.
6–8	8–12–14–14	0 / NA	16"	: as above.
8–10	14–19–18–30	0 / NA	19"	: as above (0–15") w/gray silty clay lam (1/2" thick) at 8.5". SILTY SAND/SILTY CLAY: grayish brown with gravel (15–19").
10	AUGERED			LIMESTONE: gray, crushed.
10–12	10–12–10	0 / NA	8"	: as above, saturated.
12–14	8–9–7–12	0 / NA	13"	: as above (0–6").
14–16	8–10–5–7	4** / 7	10"	SAND: gray–black, f–m, odor.
16–18	2–3–4–3	1 / 1	11"	: as above (0–7"), large wood chip 6–7". SAND: grayish black, m, loose.
18–20	3–3–6–5	1.5 / 1	12"	: as above w/roots & wood (0–7") and 1/4"–thick silty clay lamination at 10".



Driller: Northstar Drilling, Inc.
Logged by: D. Muriceak, GSC
Drilling Started: 8–27–98
Drilling Completed: 8–27–98
Well Construction: 8–27–98
Well Developed: 9–25–98
Well Coords.: N718714.27
E590180.61

Notes:

*Top no. is volatile scan of split spoon; bottom no. is jar headspace scan measurement.

** At base of spoon in sandy unit.

SWL 11.11' (9/25/98, 10:19; from TOC).

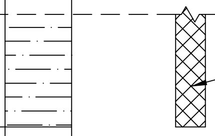
GROUNDWATER SCIENCES CORPORATION

Well Log: MW–822

Soil Auger Drilling Log
Client: IBM Mid–Hudson Valley, Kingston IWSL
Project No. 93003.05

Boring No. MW–822
Location Within boundary of former IWSL lagoon

TOC Elev. 162.72'
GS Elev. 152.5'



Depth Feet	Blow Counts	FID* (ppm)	Recovery	Overburden/Lithologic Description	Graphic	Well Construction Graphic	Depth Feet	Well Construction Details
20							20	
20–22	1–1–1–1	0 NA	11"	SILTY CLAY: brown, soft, varved.				Collapsed/swelled formation
22				Total Depth: 22.0'.			22	
24							24	
26							26	
28							28	
30							30	
32							32	
34							34	
36							36	
38							38	
40							40	

GROUNDWATER SCIENCES CORPORATION

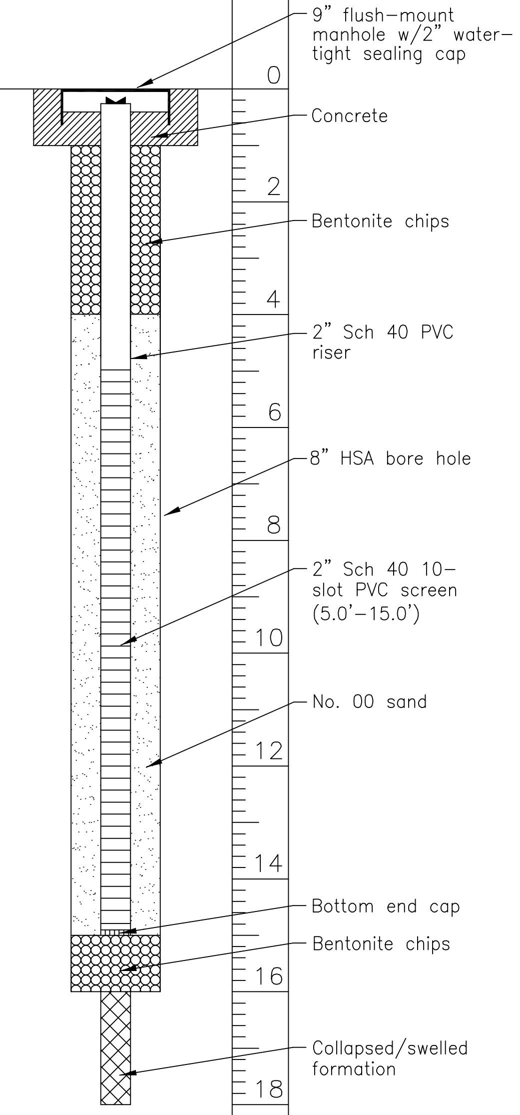
Well Log: MW–822

Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 94006

Boring No. TMP–6
TOC Elev. 177.51'
Location N. Parking Lot Area,
NW of B001
Page 1 of 1

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Road gravel 0–6" with sand. SAND: lt to mod br, m–f sand, some vf sand & silt, tr c–vc sand, tr f gravel, loose, moist. : thin silt layer at 1.5'. : turning to dk yellow brown to lt brown, m–c sand below 1.5', some f–vf sand, tr silt, tr vc sand and gravel, loose, moist.	SW
8	5–6–6–7	0	1	19"	SAND: dk yel br to mod br, mottl & banded top 7", f–m, some vf, coarsens to m w/f sand, some c, tr vc 7–9", silt zone 9–12", w/silt mass at 11", fines to f–m sand below 12" w/some organic patches, loose, moist, poorly graded at bottom.	
10	7–6–7–7	0	2	24"	: SAA top 5", sl silty, moist. SAND: at 5", dk yel br, f–m, some lit vf, tr silt, loose, moist, changes to lt olive gray, m–c sand w/f 13–16", wet at 13", color change back to dk yel br, grain size fines to f–m below 16", loose, wet.	SP
12	8–7–7–9	0	3	20"	SAND: dk yel br, pred. f w/vf, some m near top, incr silt content w/depth, fines with depth, loose, homogeneous, poorly graded, saturated.	
14	2–2–4–4	0	4	16"	: SAA, pred f–m, lit vf sand, tr silt, tr silt masses, homogeneous, loose, saturated.	
16	2–2–2–2	0	5	24"	: SAA top 10". SILT: mod yel br, varved, tr pale red, tr vf sand, some clay, dense, plastic, wet. : turns br–gray at 19" w/pale red & dk gray varves, tr vf sand lams, dense, plastic, wet.	MH
18	2–1–1–2	0	6	15"	SILT: brownish gray w/pale red varves, occ. dark gray organic–rich varves, with clay, dense, plastic, wet.	MH/CH
20					Total Depth: 18.0'.	



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 4–7–94
Drilling Completed: 4–7–94
Well Construction: 4–7–94
Well Coords.: N718583.05
E591006.04

Notes:

Hand augered to 6.0'.

SWL 9.25' (from grade), 8.98' (TOC) 4/8/94.

GROUNDWATER SCIENCES CORPORATION

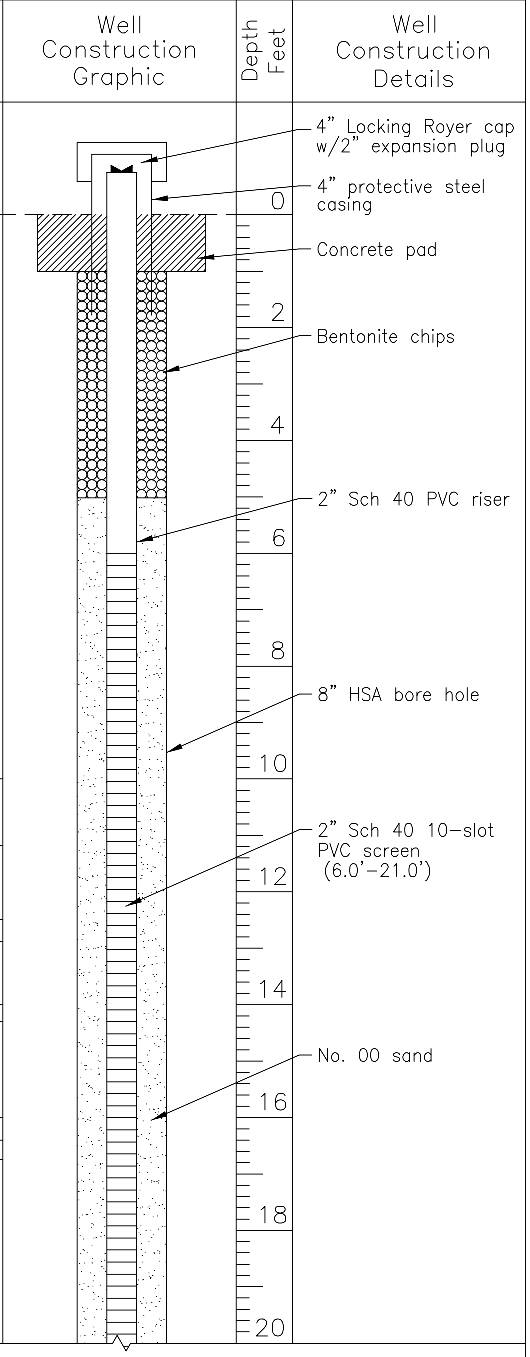
Geologic Log: TMP–6

Revised 8/12/94

Soil Augering Log
Client: IBM Mid-Hudson Valley, Kingston Site
Project No. 94006

Boring No. TMP-7
Location Approx. 75 feet W. of MW-110SA
TOC Elev. 180.08'
Page 1 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
2 4 6	HAND AUGERED				Grass with roots to 4", dk yellow brown silt and vf-m sand, some c sand, occ. f-c pebble/rock frags below 2', moist.	SW
8	2-2-1-2	0	1	17"	SAND: dk yel br, f-m, some vf, tr silt & c sand, homogeneous, well graded, loose, moist.	SW
10	4-5-4-4	0	2	12"	SAND: SAA, sl incr in f-vf, faint color banding, olive gray and mod yel br in dk yel br, loose, homogeneous, well graded, wet, dusky yel br organic masses 9-11".	
12	4-5-5-6	0	3	16"	SAND: SAA top 14", wet, fining w/depth to pred. f w/vf & m, sl incr silt w/depth, change to dusky yel br at 14-15", then mod yel br & lt br below, pred. silt w/vf sand below 15", wet, cohesive, non-plastic, organic-rich.	SP
14	2-4-4-4	0	4	15"	: SAA top 5", wet, ang. siltstone frag at 5". SILT: 5-10", tr vf sand, pale yel br to lt br 5-7.5", grades to br gray silt 7.5-9", hor. lams, wet, changes to pale yel br at 9". SAND & SILT: below 9", pred vf S w/silt, lt br mod yel br, some dkr color band., cohesive, wet.	SM ML SM
16	2-3-3-4	0	5	16"	SILT: pale yel br, changes to br gray at 1", change to lt br to mod yel br at 3", lam., silt & vf sand grades quickly to silty vf-f sand at 5.5", then to pred. f-m, some vf sand, tr silt below 6", sl incr in f-vf sand below 13", cohesive in silt, loose in sand, wet.	ML SM
18	4-8-8-9	0	6	20"	SAND: 0-5: dk yel br, f-m, loose, wet. SILT: at 5", br gray w/dk yel br sand lams. 5", wet, dense in silt, sand 6.5-7", bot. contact angled. SAND & SILT: mod yel br to lt br w/vf sand, horiz. laminated, cohesive, changes to br gray color before 11", hor. layer absent, wet.	SP ML SM
20	10-14-14-12	0	7	14"	SAND & SILT: br gray vf sand w/silt, cohesive, homogeneous, w/occ wavy vertical & divergent mod yel br streaks & f-m dk yel br sand-filled fractures w/mod yel br wthrd areas, sand filled portions pinch out, wet.	



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 4-5-94
Drilling Completed: 4-5-94
Well Construction: 4-5-94
Well Coords.: N718503.33
E591211.60

Notes:

Hand augered to 6.0'.

Faint horizontal color and grain layering from 14'-16'.

SWL 7.90' (from grade), 10.24' (TOC), 4/6/94, 09:00.

GROUNDWATER SCIENCES CORPORATION

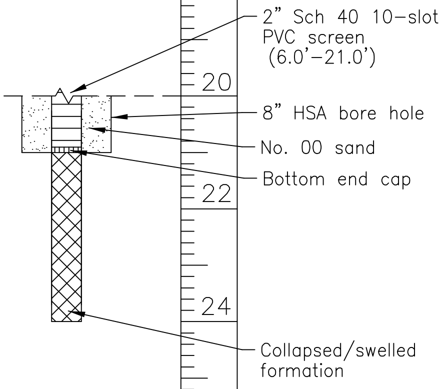
Geologic Log: TMP-7

Revised 8/12/94

Soil Augering Log
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 94006

Boring No. TMP–7
Location Approx. 75 feet W. of MW–110SA
TOC Elev. 180.08'
Page 2 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
20–22	4–3–2–1	0	8	14"	SAND & SILT: SAA top 9", wet. SILT: brownish gray w/pale red varves at 9", dense, plastic, tr clay, top contact is gradational but rapid, moist to wet.	SM
22–24	2–2–2–3	0	9	9"		MH–CH
24					Total Depth: 24.0'.	



Notes:

GROUNDWATER SCIENCES CORPORATION

Geologic Log: TMP–7

Revised 8/12/94

Soil Augering Log

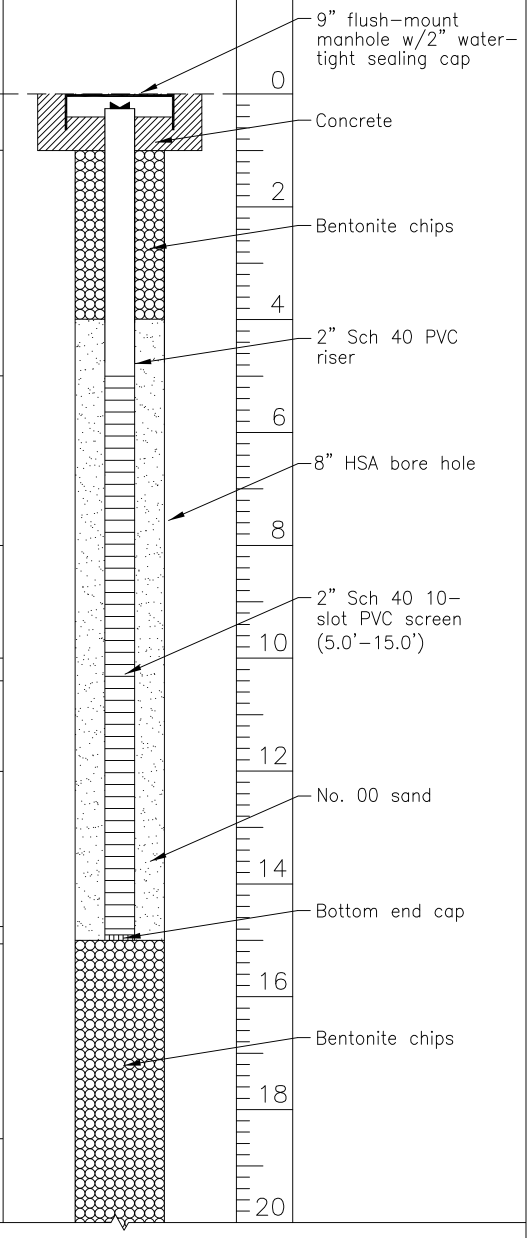
Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 94006

Boring No. TMP–8
TOC Elev. 177.50'
Location Approx. 75' W of TMP–7

Page 1 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS
0	Ground Surface					
0–6	HAND AUGERED				Asphalt pavement to 6", gravel base w/mod yellow brown sand to 1.5'. SAND: pred. mod yel brown to dk yel brown, f–m w/c, lit silt, loose, moist. : turning more olive gray to dk yel brown below 5', loose, moist.	SW
6–8	3–4–5–5	0	1	12"	SAND: dk yel brown to lt olive gray, f–m sand, some vf, tr silt, loose, variable color, mottled, occ. organic–rich mass (dusky yel brown), moist.	SP
8–10	5–5–5–6	0	2	20"	SAND: SAA, w/occ. silt–rich zones, grad. contacts w/silt–poor zones var. color, mod yel br to lt ol gray & dusky yel br, sl cohesive, wet, color bands/layers horiz., turning pred. m w/f sand, some c below 12" w/occ mod yel br silt/clay masses, loose, wet, poorly to mod graded.	SP–SM
10–12	2–2–2–3	0	3	17"	SILT & SAND: 0–4", mod yel br w/vf–f sand, horiz. laminated, dense, sl plastic, wet. SAND: below 4", dk yel brown f–m, some c, fining downward to pred. f sand w/vf and m sand, loose, wet.	SM SP
12–14	2–2–3–5	0	4	16"	SAND: dk yel br, f–m, some vf, tr silt, silty f–vf sand zone w/grad. contacts between 9–11", loose sl cohesive in finer zones, occ small silt/clay mass, mod. yel br, wet.	SP–SM
14–16	2–2–5–6	0	5	20"	: SAA top 9". SILT: mod yel br to lt br, oxidized, varved, w/ some–lit vf sand, cohesive, dense, sl plastic, change to br gray at 13", pred silt. SILT & SAND: vf sand, no varves, organic mass at 13.5", black, sl plastic, wet.	ML SM
16–18	7–8–9–9	0	6	14"	SILT & SAND: w/occ. horiz. silt/clay–rich zones w/grad. contacts, distinct horiz. silt/clay lams between 10–11", dense, cohesive, slightly plastic to non–plastic, wet	SM
18–20	7–8–7–5	0	7	14"	: SAA top 6", grading to pred. brownish–gray silt, some–lit clay, occ. pale red varves, plastic, dense, wet.	MH–CH

Well Construction Graphic / Well Construction Details



Driller: SoilTesting, Inc.
Logged by: S. Fisher, GSC
Drilling Started: 4–6–94
Drilling Completed: 4–6–94
Well Construction: 4–6–94
Well Coords.: N718499.12
E591143.57

Notes:

Hand augered to 6.0'.

SWL 7.9' (from grade), 7.5' (TOC), 4/6/94.

GROUNDWATER SCIENCES CORPORATION

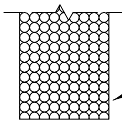
Geologic Log: TMP–8

Revised 8/12/94

Soil Augering Log

Client: IBM Mid–Hudson Valley, Kingston Site
Project No. 94006

Boring No. TMP–8 TOC Elev. 177.50'
Location Approx. 75' W of TMP–7
Page 2 of 2

Depth Feet	Blow Counts	PID (ppm)	Sample Number	Recovery	Overburden/Lithologic Description	USCS	Well Construction Graphic	Depth Feet	Well Construction Details
20								20	
	2–1–2–2	0	8	–	SILT: brownish gray w/pale red and occ. grayish black varves, clayey, v dense, v. plastic, vf sandy zones 3–8" and 18–19", moist to wet in silt & clay, wet in silt & vf sand.	MH–CH			8" HSA bore hole
22					Total Depth: 22.0'.			22	
24								24	
26								26	
28								28	
30								30	
32								32	
34								34	
36								36	
38								38	
40								40	

GROUNDWATER SCIENCES CORPORATION

Geologic Log: TMP–8

ATTACHMENT B

INSTALLED WELL STATUS BY OPERABLE UNIT

Attachment B: Installed Well Status by Operable Unit
TechCity Site. Ulster County, New York
Site: 356002

WELL ID	Operable Unit	Monitoring Status
202-1R/S	OU1	Non-GMP
202-2S	OU1	Non-GMP
202-3S	OU1	Non-GMP
LAYNE NO. 2	OU1	Non-GMP
MW-4R	OU1	Non-GMP
MW-5S	OU1	Non-GMP
MW-107S	OU1	Non-GMP
MW-108S	OU1	GMP
MW-10S	OU1	GMP
MW-173S	OU1	GMP
MW-174S	OU1	GMP
MW-189S	OU1	GMP
MW-609S	OU1	Non-GMP
MW-110AS	OU3	Non-GMP
MW-111S	OU3	Non-GMP
MW-112S	OU3	Non-GMP
MW-113S	OU3	Non-GMP
MW-114S	OU3	Non-GMP
MW-115S	OU3	Non-GMP
MW-116S	OU3	Non-GMP
MW-117S	OU3	Non-GMP
MW-175S	OU3	Non-GMP
MW-176S	OU3	GMP
MW-177S	OU3	GMP
MW-178M	OU3	Non-GMP
MW-178S	OU3	GMP
MW-181S	OU3	GMP
MW-182S	OU3	GMP
MW-232M	OU3	Non-GMP
MW-232S	OU3	Non-GMP
MW-250M	OU3	GMP
MW-250S	OU3	GMP
MW-251M	OU3	Inaccessible
MW-251S	OU3	Inaccessible
MW-255S	OU3	Non-GMP
MW-260S	OU3	Non-GMP
MW-261S	OU3	Non-GMP
MW-262S	OU3	Non-GMP
MW-263S	OU3	Non-GMP
MW-264S	OU3	Non-GMP
MW-265S	OU3	Non-GMP
MW-266S	OU3	Non-GMP
MW-267S	OU3	GMP
MW-268S	OU3	Non-GMP
MW-269S	OU3	GMP
MW-270S	OU3	Non-GMP
MW-271S	OU3	GMP

Attachment B: Installed Well Status by Operable Unit
TechCity Site. Ulster County, New York
Site: 356002

WELL ID	Operable Unit	Monitoring Status
MW-272S	OU3	GMP
MW-273S	OU3	Non-GMP
MW-274S	OU3	Non-GMP
MW-275S	OU3	GMP
MW-276S	OU3	Non-GMP
MW-277S	OU3	GMP
MW-279S	OU3	GMP
MW-281S	OU3	Non-GMP
MW-282S	OU3	Non-GMP
MW-285S	OU3	Non-GMP
MW-288S	OU3	Non-GMP
MW-297S	OU3	Non-GMP
MW-305S	OU3	Non-GMP
MW-306S	OU3	Non-GMP
MW-315S	OU3	Non-GMP
MW-320S	OU3	Non-GMP
MW-321R	OU3	Non-GMP
MW-323R	OU3	Non-GMP
MW-324R	OU3	Non-GMP
MW-502S	OU3	Non-GMP
MW-503S	OU3	Non-GMP
MW-504S	OU3	GMP
MW-505S	OU3	GMP
MW-506S	OU3	Non-GMP
MW-507S	OU3	Non-GMP
MW-601S	OU3	GMP
MW-602S	OU3	Non-GMP
MW-610S	OU3	Non-GMP
MW-806	OU3	GMP
MW-807	OU3	Non-GMP
TMP-6	OU3	Non-GMP
TMP-7	OU3	Non-GMP
TMP-8	OU3	Non-GMP
TMP-9	OU3	Non-GMP
MW-3S	OU3a	Non-GMP
MW-4S	OU3a	Non-GMP
MW-6S	OU3a	Non-GMP
MW-7S	OU3a	Non-GMP
MW-109S	OU3a	Non-GMP
MW-170S	OU3a	Non-GMP
MW-171S	OU3a	Non-GMP
MW-172S	OU3a	Non-GMP
MW-184SA	OU3a	GMP
MW-185SA	OU3a	GMP
MW-186S	OU3a	Non-GMP
MW-187S	OU3a	Non-GMP
MW-188S	OU3a	GMP

Attachment B: Installed Well Status by Operable Unit
TechCity Site. Ulster County, New York
Site: 356002

WELL ID	Operable Unit	Monitoring Status
MW-201S	OU3a	Non-GMP
MW-202S	OU3a	Non-GMP
MW-203S	OU3a	GMP
MW-204S	OU3a	GMP
MW-278S	OU3a	Non-GMP
MW-403S	OU3a	GMP
MW-404S	OU3a	Non-GMP
MW-405S	OU3a	Non-GMP
MW-406S	OU3a	Non-GMP
MW-407S	OU3a	Non-GMP
MW-508SA	OU3a	GMP
MW-603S	OU3a	Non-GMP
MW-604S	OU3a	GMP
MW-605S	OU3a	Non-GMP
MW-607S	OU3a	GMP
MW-608S	OU3a	GMP
MW-8S	OU4	Non-GMP
MW-118S	OU4	Non-GMP
MW-119S	OU4	Non-GMP
MW-120S	OU4	Non-GMP
MW-161S	OU4	GMP
MW-162S	OU4	GMP
MW-163S	OU4	Non-GMP
MW-164S	OU4	GMP
MW-169S	OU4	Non-GMP
MW-179S	OU4	Non-GMP
MW-180S	OU4	Non-GMP
MW-183S	OU4	GMP
MW-236M	OU4	Non-GMP
MW-236S	OU4	Non-GMP
MW-280M	OU4	Non-GMP
MW-280S	OU4	Non-GMP
MW-2AS	OU4	Non-GMP
MW-304S	OU4	Non-GMP
MW-307S	OU4	Non-GMP
MW-310S	OU4	Non-GMP
MW-314S	OU4	Non-GMP
MW-409S	OU4	Non-GMP
MW-410S	OU4	Non-GMP
MW-411S	OU4	Non-GMP
MW-412S	OU4	Non-GMP
MW-101R	OU4a	GMP
MW-102R	OU4a	GMP
MW-122S	OU4a	GMP
MW-123AS	OU4a	GMP
MW-124S	OU4a	Non-GMP
MW-126S	OU4a	GMP

Attachment B: Installed Well Status by Operable Unit
TechCity Site. Ulster County, New York
Site: 356002

WELL ID	Operable Unit	Monitoring Status
MW-1R	OU5	Non-GMP
MW-1S	OU5	Non-GMP
MW-106S	OU5	Non-GMP
MW-206S	OU5	GMP
MW-207S	OU5	Non-GMP
MW-208S	OU5	GMP
MW-209S	OU5	Non-GMP
MW-210S	OU5	GMP
MW-211S	OU5	Non-GMP
MW-612S	OU5	GMP
MW-801	OU5	Non-GMP
MW-802	OU5	GMP
MW-804	OU5	Non-GMP
MW-813	OU5	Non-GMP
MW-814	OU5	GMP
MW-819	OU5	GMP
MW-821	OU5	Non-GMP
MW-822	OU5	Non-GMP
MW-102S	OU6	Non-GMP
MW-103R	OU6	Non-GMP
MW-103S	OU6	Non-GMP
MW-104S	OU6	Non-GMP
MW-105S	OU6	Non-GMP
MW-125S	OU6	GMP
MW-205S	OU6	Non-GMP
MW-207S	OU6	Non-GMP
MW-211S	OU6	Non-GMP
MW-225S	OU6	Non-GMP
MW-289S	OU6	Non-GMP
MW-290S	OU6	Non-GMP
MW-292S	OU6	Non-GMP
MW-293S	OU6	Non-GMP
MW-294S	OU6	Non-GMP
MW-296S	OU6	Non-GMP
MW-402S	OU6	GMP
MW-501S	OU6	Non-GMP
MW-810	OU6	Non-GMP
MW-811D	OU6	Non-GMP
MW-811S	OU6	Non-GMP
MW-812	OU6	Non-GMP
MW-815	OU6	Non-GMP
MW-816	OU6	GMP
MW-816R	OU6	Non-GMP
MW-817	OU6	GMP
MW-818	OU6	Non-GMP
MW-820	OU6	Non-GMP
MW-283S	OU7	Non-GMP

Attachment B: Installed Well Status by Operable Unit
TechCity Site. Ulster County, New York
Site: 356002

WELL ID	Operable Unit	Monitoring Status
MW-284S	OU7	Non-GMP
MW-313S	OU7	Non-GMP

Notes:

1. No wells are located within OU2 and OU8
2. MW-A(S) does not fall within an OU.

ATTACHMENT C

MONITORING SCHEDULES

Attachment C: Monitoring Schedules
TechCity Site. Ulster County, New York
Site: 356002

Table 1: Water Quality Monitoring Sampling and Analysis Plan

Sampling at the below listed locations will be conducted every 5th quarter, beginning with the third quarter 2013. Additional sampling may occur as directed by the NYSDEC at other locations and frequencies.

Monitoring Well	OU #	Monitoring Purpose	Sampling Parameters	Analytical Method
MW-10S	OU 1	Utility Trench Barrier Wall	VOCs (Halogenated)	SW846 8021
MW-108S	OU 1	Triangle Plume Area	VOCs (Halogenated)	SW846 8021
MW-125S	OU 6	Utility Trench Barrier Wall	VOCs (Halogenated)	SW846 8021
MW-161S	OU 4	Upgradient Former B058	VOCs (Halogenated)	SW846 8021
MW-162S	OU 4	Former B058	VOCs (Halogenated)	SW846 8021
MW-164S	OU 4	Former B058	VOCs (Halogenated)	SW846 8021
MW-173S	OU 1	Drainage to 42" Storm	VOCs (Halogenated)	SW846 8021
MW-174S	OU 1	42" Storm Control Perimeter	VOCs (Halogenated)	SW846 8021
MW-176S	OU 3	Drainage to 42" Storm	VOCs (Halogenated)	SW846 8021
MW-177S	OU 3	42" Storm Control Perimeter	VOCs (Halogenated)	SW846 8021
MW-178S	OU 3	Drainage to 42" Storm	VOCs (Halogenated)	SW846 8021
MW-180S	OU 4a	42" Storm Control Perimeter	VOCs (Halogenated)	SW846 8021
MW-181S	OU 3	42" Storm Control Perimeter	VOCs (Halogenated)	SW846 8021
MW-182S	OU 3a	42" Storm Control Perimeter	VOCs (Halogenated)	SW846 8021
MW-183S	OU 4	42" Storm Control Perimeter	VOCs (Halogenated)	SW846 8021
MW-184SA	OU 3a	GWCS Trench Effectiveness	VOCs (Halogenated)	SW846 8021
MW-185SA	OU 3a	GWCS Trench Effectiveness	VOCs (Halogenated)	SW846 8021
MW-188S	OU 3a	60" Storm Control Perimeter	VOCs (Halogenated)	SW846 8021
MW-189S	OU 1	B005 Plume	VOCs (Halogenated)	SW846 8021
MW-203S	OU 3a	GWCS Trench Effectiveness	VOCs (Halogenated)	SW846 8021
MW-204S	OU 3a	NPLA Plume	VOCs (Halogenated)	SW846 8021
MW-206S	OU 5	Former IWSL	VOCs (Halogenated)	SW846 8021
			Arsenic	SW846 6020
			Cadmium	SW846 6020
			Lead	SW846 6020
			Silver	SW846 6020
			Phenols (total)	LAC-10-210-001-A
MW-208S	OU 5	Former IWSL	VOCs (Halogenated)	SW846 8021
			Arsenic	SW846 6020
			Cadmium	SW846 6020
			Lead	SW846 6020
			Silver	SW846 6020
			Phenols (total)	LAC-10-210-001-A
MW-210S	OU 5	Former IWSL	VOCs (Halogenated)	SW846 8021
			Arsenic	SW846 6020
			Cadmium	SW846 6020
			Lead	SW846 6020
			Silver	SW846 6020
			Phenols (total)	LAC-10-210-001-A
MW-250S	OU3	B005 PCE Source	VOCs (Halogenated)	SW846 8021
MW-250M	OU 3	B005 PCE Source	VOCs (Halogenated)	SW846 8021
MW-267S	OU 3	B003	VOCs (Halogenated)	SW846 8021
MW-269S	OU 3	B003 N Source	VOCs (Halogenated)	SW846 8021
			VOCs (Aromatics)	SW846 8021
MW-271S	OU 3	B003 N Source	VOCs (Halogenated)	SW846 8021
			VOCs (Aromatics)	SW846 8021
MW-272S	OU 3	B003	VOCs (Halogenated)	SW846 8021
MW-275S	OU 3	B001 N Plume	VOCs (Halogenated)	SW846 8021
MW-277S	OU 3	B001 N Source	VOCs (Halogenated)	SW846 8021
MW-279S	OU 3	B001 N Plume Boundary	VOCs (Halogenated)	SW846 8021

Attachment C: Monitoring Schedules
TechCity Site. Ulster County, New York
Site: 356002

Table 1: Water Quality Monitoring Sampling and Analysis Plan

Sampling at the below listed locations will be conducted every 5th quarter, beginning with the third quarter 2013.
Additional sampling may occur as directed by the NYSDEC at other locations and frequencies.

Monitoring Well	OU #	Monitoring Purpose	Sampling Parameters	Analytical Method
MW-402S	OU 6	GWCS Trench Effectiveness	VOCs (Halogenated)	SW846 8021
MW-403S	OU 3a	GWCS Trench Effectiveness	VOCs (Halogenated)	SW846 8021
MW-504S	OU 3	Groundwater Extraction Well	VOCs (Halogenated)	SW846 8021
MW-505S	OU 3	B005 Plume	VOCs (Halogenated)	SW846 8021
MW-508SA	OU 3a	GWCS Trench Effectiveness	VOCs (Halogenated)	SW846 8021
MW-601S	OU 3	B005 Plume	VOCs (Halogenated)	SW846 8021
MW-604S	OU 3a	NPLA Plume	VOCs (Halogenated)	SW846 8021
MW-607S	OU 3a	GWCS Trench Effectiveness	VOCs (Halogenated)	SW846 8021
MW-608S	OU 3a	GWCS Trench Effectiveness	VOCs (Halogenated)	SW846 8021
MW-612S	OU 5	Former IWSL	VOCs (Halogenated)	SW846 8021
			Arsenic	SW846 6020
			Cadmium	SW846 6020
			Lead	SW846 6020
			Silver	SW846 6020
			Phenols (total)	LAC-10-210-001-A
MW-802	OU 5	Former IWSL	VOCs (Halogenated)	SW846 8021
			Arsenic	SW846 6020
			Cadmium	SW846 6020
			Lead	SW846 6020
			Silver	SW846 6020
			Phenols (total)	LAC-10-210-001-A
MW-806	OU 3	B005 PCE Plume	VOCs (Halogenated)	SW846 8021
MW-816	OU 6	Former IWSL	VOCs (Halogenated)	SW846 8021
			Arsenic	SW846 6020
			Cadmium	SW846 6020
			Lead	SW846 6020
			Silver	SW846 6020
			Phenols (total)	LAC-10-210-001-A
MW-817	OU 6	Former IWSL	VOCs (Halogenated)	SW846 8021
			Arsenic	SW846 6020
			Cadmium	SW846 6020
			Lead	SW846 6020
			Silver	SW846 6020
			Phenols (total)	LAC-10-210-001-A

Attachment C: Monitoring Schedules
TechCity Site. Ulster County, New York
Site: 356002

Table 2: Routine GMP Sampling Schedule

YEAR	Quarter Sampled
2013	Third Quarter
2014	Fourth Quarter
2016	First Quarter
2017	Second Quarter
2018	Third Quarter
2019	Fourth Quarter
2021	First Quarter
2022	Second Quarter
2023	Third Quarter
2024	Fourth Quarter
2027	First Quarter
2028	Second Quarter
2029	Third Quarter

ATTACHMENT D

FIELD DOCUMENTATION FORMS

Field Sampling Data Sheet

GENERAL INFORMATION:

Well No: ________ **Date:** _____/_____/_____ **Personnel:** ____________

PURGING:

Reference Depth To Bottom (DTBr)	ft.	**Start:**	**Stop:**
Measured Depth to Bottom (DTBm)	**ft.**	***Note: Use Reference Depth to Bottom for calculations***	
Depth to Water (DTW):	ft.	**Well Yields:**	☐ Yes ☐ No
Target Volume:	gal.	**Water Contained:**	☐ Yes ☐ No
Actual Volume:	gal.	**DTW After Purge:**	ft.

PID:

Background:	***Purging:***

☐ *Not Applicable*

Purge Method	***Rate***	***Equipment ID***
☐ Bailer	____________________	____________________
☐ Peristaltic Pump	____________________	____________________
☐ Submersible	____________________	____________________
☐ Other: ____________	____________________	____________________

SAMPLING:

Sample ID:

Sample Time: Start: __________ Stop: ____________

Duplicate ID:

Sampling Method:

☐ Bailer ☐ Submersible (Tap)

☐ Peristaltic ☐ Other: ____________

COMMENTS:

Signature: ________________________ **Date:** _______ **QA/QC Review:** _______ **Date:** ________

Analysis Request Form

Well Number: ________________ **Date**: ______/______/______

LABORATORY:

☐ EnviroTest Laboratories, Inc.

☐ Lancaster Laboratories

☐ Other: ____________________________________

ANALYSES REQUESTED:

☐ 8021, Freon 113, Freon 123a

☐ Phenols (total) (EPA 420.1)

☐ Metals are Filtered

☐ Metals are Unfiltered

☐ Other Parameter (specify below)

☐ Antimony (EPA 200.7 or 6010A)

☐ Arsenic (EPA 206.2 or 7060A)

☐ Cadmium (EPA 7131)

☐ Lead (EPA 239.2 or 7421)

☐ Silver (EPA 7761)

Other: ________________________

____

____

FIELD PARAMETERS:

Date	**Time**	**Temp (°C)**	**pH (SU)**	**Sp. Cond. (µmhos/cm)**	**Turbidity (NTU)**	**Notes**

COMMENTS:

TechCity Site
Physical Well Inventory Form

Needs Repair: Yes No

Date repair was completed: ______________

Well #: ___________________

Date: ___________________

Evaluation:

☐ Manhole ☐ Standpipe ☐ Other ________________________

Is the ID # of the well visible	yes	no	n/a
Is the Royer or Cover functional	yes	no	n/a
If Manhole, is there an expanding plug	yes	no	n/a
Is the lock functional	yes	no	n/a
Does the well have a concrete apron	yes	no	n/a
Is the surface completion stable	yes	no	n/a
Is the well paint in good condition	yes	no	n/a
Verify well location using site print	yes	no	n/a
Does well location agree with print	yes	no	n/a
Is the survey mark visible	yes	no	n/a

Measurements:

☐ survey mark
☐ top of casing
☐ other __________

Static Water Level: _____________
Depth to Bottom: ______________
Diameter of well: _______________

Standpipe measurement above grade: _____________________
Manhole measurement below grade: ______________________

Location of Well: ____

Comments: ____

Well Inventory Performed By (Name): ____

(Site 356002)

ATTACHMENT E

HEALTH AND SAFETY PLAN

GROUNDWATER MONITORING and REMEDIATION PROGRAM

TECHCITY

TOWN OF ULSTER, ULSTER COUNTY NEW YORK
SITE ID: 356002
ORDER ON CONSENT INDEX: D3-10023-6-11

HEALTH AND SAFETY PLAN

GROUNDWATER MONITORING AND REMEDIATION PROGRAM

October 2011

Prepared by:

Groundwater Sciences Corporation

2601 Market Place Street, Suite 310
Harrisburg, Pennsylvania 17110

560 Route 52, Suite 202
Beacon, New York 12508

1108 Vestal Parkway East, Suite 2
Vestal, New York 13850

Table of Contents

Table of Appendices

1.0 SITE DESCRIPTION

Groundwater Sciences Corporation (GSC) has prepared this Health and Safety Plan for the TechCity Site (Site) under requirements set forth in Exhibit C of the Order on Consent (Order), Index # D3-10023-6-11, for Site 356002.

1.1 Site Location & Background Information

The Site is located north of the City of Kingston in the Town of Ulster, Ulster County, New York and is bounded by John M. Clarke Drive and Route 9W to the east, Old Neighborhood Road and Route 209 to the north, Esopus Creek to the west and Boices Lane to the south (see Figure 1). The total area of the Site is comprised of three Operable Units as detailed in the Order and is approximately 66.3 acres.

The Site is currently listed as a Class 4 Site on the New York State Department of Environmental Conservation, Inactive Hazardous Waste Registry, Site Code 356002.

1.2 Potential Hazards

Potential hazards are listed in the following subsections.

1.2.1 Chemical Hazards

The primary chemicals of concern at this Site include chlorinated ethenes, chlorinated ethanes, and other compounds in groundwater. The significant chemicals at the Site are described below. The primary chemical safety concerns are inhalation of vapor-phase contamination originating from contaminated groundwater as well as dermal contact with contaminated groundwater. The chemical hazards associated with contaminated groundwater and soils are evaluated in Section 4: Chemical Hazard Evaluation.

1.2.2 Physical Hazards

1.2.2.1 Utilities

Electrical shock or electrocution can result from exposed wiring, electrical panels, extension cords, and motors. Extension cords shall be inspected for fraying and shall not be used in a way that creates a tripping hazard. GFCI outlets shall be used whenever possible. Appropriate lock-out/tag-out procedures must be followed prior to servicing electrical equipment (see Section 9, Lock-out/Tag-out/Control of Hazardous Energy).

1.2.2.2 Confined Space/Excavation

If entry into a confined space is necessary, proper confined space procedures, including the use of a permit, will be followed. The safety concerns in these confined spaces are lack of oxygen and possible inhalation of vapors. These concerns are addressed in Section 8: Confined Space Entry Procedures.

1.2.2.3 Slipping/tripping and uneven terrain

Wet floors in the various groundwater treatment facilities may be slippery when wet. In addition, metal floor grates must be kept in place.

1.2.3 Mechanical Hazards

Heavy equipment, including drilling rigs, tender vehicles, backhoes, and dump trucks, may be used during certain Site activities. Loose clothing that could become entangled during operation of devices equipped with cables, chains, or belts shall be removed. Generators shall not be refueled while they are operating. Extension cords shall be inspected for fraying and shall not be used in a way that creates a tripping hazard.

1.2.4 Biological Hazards

Mosquitoes, bees, and wasps are expected to be present throughout the spring and summer. Avoid direct contact with animals.

1.2.5 Noise Hazards

Hearing protection such as earplugs or earmuffs shall be used during the operation of power tools and equipment that create percussive sounds, particularly in confined areas. Hearing protection shall also be used during drilling, construction, maintenance, testing, and waste management activities where required by Section 7.1 of this HASP.

1.2.6 Eye Hazard

Protective eyewear shall be worn during activities such as welding, cutting, or sawing, and other field activities where a splash hazard exists. A portable eyewash must be present at all times during such activities.

1.2.7 Heat Stress and Fatigue Hazard

Heat stress monitoring of pulse rates and heat stress/hydration breaks shall be required for personnel in Tyvek or other protective clothing when the ambient temperature exceeds 85°F. If heat stress or heat stroke symptoms are identified, then immediate medical attention is required.

1.2.8 Cold Stress – Hypothermia and Frostbite

Personnel conducting field activities in exceptionally cold temperatures should take the appropriate precautions to prevent hypothermia or frostbite. Warm, dry clothing should be worn at all times while working in cold temperatures.

Hypothermia usually is caused by extended exposure to cold. Hypothermia results when more heat is lost than the body can generate. Common causes include being outside without enough covering in winter, wearing wet clothing for an extended period of time in windy or very cold weather, or heavy exertion, or poor fluid or food intake in cold weather, even in above-freezing temperatures. The onset of symptoms is usually slow. There is likely to be a gradual loss of mental acuity and physical ability. The person experiencing hypothermia, in fact, may be unaware that he or she is in a state that requires emergency medical treatment. Symptoms of hypothermia include apathy, lethargy, confusion, drowsiness, loss of coordination, pale skin, slowing of breathing, slurred speech, uncontrollable shivering, and weakness. It requires immediate emergency medical attention.

Frostbite is, literally, frozen body tissue - usually skin but sometimes deeper - and must be handled carefully to prevent permanent tissue damage or loss. You can help prevent frostbite in cold weather by dressing in layers, making sure you come indoors at regular intervals, and watching for frostnip, frostbite's early warning signal. Frostnip usually affects areas that are exposed to the cold, such as the cheeks, nose, ears, fingers, and toes, leaving them white and numb. Frostbite is characterized by white, waxy skin that feels numb and hard. It requires immediate emergency medical attention.

1.2.9 Affected Area and Control Measures

The work zones typically associated with a health and safety plan (exclusion zone, contaminant reduction zone, and support zone) are required for some anticipated field activities.

The work areas requiring possible perimeter control measures are primarily in the immediate vicinity of the well drilling sites, groundwater monitoring and groundwater extraction and treatment system sampling locations. The areas where soil and/or groundwater contamination may be present, and where the greatest potential for chemical exposure and physical injury exists, are in the immediate vicinity of drilling and sampling operations. Perimeter control measures will be set up at each drilling or sampling location. The perimeter control area will be determined individually for each location by the Project Manager, Assistant Project Manager, or Field Team Leader and will be based on the proximity to roads and structures, and on the general nature of the surrounding area. Perimeter control measures shall include one or more of the following: traffic cones, safety fence, caution tape, or fencing. Only OSHA-trained personnel necessary for completion of the specific task will be allowed inside of the bounded areas.

All field personnel and samplers in particular, shall use appropriate personal protective equipment and health and safety measures detailed in this HASP to minimize exposure to contaminated vapor, groundwater or soil.

2.0 WORK OBJECTIVES

Various work plans and sampling plans prepared describe the field activities that will be performed by GSC and others. These activities may include:

1. Surveying and reconnaissance activities such as topographic mapping.
2. Drilling of monitoring wells, extraction wells, and soil borings.
3. Construction of monitoring wells and extraction wells.
4. Hydraulic testing.
5. Sampling of soil, groundwater, surface water, sewer, and soil vapor.
6. Management of soil, water, and drill cuttings.
7. Measurement of groundwater elevations in monitoring wells.
8. Maintenance, repair, and installation of groundwater transport piping, treatment facilities, and associated equipment.
9. Well rehabilitation and decommissioning activities.

3.0 ORGANIZATION, COORDINATION, AND SITE ACCESS

The following personnel are designated to carry out the stated job functions. (Note: One person may carry out more than one job function.)

Project Director:	Craig G. Robertson
Project Managers:	Dorothy A. Bergmann Mitchell W. Ruchin
Assistant Project Managers	C. Edward Stoner
Project Quality Assurance Manager:	Dorothy A. Bergmann
GSC Health and Safety Officer:	Charles A. Rine
GSC Field Team Leaders/Members:	Kenneth W. Bittner Glenn S. Carson Stephen M. Fisher Matthew T. Luckman Charles A. Rine Mitchell W. Ruchin C. Edward Stoner Christopher J. Shannon Kaitlin B. Fleming Robert C. Watson
Client Representatives:	IBM: Dean Chartrand

Project personnel may be rotated, added, or dropped as needed. All personnel conducting field activities shall be authorized to do so by GSC. GSC field personnel will advise IBM employees, GEMs employees, subcontractors, and other persons without proper personal protective equipment or health and safety training that they will not be allowed on the Site.

3.1 Distribution of the HASP

All subcontractors working at the Site, or who otherwise could be exposed to health and safety hazards, will be advised of known hazards through distribution of this Health and Safety Plan. They shall be solely responsible for the health and safety of their employees and shall comply with applicable state and federal health and safety laws and regulations. All GSC personnel and subcontractors of GSC working at the Site shall review this Health and Safety Plan in its entirety and shall read and sign Section 11 of this HASP.

3.2 Contractor’s Conduct

All relevant procedures described in the *Health and Safety Plan* shall be followed. Smoking and use of chewing tobacco is prohibited during work activities associated with this HASP.

4.0 CHEMICAL HAZARD EVALUATION

Ten volatile organic compounds (VOCs) have been identified as significant with regard to concentration and lateral distribution in groundwater at the Site. Only low concentrations in soil vapor are expected to be encountered during field activities because the source of the vapor is typically partitioning from groundwater. In addition, Poly Chlorinate Biphenyls (PCBs or Arochlors) have been identified in soils and groundwater at the Site, specifically in wells associated with SWMU T, the Former Waste Oil Tank located proximal to the northern end of Building 003. Information from the *NIOSH Pocket Guide to Chemical Hazards* for each of the ten VOCs and PCBs are presented in Appendix A. These significant VOCs are listed below with their Chemical Abstract Service Registration Numbers (CASRN).

Substances	CASRN
Tetrachloroethene (PCE)*	**127-18-4**
Trichloroethene* (TCE)*	**79-01-6**
cis-1,2-Dichloroethene	**540-59-0**
Vinyl Chloride*	**75-01-4**
1,1,1-Trichloroethane (Methyl Chloroform)	**71-55-6**
1,1,2-Trichloroethane*	**79-00-5**
1,1-Dichloroethane	**75-34-3**
1,1-Dichloroethene*	**75-35-4**
1,2-Dichloroethane*	**107-06-2**
1,1,2-Trichloro-1,2,2,-trifluoroethane (Freon 113)	**76-13-1**
Chloroform*	**67-66-3**
*** - NIOSH potential occupational carcinogen.**	

This information in Appendix A includes primary routes of exposure and exposure limits. Time-weighted averages (TWAs) and/or short-term exposure limits (STELs) for these and other substances are also summarized in Appendix B of this HASP.

Potential chemical exposures from the work activities detailed in Section 2 of this HASP are via skin contact with, and inhalation of, contaminated media.

Appropriate personal protective equipment will be required as described in Section 7 of this HASP.

5.0 DECONTAMINATION PROCEDURES

Items that come into contact with potentially contaminated soil and groundwater will be disposed of or decontaminated as described in an approved Work Plan or the Quality Assurance Project Plan.

5.1 Personal

Because the degree of contamination is known and the potential for transfer is judged to be minimal, scrubbing and rinsing of personal protective equipment (PPE) generally will not be necessary. PPE, including gloves will be removed, placed in labeled plastic bags, and disposed of properly.

5.2 Equipment

Non-disposable groundwater gauging equipment, such as interface probes and water level meters, will be decontaminated as specified in an approved Work Plan, the Groundwater Monitoring Plan or the Quality Assurance Project Plan.

Non-disposable drilling equipment (such as augers, sampling spoons, drill rods, etc.), excavating equipment and all other non-disposable tools that come into contact with Site soils and/or groundwater will be decontaminated as specified in the relevant drilling procedure of the Quality Assurance Project Plan.

5.3 Disposable Items

Decontamination shall not be required for disposable items. Disposable items shall be placed into labeled plastic bags or containers and disposed of properly.

6.0 AIR MONITORING

VOC concentrations in the breathing air in all work areas during normal work activities (not including confined space entry and drilling activities) are expected to be minimal (less than 1 part per million as measured by an organic vapor analyzer in the breathing zone). During typical groundwater sampling and testing activities, continuous and periodic air monitoring for VOCs will not be performed.

If air monitoring for VOCs is required (confined space entry and drilling activities) or otherwise deemed necessary due to noticeable odor or suspected elevated levels of VOCs in water or soil, then this air monitoring will be performed either continuously or at periodic intervals (at least every 15 minutes) in the breathing zone using a photoionization detector (PID) or flame ionization detector equipped with an 11.7 eV lamp. If a PID with a lower eV rating is used (e.g., 10.2 eV), then the user must be aware that TCA will not be detectable by the PID. The FID or PID will be calibrated according to the manufacturer's instructions. If persistent concentrations greater than 5 ppm above background are measured in the breathing zone, then workers will leave the area until the contamination dissipates or until alternative protection measures, such as high volume fan ventilation or Level C or B respiratory protection, are established (refer to Section 7). The air monitoring frequency may be changed at the discretion of the Health and Safety Officer or Field Team Leader.

Prior to entering a confined space such as a well pit, air monitoring for oxygen content and combustible gases shall be performed as described in Section 8.3.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Based on an evaluation of potential hazards, level D protection will be designated to perform most sampling, maintenance and monitoring activities. Modified level D (with Tyvek, Saranex, or chemical-resistant apron) protection maybe designated where splash protection is necessary. Appropriate ventilation or Level B or C respiratory protection will be required where organic vapor concentrations, as measured with a PID, exceed 5 ppm above background in the breathing zone. The following levels of personal protection have been designated for the applicable work areas or tasks:

Location	Activity	Level of Protection
Well Drilling Sites	Monitoring well drilling, construction, and related activities	D, Mod. D, C, or B depending on the organic vapor concentration in the breathing zone and the presence of VC in groundwater
Monitoring Well Sites	Purging and sampling; hydraulic testing	D
Confined spaces	Activities requiring entry into an GAC units, pits, tanks, or excavations determined to be a confined space	D, Mod. D or B, depending on O_2 level
Groundwater Extraction System	Operation, maintenance, and monitoring of groundwater treatment systems	D or Mod. D, except for confined space work

Specific levels of protective equipment for each level of protection are as follows:

7.1 Level D

Clothing: Regular work clothes, not loose fitting, shall be worn. Shirt sleeves shall preferably cover the entire arm. Shorts are not permitted.

Hearing protection: Earplugs or earmuffs shall be worn during operations where the 8-hour time-weighted average sound level (slow response) is greater than 85 dB. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level, with or without hearing protection.

Eye protection: Wraparound glasses or goggles shall be worn when operating percussion tools and during sampling activities where the potential for a splash hazard exists. Welding glasses or goggles specifically designed for use during welding or torch cutting shall be used for those activities.

Footwear: Steel toe boots or shoes shall be worn at all times.

Hand protection: Chemical resistant gloves shall be worn for sampling-related activities. Disposable vinyl or nitrile surgical-type gloves are acceptable. Where a puncture risk exists, protective leather or neoprene outer gloves shall be worn over the vinyl inner gloves.

Head protection: ANSI spec hard hats shall be worn while working around heavy equipment.

7.2 Modified Level D

Includes all of the items listed in Level D plus Tyvek coveralls for particulate protection or Tyvek Saranex for splash protection. Disposable boots or boot covers may also be worn. Gloves and boots may be taped to coveralls using duct tape.

7.3 Level C

Includes all of the items listed for Level D and modified Level D plus a chemical cartridge respirator with organic vapor cartridge(s) or a powered, air-purifying respirator with organic vapor cartridge(s).

7.4 Level B

Includes all of the items listed for Level D and modified Level D plus (1) a self-contained breathing apparatus (SCBA) that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode or (2) a supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

Facial hair which interferes with the operation and fit of the respirator face piece shall be removed prior to using such equipment. Contact lenses are not compatible with SCBA or airline respirators and shall not be worn. Eyeglass lens inserts shall be used instead.

Each SCBA and airline respirator unit will be fit- and pressure-tested prior to use. The contact surfaces of all respiratory protection equipment will be cleaned with rubbing alcohol after each use.

Personal protective equipment may be modified at the discretion of the Health and Safety Officer or Field Team Leader. No changes to the specified levels of protection shall be made without the approval of the Health and Safety Officer or Field Team Leader.

8.0 CONFINED SPACE ENTRY PROCEDURES

Confined spaces at the Site may include shored excavations that are deeper than they are wide and certain areas of the groundwater treatment system such as well pits and tanks. Confined space entry is defined as inserting any part of the body past the plane of the portal to the confined space. For example, putting one’s arm into a large tank constitutes confined space entry; looking into the tank from outside the manway does not.

All confined spaces, are presumed to be potentially dangerous, and entry will require the issuance of a confined space entry permit. Appropriate safety measures shall be taken before entering a confined space or vessel. Under no circumstances is a vessel to be entered without an authorized confined space permit.

Confined spaces may be entered for various sampling and maintenance purposes. These activities will be conducted by personnel who have received specific confined space entry training in addition to the required 40-hour HAZWOPER training (with 8-hour annual refresher training, where applicable).

8.1 Confined Space Entry Permit

A confined space entry permit is a written document provided to allow and control entry into a permit-required space. In the case of a non-permit-required space, the entry permit will serve as the written certification required by OSHA that the space is safe for entry. The form presented in Appendix C of this HASP, or an equivalent form, shall be completed for all permit-required confined spaces. No one shall enter a permit-required confined space unless a permit, authorized for the specific location and activity, has been completed by the field team leader or other trained professional. A new confined space permit will be required daily, or when an activity stops and starts up again after a delay.

Confined space activities on this property require a confined space permit.

8.2 Personal Protective Equipment

Personal protective equipment shall be as described in Section 7. A body harness attached to a life line should be used if the other end of the life line can be securely anchored to a tripod, hoist or other device outside the confined space.

8.3 Monitoring Equipment

Prior to entry into a confined space, an attempt shall be made to ventilate the confined space. Ventilation may be accomplished by the use of a fan designed for this purpose. The confined space atmosphere shall be checked and continuous monitoring shall occur as long as the entrant is within the confined space. The atmosphere will be checked for oxygen content and lower explosive limit (LEL). Continuous monitoring of oxygen levels is not necessary if the entrant is using SCBA or an airline respirator.

Oxygen levels are to be between 19.5 and 23 percent prior to entry into the confined space. If the oxygen concentration within the confined space, as determined by continuous monitoring, is not within this range while the entrant is in the confined space, then the entrant will immediately exit the confined space unless using a supplied air device. The oxygen meter shall be calibrated at an elevation similar to the elevation of the confined space.

After the oxygen content of the confined space is determined to be between 19.5 and 23 percent, the LEL will be measured. If the LEL is less than 10 percent, then the confined space may be entered. Where an explosive vapor hazard is expected, the LEL will be monitored continuously while the entrant is in the confined space, and if the concentration increases to greater than 10 percent, then the entrant shall immediately exit the confined space.

8.4 Role of Attendant

An attendant shall be present outside of the confined space for the entire time that the entrant is in the confined space. The entrant shall be within sight of the attendant at all times or shall otherwise make verbal contact at approximately one-minute intervals. The attendant is not permitted to perform entry-type rescue unless relieved of the attending responsibilities and by a properly trained and equipped person. The attendant is not to perform any procedure that would detract from the attendant’s ability to recognize and warn of unsafe conditions and is in no instance allowed to break the plane of the confined space. This does not preclude the attendant from performing such tasks as getting tools and sampling equipment and passing them to the persons working in the confined space. The attendant will also perform the role of supervisor with all of the necessary responsibilities. The attendant will, therefore, be responsible for adherence to standard operating procedures, and for keeping unauthorized personnel from entering the confined space.

8.5 Emergency Response

In the event that an emergency situation arises within the confined space, the attendant shall immediately notify the emergency number (refer to Section 10). The attendant is then to return to the confined space unless the emergency is of such a nature that the safety of the attendant would be threatened. The attendant is to render only non-entry assistance until such time as the emergency response personnel arrive at the confined space.

9.0 LOCK-OUT/TAG-OUT/CONTROL OF HAZARDOUS ENERGY

To ensure that all individuals working on the Site are protected from accidental or unexpected activation of mechanical and/or electrical equipment during maintenance, repair, cleaning, servicing, or adjusting of prime movers, machinery, or equipment, a lock-out/tag-out procedure must be followed.

The term “lock-out” refers to the practice of using keyed or combination security devices ("locks") to prevent the unwanted activation of mechanical or electrical equipment. The term “tag-out” refers to the practice of using tags in conjunction with locks to increase the visibility and awareness that equipment is not to be energized or activated until such devices are removed.

Lock-out/tag-out requirements are specified by OSHA in 29CFR1910.147. Specific lock-out/tag-out procedures for operation, maintenance, and monitoring of the groundwater treatment facilities are described in the following sections.

9.1 Preparation for Lock-out/Tag-out

Make a survey to locate and identify all isolating devices to be certain which switches, valves, or other energy isolating devices apply to the equipment to be locked and tagged out. More than one energy source (electrical, mechanical, stored energy, or others) may be involved.

9.2 Sequence of Lock-out or Tag-out System Procedure

Notify affected employees that a lock-out or tag-out system is using used and the reason for its use. The authorized employee shall know the type and magnitude of energy that the machine or equipment uses and shall understand the hazards associated with the machine or equipment.

If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch, etc.).

Operate the switch, valve, or other energy isolating devices so that the equipment is isolated from its energy sources. Stored energy (such as in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure) must be dissipated or restrained by methods such as repositioning, blocking, or bleeding down.

Lock-out/tag-out the energy-isolating devices with assigned individual locks or tags.

To verify that all energy sources have been disconnected, operate the push button or other normal operating controls to make certain the equipment will not operate. CAUTION: Return operating controls to neutral or off position after the test.

The equipment is now locked out or tagged out.

9.3 Restoring Machines or Equipment to Normal Operations

After the maintenance activity is complete and equipment is ready for normal operations, check the area around the machines or equipment to ensure that no one is exposed.

After all tools have been removed from the machine or equipment, guards have been reinstalled, and employees are in the clear, remove all lock-out or tag-out devices. Operate the energy-isolating devices to restore energy to the machine or equipment.

9.4 Electrical Safety and Lock-out/Tag-out

In the preceding steps, if more than one individual is required to lock-out or tag-out equipment, each shall place his own personal lock-out/tag-out device on the energy-isolating devices. When an energy-isolating device cannot accept multiple locks or tags, a multiple lock-out or tag-out device such as a hasp may be used. If lock-out is used, a single lock may be used to lock out the machine or equipment with the key being placed in a lock-out box or cabinet that allows the use of multiple locks to secure it. Each employee will then use his own lock to secure the box or cabinet. As each person no longer needs to maintain his lock-out protection, that person will remove his lock from the box or cabinet.

9.5 Temporary Removal of Lock-out/Tag-out Devices

In situations where lock-out/tag-out devices must be temporarily removed from the energy-isolating device and the machine or equipment energized to test or position the machine, equipment, or component, the following sequence of actions will be followed:

1. Remove non-essential items and ensure that the machine or equipment components are operationally intact.
2. Notify affected employees that the lock-out/tag-out devices have been removed and ensure that all employees have been safely positioned or removed from the area.
3. Have employees who applied the lock-out/tag-out devices remove the lock-out/tag-out devices.
4. Energize and proceed with testing or positioning.
5. De-energize all systems and reapply energy control measures in accordance with section 9.1.2 of these procedures.

9.6 Common Pitfalls of Lock-out/Tag-out

The lock-out/tag-out procedure is to be adhered to in all situations when working on electrically powered equipment. The following is a list of common pitfalls of lock-out/tag-out systems that are to be avoided:

1. Failure to use the lock.
2. Locking through another lock instead of through the device to be locked out.
3. Leaving the key in the lock.
4. Asking others to attach the lock.
5. Failure to use tags.
6. Failure to check inside the switch box to confirm with a voltage meter that the power has been disconnected.
7. Pulling fuses without performing a lock out.
8. Failure to identify all switches and disconnects in-line with equipment.
9. Assuming the equipment is inoperable and failing to lock out.
10. Assuming the job is too small to merit locking out.

10.0 EMERGENCY PROCEDURES AND EQUIPMENT

10.1 Emergency Contacts and Directions

Emergency Phone Numbers:
AMBULANCE: ***911***
FIRE: ***911***
Nearest Hospital: Kingston Hospital Campus

Address: *396 Broadway, Kingston, NY 12401*
(845) 331-3131

A Hospital Route Map is attached to this HASP as Appendix D.

Driving directions to Kingston Hospital Campus (Kingston, NY) (estimated driving time 11 minutes, distance 3.4 miles):	
Head **South** on **Enterprise Drive** toward **Boices Lane**	305 feet
Turn **Left** onto **Boices Lane**	0.4 miles
Take **Right** onto **Morton Boulevard**	0.5 miles
Turn **Right** onto **Ulster Avenue**	0.9 miles
Continue onto **Albany Avenue**	0.4 miles
Turn **Left** onto **Foxhall Avenue**	1.1 miles
Turn **Right** onto **Broadway, Kingston Hospital will be on the right**	285 feet

Additional Emergency Phone Numbers:

Agency for Toxic Substances and Disease Registry: 404-639-0615

National Poison Control Center: 800-764-7661

10.2 Emergency Equipment

First aid equipment is available at the following locations:

Fire Extinguisher: In all GSC vehicles.

Emergency Eye Wash: In all GSC vehicles.

First Aid Kit: In all GSC vehicles.

10.3 Exposure Symptoms for Chemicals

Emergency medical information for the Site’s principal substances is included in Appendix A. This information is from the NIOSH Pocket Guide online at http://www.cdc.gov/niosh/npg.

10.4 First Aid

First aid for contact with materials or groundwater contaminated with the ten substances listed as significant in this HASP is described below.

10.4.1 Eye Contact

If contaminated groundwater contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids.

10.4.2 Skin Contact

If contaminated groundwater contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing, promptly remove the clothing and wash the skin with soap and water.

10.4.3 Inhalation

If a person breathes in significant VOC vapors, move the exposed person to fresh air at once.

10.4.4 Ingestion

Ingestion is not considered to be a likely route of exposure.

10.4.5 Contact with Separate-Phase Solvent

In case of contact with separate-phase solvent, follow the first aid procedures described above and get medical attention immediately. If breathing has stopped as a result of vapor inhalation, perform rescue breathing. Keep the affected person warm and at rest and get medical attention immediately.

10.5 Emergency Procedures

10.5.1 Personnel Injury

All injuries, no matter how minor, shall be reported to the Project Manager or Health and Safety Officer and will be logged and recorded.

Upon notification of an injury, work will cease and the injured person will be removed from the work area. The Site Safety Officer and/or field team members will assess the nature of the injury, will initiate the appropriate first aid, and will arrange for transportation to the designated medical facility, if required. If the injury increases the risk to other Site workers, activities on site will not resume until the added risk is removed or minimized.

10.5.2 Fire Explosion

In the event of fire or explosion, all personnel will immediately evacuate the site and will move to a safe distance from the affected area. The emergency phone number (911) shall be contacted. If it is safe to do so, site personnel may use firefighting equipment available on-site to control or extinguish the fire, and may attempt to isolate flammable materials that may contribute to the fire.

10.5.3 Equipment Failure

If equipment, including personal protective equipment, fails to operate properly, the Site Safety Officer or Project Manager will determine the effect of this failure on continuing the planned activity. If the failure affects the safety of personnel or prevents completion of tasks, work will cease until the equipment is repaired or until other appropriate actions are taken.

Following all emergency situations, work will not resume until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed.
3. This Health and Safety Plan has been reviewed.
4. Site personnel have been briefed on changes to this Health and Safety Plan.

11.0 ACKNOWLEDGMENT OF PLAN

All site workers performing intrusive work activities shall have completed 40 hours of HAZWOPER safety training under the requirements of 29 CFR 1910.120 and 8 hours of annual HAZWOPER refresher training within the past 12 months. Certificates shall be supplied and kept on file with GSC.

By signing in the designated space below, GSC personnel acknowledge that they have read this Health and Safety Plan and are familiar with its provisions.

Name	Title	Signature

If a subcontractor does not have a site-specific health and safety plan, then they may accept and acknowledge this HASP with their modifications, if any, or prepare a HASP at least as stringent as this HASP. If the subcontractor chooses to accept this HASP for its own use, then the subcontractor shall sign this HASP in the designated space below. In so doing, the subcontractor accepts full responsibility for the use of this HASP by the subcontractor and subcontractor's employees. The subcontractor agrees to fully indemnify GSC and IBM from any and all liability arising out of reliance on this HASP by the subcontractor's employees.

Name	**Company**	**Signature**

APPENDIX A

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS INFORMATION FOR SIGNIFICANT VOCs

Tetrachloroethylene

Synonyms & Trade Names Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

CAS No. 127-18-4

RTECS No. KX3850000 (/niosh-rtecs/KX3ABF10.html)

DOT ID & Guide 1897 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160)

Formula $Cl_2C=CCl_2$

Conversion 1 ppm = 6.78 mg/m^3

IDLH Ca [150 ppm]
See: 127184 (/niosh/idlh/127184.html)

Exposure Limits

NIOSH REL : Ca Minimize workplace exposure concentrations. See Appendix A (nengapdxa.html)

OSHA PEL † (nengapdxg.html) : TWA 100 ppm
C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm

Measurement Methods
NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ;
OSHA 1001 (/niosh/docs/2003-154/pdfs/1001.pdf)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless liquid with a mild, chloroform-like odor.

MW: 165.8	**BP:** 250°F	**FRZ:** -2°F	**Sol:** 0.02%	**VP:** 14 mmHg	**IP:** 9.32 eV
Sp.Gr: 1.62	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Incompatibilities & Reactivities Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system

Cancer Site [in animals: liver tumors]

Personal Protection/Sanitation (See protection codes (protect.html))

Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))

Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

Trichloroethylene

Synonyms & Trade Names Ethylene trichloride, TCE, Trichloroethene, Trilene

CAS No. 79-01-6

RTECS No. KX4550000 (/niosh-rtecs/KX456D70.html)

DOT ID & Guide 1710 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160)

Formula $ClCH=CCl_2$

Conversion 1 ppm = 5.37 mg/m^3

IDLH Ca [1000 ppm]
See: 79016 (/niosh/idlh/79016.html)

Exposure Limits

NIOSH REL : Ca See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html)

OSHA PEL † (nengapdxg.html) : TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)

Measurement Methods

NIOSH 1022 (/niosh/docs/2003-154/pdfs/1022.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) ;
OSHA 1001 (/niosh/docs/2003-154/pdfs/1001.pdf)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless liquid (unless dyed blue) with a chloroform-like odor.

MW: 131.4	**BP:** 189°F	**FRZ:** -99°F	**Sol:** 0.1%	**VP:** 58 mmHg	**IP:** 9.45 eV
Sp.Gr: 1.46	**Fl.P:** ?	UEL(77°F): 10.5%	LEL(77°F): 8%		

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system

Cancer Site [in animals: liver & kidney cancer]

Personal Protection/Sanitation (See protection codes (protect.html))

Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))

Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

1,2-Dichloroethylene

Synonyms & Trade Names Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene

CAS No. 540-59-0

RTECS No. KV9360000 (/niosh-rtecs/KV8ED280.html)

DOT ID & Guide 1150 130P (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130&poly=1)

Formula $\mathrm{ClCH{=}CHCl}$

Conversion 1 ppm = 3.97 mg/m^3

IDLH 1000 ppm
See: 540590 (/niosh/idlh/540590.html)

Exposure Limits

NIOSH REL : TWA 200 ppm (790 mg/m^3)
OSHA PEL : TWA 200 ppm (790 mg/m^3)

Measurement Methods
NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ;
OSHA 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.

MW: 97.0	**BP:** 118-140°F	**FRZ:** -57 to -115°F	**Sol:** 0.4%	**VP:** 180-265 mmHg	**IP:** 9.65 eV
Sp.Gr(77°F): 1.27	**Fl.P:** 36-39°F	**UEL:** 12.8%	**LEL:** 5.6%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, respiratory system; central nervous system depression

Target Organs Eyes, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately

Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 1000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode[£]
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)[£]
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

Vinyl chloride

Synonyms & Trade Names Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)

CAS No. 75-01-4

RTECS No. KU9625000 (/niosh-rtecs/KU92DDA8.html)

DOT ID & Guide 1086 116P (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=116&poly=1) (inhibited)

Formula $CH_2=CHCl$

Conversion 1 ppm = 2.56 mg/m^3

IDLH Ca [N.D.]
See: IDLH INDEX (/niosh/idlh/intridl4.html)

Exposure Limits

NIOSH REL : Ca See Appendix A (nengapdxa.html)
OSHA PEL : [1910.1017] TWA 1 ppm C 5 ppm [15-minute]

Measurement Methods
NIOSH 1007 (/niosh/docs/2003-154/pdfs/1007.pdf) ;
OSHA 4 (http://www.osha.gov/dts/sltc/methods/organic/org004/org004.html) , 75 (http://www.osha.gov/dts/sltc/methods/organic/org075/org075.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.]

MW: 62.5	**BP:** 7°F	**FRZ:** -256°F	Sol(77°F): 0.1%	**VP:** 3.3 atm	**IP:** 9.99 eV
	Fl.P: NA (Gas)	**UEL:** 33.0%	**LEL:** 3.6%	**RGasD:** 2.21	

Flammable Gas

Incompatibilities & Reactivities Copper, oxidizers, aluminum, peroxides, iron, steel [Note: Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]

Exposure Routes inhalation, skin and/or eye contact (liquid)

Symptoms lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]

Target Organs Liver, central nervous system, blood, respiratory system, lymphatic system

Cancer Site [liver cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Frostbite
Eyes: Frostbite
Wash skin: No recommendation
Remove: When wet (flammable)
Change: No recommendation
Provide: Frostbite wash

First Aid (See procedures (firstaid.html))
Eye: Frostbite
Skin: Frostbite
Breathing: Respiratory support

Respiratory Recommendations
(See Appendix E) (nengapdxe.html)

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

Methyl chloroform

Synonyms & Trade Names Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)

CAS No. 71-55-6

RTECS No. KJ2975000 (/niosh-rtecs/KJ2D6518.html)

DOT ID & Guide 2831 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160)

Formula CH_3CCl_3

Conversion 1 ppm = 5.46 mg/m^3

IDLH 700 ppm
See: 71556 (/niosh/idlh/71556.html)

Exposure Limits

NIOSH REL : C 350 ppm (1900 mg/m^3) [15-minute] See Appendix C (nengapdxc.html) (Chloroethanes)

OSHA PEL † (nengapdxg.html) : TWA 350 ppm (1900 mg/m^3)

Measurement Methods

NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless liquid with a mild, chloroform-like odor.

MW: 133.4	**BP:** 165°F	**FRZ:** -23°F	**Sol:** 0.4%	**VP:** 100 mmHg	**IP:** 11.00 eV
Sp.Gr: 1.34	**Fl.P:** ?	**UEL:** 12.5%	**LEL:** 7.5%		

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium; water [Note: Reacts slowly with water to form hydrochloric acid.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage

Target Organs Eyes, skin, central nervous system, cardiovascular system, liver

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly

Remove: When wet or contaminated **Change:** No recommendation	**Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 700 ppm:
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

1,1,2-Trichloroethane

Synonyms & Trade Names Ethane trichloride, ß-Trichloroethane, Vinyl trichloride

CAS No. 79-00-5

RTECS No. KJ3150000 (/niosh-rtecs/KJ3010B0.html)

DOT ID & Guide

Formula $CHCl_2CH_2Cl$

Conversion 1 ppm = 5.46 mg/m^3

IDLH Ca [100 ppm]
See: 79005 (/niosh/idlh/79005.html)

Exposure Limits

NIOSH REL : Ca TWA 10 ppm (45 mg/m^3) [skin] See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html) (Chloroethanes)

OSHA PEL : TWA 10 ppm (45 mg/m^3) [skin]

Measurement Methods
NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ;
OSHA 11 (http://www.osha.gov/dts/sltc/methods/organic/org011/org011.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless liquid with a sweet, chloroform-like odor.

MW: 133.4	**BP:** 237°F	**FRZ:** -34°F	**Sol:** 0.4%	**VP:** 19 mmHg	**IP:** 11.00 eV
Sp.Gr: 1.44	**Fl.P:** ?	**UEL:** 15.5%	**LEL:** 6%		

Combustible Liquid, forms dense soot.

Incompatibilities & Reactivities Strong oxidizers & caustics; chemically-active metals (such as aluminum, magnesium powders, sodium & potassium)

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]

Target Organs Eyes, respiratory system, central nervous system, liver, kidneys

Cancer Site [in animals: liver cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately

Eyes: Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet or contaminated **Change:** No recommendation **Provide:** Eyewash, Quick drench	**Skin:** Soap wash promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

1,1-Dichloroethane

Synonyms & Trade Names Asymmetrical dichloroethane; Ethylidene chloride; 1,1-Ethylidene dichloride

CAS No. 75-34-3	**RTECS No.** KI0175000 (/niosh-rtecs/KI2AB98.html)	**DOT ID & Guide** 2362 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130)
Formula $CHCl_2CH_3$	**Conversion** 1 ppm = 4.05 mg/m^3	**IDLH** 3000 ppm See: 75343 (/niosh/idlh/75343.html)

Exposure Limits

NIOSH REL : TWA 100 ppm (400 mg/m^3) See Appendix C (nengapdxc.html) (Chloroethanes)

OSHA PEL : TWA 100 ppm (400 mg/m^3)

Measurement Methods

NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ;

OSHA 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless, oily liquid with a chloroform-like odor.

MW: 99.0	**BP:** 135°F	**FRZ:** -143°F	**Sol:** 0.6%	**VP:** 182 mmHg	**IP:** 11.06 eV
Sp.Gr: 1.18	**Fl.P:** 2°F	**UEL:** 11.4%	**LEL:** 5.4%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong caustics

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation skin; central nervous system depression; liver, kidney, lung damage

Target Organs Skin, liver, kidneys, lungs, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Remove: When wet (flammable)
Change: No recommendation

Respirator Recommendations

NIOSH/OSHA

Up to 1000 ppm:
(APF = 10) Any supplied-air respirator

Up to 2500 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

Up to 3000 ppm:
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

Vinylidene chloride

Synonyms & Trade Names 1,1-DCE; 1,1-Dichloroethene; 1,1-Dichloroethylene; VDC; Vinylidene chloride monomer; Vinylidene dichloride

CAS No. 75-35-4

RTECS No. KV9275000 (/niosh-rtecs/KV8D8678.html)

DOT ID & Guide 1303 130P (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130&poly=1) (inhibited)

Formula $CH_2{=}CCl_2$

Conversion

IDLH Ca [N.D.]
See: IDLH INDEX (/niosh/idlh/intridl4.html)

Exposure Limits

NIOSH REL : Ca See Appendix A (nengapdxa.html)
OSHA PEL † (nengapdxg.html) : none

Measurement Methods
NIOSH 1015 (/niosh/docs/2003-154/pdfs/1015.pdf) ;
OSHA 19 (http://www.osha.gov/dts/sltc/methods/organic/org019/org019.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor.

MW: 96.9	**BP:** 89° F	**FRZ:** -189°F	**Sol:** 0.04%	**VP:** 500 mmHg	**IP:** 10.00 eV
Sp.Gr: 1.21	**Fl.P:** -2° F	**UEL:** 15.5%	**LEL:** 6.5%		

Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.

Incompatibilities & Reactivities Aluminum, sunlight, air, copper, heat [Note: Polymerization may occur if exposed to oxidizers, chlorosulfonic acid, nitric acid, or oleum. Inhibitors such as the monomethyl ether of hydroquinone are added to prevent polymerization.]

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Cancer Site [in animals: liver & kidney tumors]

Personal Protection/Sanitation (See protection codes (protect.html))

Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))

Eye: Irrigate immediately
Skin: Soap flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

Ethylene dichloride

Synonyms & Trade Names 1,2-Dichloroethane; Ethylene chloride; Glycol dichloride

CAS No. 107-06-2

RTECS No. KI0525000 (/niosh-rtecs/KI802C8.html)

DOT ID & Guide 1184 131 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=131)

Formula $ClCH_2CH_2Cl$

Conversion 1 ppm = 4.05 mg/m^3

IDLH Ca [50 ppm]
See: 107062 (/niosh/idlh/107062.html)

Exposure Limits

NIOSH REL : Ca TWA 1 ppm (4 mg/m^3) ST 2 ppm (8 mg/m^3) See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html) (Chloroethanes)

OSHA PEL † (nengapdxg.html) : TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]

Measurement Methods

NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ; **OSHA** 3 (http://www.osha.gov/dts/sltc/methods/organic/org003/org003.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.]

MW: 99.0	**BP:** 182°F	**FRZ:** -32°F	**Sol:** 0.9%	**VP:** 64 mmHg	**IP:** 11.05 eV
Sp.Gr: 1.24	**Fl.P:** 56°F	**UEL:** 16%	**LEL:** 6.2%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers & caustics; chemically-active metals such as magnesium or aluminum powder, sodium & potassium; liquid ammonia [Note: Decomposes to vinyl chloride & HCl above 1112°F.]

Exposure Routes inhalation, ingestion, skin absorption, skin and/or eye contact

Symptoms irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]

Target Organs Eyes, skin, kidneys, liver, central nervous system, cardiovascular system

Cancer Site [in animals: forestomach, mammary gland & circulatory sys cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

1,1,2-Trichloro-1,2,2-trifluoroethane

Synonyms & Trade Names Chlorofluorocarbon-113, CFC-113, Freon® 113, Genetron® 113, Halocarbon 113, Refrigerant 113, TTE

CAS No. 76-13-1

RTECS No. KJ4000000 (/niosh-rtecs/KJ3D0900.html)

DOT ID & Guide

Formula CCl_2FCClF_2

Conversion 1 ppm = 7.67 mg/m^3

IDLH 2000 ppm
See: 76131 (/niosh/idlh/76131.html)

Exposure Limits

NIOSH REL : TWA 1000 ppm (7600 mg/m^3) ST 1250 ppm (9500 mg/m^3)

OSHA PEL † (nengapdxg.html) : TWA 1000 ppm (7600 mg/m^3)

Measurement Methods
NIOSH 1020 (/niosh/docs/2003-154/pdfs/1020.pdf) ;
OSHA 113 (http://www.osha.gov/dts/sltc/methods/organic/org113/org113.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless to water-white liquid with an odor like carbon tetrachloride at high concentrations. [Note: A gas above 118°F.]

MW: 187.4	**BP:** 118° F	**FRZ:** -31°F	Sol(77°F): 0.02%	**VP:** 285 mmHg	**IP:** 11.99 eV
Sp.Gr(77°F): 1.56	**Fl.P:** ?	**UEL:** ?	**LEL:** ?		

Noncombustible Liquid at ordinary temperatures, but the gas will ignite and burn weakly at 1256°F.

Incompatibilities & Reactivities Chemically-active metals such as calcium, powdered aluminum, zinc, magnesium & beryllium [Note: Decomposes if in contact with alloys containing >2% magnesium.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation skin, throat, drowsiness, dermatitis; central nervous system depression; in animals: cardiac arrhythmias, narcosis

Target Organs Skin, heart, central nervous system, cardiovascular system

Personal Protection/Sanitation (See protection codes (protect.html))

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately

Skin: Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet or contaminated **Change:** No recommendation	**Skin:** Soap wash promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 2000 ppm:
(APF = 10) Any supplied-air respirator
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

Chloroform

Synonyms & Trade Names Methane trichloride, Trichloromethane

CAS No. 67-66-3	**RTECS No.** FS9100000 (/niosh-rtecs/FS8ADAE0.html)	**DOT ID & Guide** 1888 151 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=151)
Formula $CHCl_3$	**Conversion** 1 ppm = 4.88 mg/m^3	**IDLH** Ca [500 ppm] See: 67663 (/niosh/idlh/67663.html)

Exposure Limits

NIOSH REL : Ca ST 2 ppm (9.78 mg/m^3) [60-minute] See Appendix A (nengapdxa.html)

OSHA PEL † (nengapdxg.html) : C 50 ppm (240 mg/m^3)

Measurement Methods

NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Colorless liquid with a pleasant odor.

MW: 119.4	**BP:** 143°F	**FRZ:** -82°F	Sol(77°F): 0.5%	**VP:** 160 mmHg	**IP:** 11.42 eV
Sp.Gr: 1.48	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Liquid

Incompatibilities & Reactivities Strong caustics; chemically-active metals such as aluminum or magnesium powder, sodium & potassium; strong oxidizers [Note: When heated to decomposition, forms phosgene gas.]

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]

Target Organs Liver, kidneys, heart, eyes, skin, central nervous system

Cancer Site [in animals: liver & kidney cancer]

Personal Protection/Sanitation (See protection codes (protect.html))

Skin: Prevent skin contact

First Aid (See procedures (firstaid.html))

Eye: Irrigate immediately

Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

APPENDIX B

RELATIVE RESPONSE TABLE FOR FIELD MONITORING EQUIPMENT

Table 1. Relative Response of Field Monitoring Equipment to Selected Compounds

Compound	IP (eV)	PID (<10.2eV)	FID (<15.4eV)	%LEL	Odor Threshold (ppm)	TWA (ppm)	STEL (ppm)
p-xylene	8.44	E	E	1.1	NA	100	150
o,m-xylene	8.56	E	E	0.9	NA	100	150
ethylbenzene	8.76	E	E	0.8	0.092-0.60	100	125
toluene	8.82	E	E	1.1	0.16-37	100 (C300)	150
1,2-dichlorobenzene	9.06	E	NA	2.2	0.70	C50	NA
chlorobenzene	9.07	E	NA	1.3	1.3	75	NA
benzene	9.24	E	E	1.2	34-119	0.1	1
tetrachloroethene	9.32	G	F		47	25 (C200)	NA
trichloroethene	9.45	G	G	8.0	82	50 (C200)	200
methyl ethyl ketone (2-butanone)	9.54	G	G	1.4	1-30	200	300
cis/trans-1,2-dichloroethene	9.65	G	NA	5.6	0.08-17	200	NA
acetone (2-propanone)	9.69	G	E	2.5	3.6-653	250	NA
vinyl chloride	9.99	F	F	3.6	10-20	1 (C5)	NA
1,1-dichloroethene	10.00	G	NA	6.5	NA	1	NA
chloroethane	10.97	NR	E	3.8	4.2	1000	NA
1,1,1-trichloroethane	11.00	NR	E	7.5	390	C350	NA
1,1,2-trichloroethane	11.00	NR	NA	6.0	0.5-167	10	NA
1,2-dichloroethane	11.05	NR	G	6.2	6-185	1	2
1,1-dichloroethane	11.06	NR	NA	5.4	49-1359	100	NA
methylene chloride	11.32	NR	G-E	13	160	25	125
chloroform	11.42	NR	G	NR	133-276		2
dichlorodifluoromethane (Freon 12)	11.75	NR	F-P	NR	NA	1000	NA
trichlorofluoromethane (Freon 11)	11.77	NR	F-P	NR	5-100	C1000	NA
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	11.99	NR	G	NR	0.5-200	1000	1250

IP = ionization potential
PID = photoionization detector
FID = flame ionization detector
%LEL = percent lower explosive limit (for explosimeter)
ppm = parts per million
TWA = 8-hour time-weighted average: value listed is the lowest of NIOSH and OSHA values
STEL = short-term exposure limit: value listed is the lowest of NIOSH and OSHA values
C = ceiling value, do not exceed
NR = no response (i.e., compound is not flammable or has a higher IP than the detector)
NA = not available
Response relative to methane standard for PID or benzene standard for FID:
E = excellent G = good F = fair P = poor

APPENDIX C

CONFINED SPACE ENTRY PERMIT (sample)

Groundwater Sciences Corporation Confined Space Entry Permit

Date ☐ **Start Time** ☐ AM ☐ PM ☐

Emergency # (notified prior to entry √)
Phone number: ☐

Location of Work: ______________________

Nature of Work (describe): ______________________

Personnel Trained In	Y	N	NA		Y	N	NA
Emergency Entry & Exit Procedures	☐	■	■	First Aid	☐	☐	☐
Use of Appropriate Respirators	☐	☐	☐	Rescue Procedures & First Aid	☐	☐	☐
When & How to Exit the Space	☐	■	■	Use of Confined Space Equipment	☐	■	■
Review of Material Data Sheets (MSDS's)	☐	☐	☐	Means of Communication	☐	■	■
How hazards are Controlled	☐	■	■	Non-routine Tasks ____________	☐	☐	☐
Signs & Symptoms of Chemical Exposure	☐	■	☐	Lockout Tagout Procedures	☐	☐	☐
Other: ____________________	☐	☐	☐	Safe Work Practices	☐	■	■

Potential Confined Space Hazards	Y	N	NA		Y	N	NA
Oxygen Deficient/Enriched Atmosphere	☐	☐	☐	Mechanical	☐	☐	☐
Flammable/Explosive Atmosphere	☐	☐	☐	Electrical	☐	☐	☐
Equipment Hazards	☐	☐	☐	Humidity/Temperature	☐	☐	☐
Toxic Gases/Fumes	☐	☐	☐	Chemical	☐	☐	☐

Confined Space Preparation Checklist	Y	N	NA		Y	N	NA
Blanking/Disconnecting Lines	☐	☐	☐	Full Body Harness w/'D' Ring	☐	■	☐
Electrical Lockout	☐	☐	☐	Emergency Escape Retreval Equip.	☐	☐	☐
Mechanical Lockout	☐	☐	☐	Lifelines	☐	☐	☐
Purge-Flush & Vent	☐	☐	☐	Fire Extinguisher(s)	☐	☐	☐
Secure Area (baracade, post & flag)	☐	☐	☐	Lighting (explosion proof)	☐	☐	☐
Calibrated of Confined Space Meter	☐	☐	☐	Protective Clothing ____________	☐	☐	☐
Forced Air Ventilation	☐	■	■	Respirator(s) (air purifying)/supplied air	☐	☐	☐
Breathing Apparatus	☐	■	☐	Burning & Welding Permit	☐	■	☐
Ground Fault Protection (GFCI)	☐	■	☐	Hazards Identified & Explained	☐	■	■
Authorized Attendant	☐	■	■	Fall Protection	☐	■	☐
Other:	☐	☐	☐	Area Free of Flammables, Toxic Chemicals	☐	■	☐
				Communication System Tested/On-site	☐	■	■

Meter Bump Check

Meter Serial Number ______________________

Conducted by (*print name*): ______________________

	%O_2	%LEL	H_2S (ppm)	CO (ppm)	Other Toxic:
Bump Check Readings:					

Atmospheric testing shall be continous throughout entry - document the readings every two hours

Time	%O_2 *19.5 - 23.5 %*	%LEL *<10%*	H_2S *< 10 ppm*	CO *< 35 ppm*	Other Toxic Gases/Fumes: *< 2 ppm*	Initials

Name *(print clearly)* **Signature**

Entry Supervisor: ______________________ ______________________

Attendant: ______________________ ______________________

Entrant: ______________________ ______________________

Entrant: ______________________ ______________________

Entrant: ______________________ ______________________

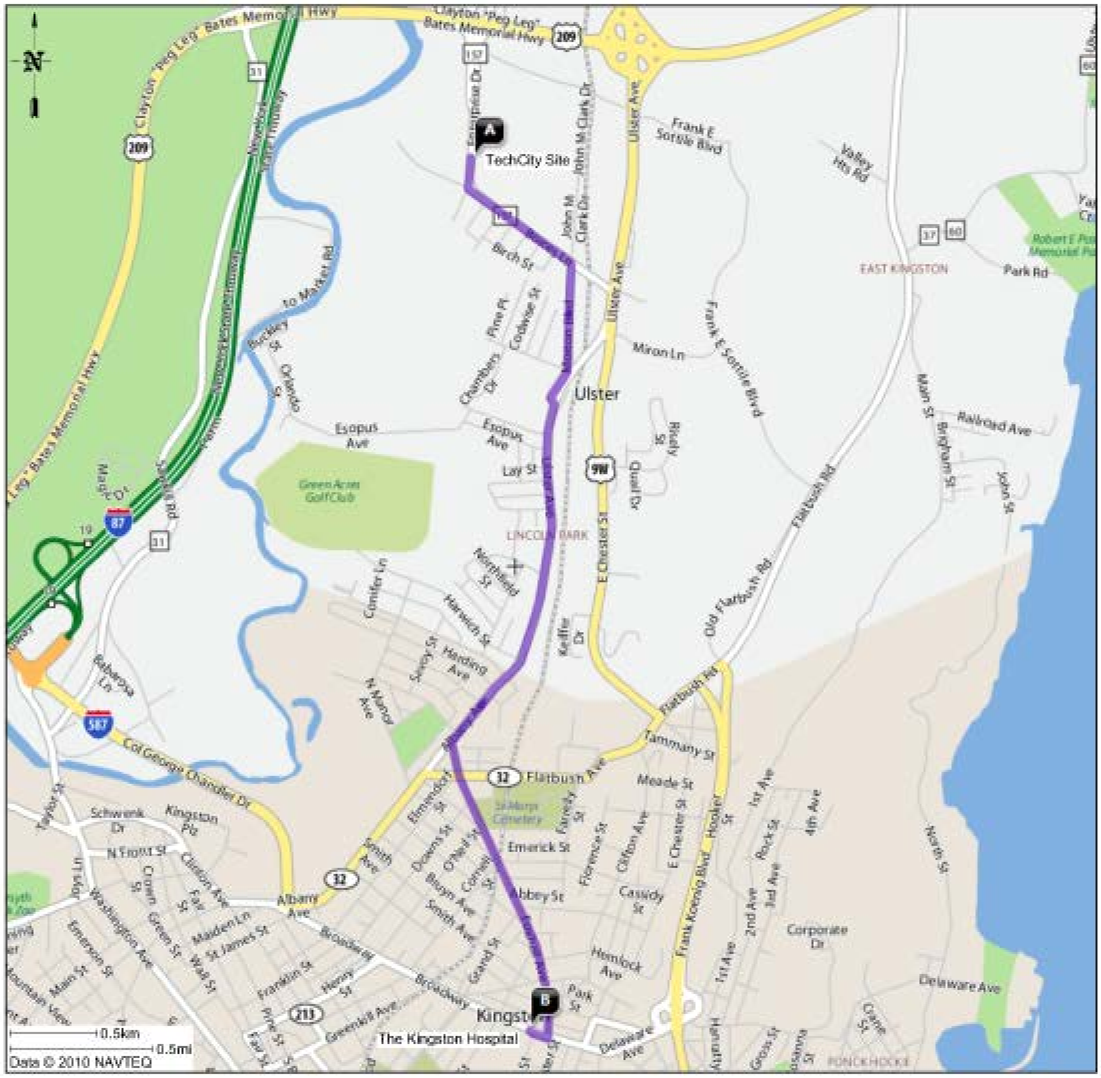
Entrant: ______________________ ______________________

Authorization/Approval (Director, Manager, or Supervisor): ______________________ **Date:** __________

This permit cannot be issued for a time period exceeding one uninterrupted work shift.

APPENDIX D

HOSPITAL ROUTE MAP



A 300 Enterprise Dr, Kingston, NY 12401

	1. Head **south** on **Enterprise Dr** toward **Boices Ln**	go 306 ft total 305 ft
↰	2. Turn left onto **Boices Ln** About 1 min	go 0.4 mi total 0.5 mi
↱	3. Turn right onto **Morton Blvd** About 1 min	go 0.5 mi total 1.0 mi
↱	4. Turn right onto **Ulster Ave** About 2 mins	go 0.9 mi total 1.9 mi
	5. Continue onto **Albany Ave**	go 0.4 mi total 2.2 mi
↰	6. Turn left onto **Foxhall Ave** About 5 mins	go 1.1 mi total 3.3 mi
↱	7. Turn right onto **Broadway** Destination will be on the right	go 285 ft total 3.4 mi

B 396 Broadway, Kingston, NY 12401

ATTACHMENT F

LABORATORY QUALITY ASSURANCE PLAN

Attachment F
TechCity Site, Ulster County NY
Site: 356002

Table 1: Site Specific Parameter List

Method	Parameter Name	Detection Limits	Reporting Units	Group
SW846 8021	BENZENE	ND@1	ug/l	VOCs (Aromatics)
SW846 8021	ETHYLBENZENE	ND@1	ug/l	VOCs (Aromatics)
SW846 8021	TOLUENE	ND@1	ug/l	VOCs (Aromatics)
SW846 8021	XYLENE, TOTAL	ND@1	ug/l	VOCs (Aromatics)
SW846 8021	CHLOROBENZENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,2-DICHLOROBENZENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,3-DICHLOROBENZENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,4-DICHLOROBENZENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	CHLOROMETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	BROMOMETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	DICHLORODIFLUOROMETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	VINYL CHLORIDE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	CHLOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	METHYLENE CHLORIDE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	TRICHLOROFLUOROMETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,1-DICHLOROETHYLENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,1-DICHLOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	CHLOROFORM	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,2-DICHLOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,1,1-TRICHLOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	CARBON TETRACHLORIDE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	BROMODICHLOROMETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,2-DICHLOROPROPANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	TRICHLOROETHYLENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	CHLORODIBROMOMETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	DIBROMOMETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	BROMOFORM	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,1,1,2-TETRACHLOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,2,3-TRICHLOROPROPANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,1,2,2-TETRACHLOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	TETRACHLOROETHYLENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	BROMOBENZENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	4-CHLOROTOLUENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	CIS-1,3-DICHLOROPROPYLENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	TRANS-1,3-DICHLOROPROPENE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	2-CHLOROETHYLVINYL ETHER	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1-CHLOROHEXANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,2-DICHLORO-1,2,2-TRIFLUOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	BENZYL CHLORIDE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,1,2-TRICHLOROETHANE	ND@1	ug/l	VOCs (Halogenated)
SW846 8021	1,2-DICHLOROETHYLENE, TOTAL	ND@1	ug/l	VOCs (Halogenated)
SW846 6020	SILVER, DISSOLVED	ND@0.00030	mg/l	Metals
SW846 6020	ARSENIC, DISSOLVED	ND@0.0014	mg/l	Metals
SW846 6020	CADMIUM, DISSOLVED	ND@0.00030	mg/l	Metals
SW846 6020	LEAD, DISSOLVED	ND@0.00030	mg/l	Metals
LAC-10-210-001-A	PHENOLS, TOTAL	ND@10	ug/l	Phenols, total

Quality Assurance Project Plan

For

Analytical Services
In Support of TechCity Site, Kingston,
Ulster County, New York

Prepared For:
Groundwater Sciences Corporation
2601 Market Place Street
Suite 310
Harrisburg, PA 17110

Prepared By:
EnviroTest Laboratories, Inc.
315 Fullerton Avenue
Newburgh, NY 12550

Approved: ____________________ Date: 12 OCT 2011
EnviroTest President
Douglas O. Tawse

Approved: ____________________ Date: 10/12/11
EnviroTest VP Operations Specialist
Ronald A. Bayer

Approved: ____________________ Date: 10/12/11
EnviroTest QA/QC Director
Maria Pistole

Approved: ____________________ Date: ____________
Groundwater Sciences Corporation
President/ Project Manager
Craig G. Robertson

2.0 Table of Contents

3.0 PROJECT DESCRIPTION

3.1 Introduction

This Quality Assurance Project Plan (QAPP), submitted by EnviroTest Laboratories, Inc. describes the Quality Assurance and Quality Control (QA/QC) procedures employed to ensure the integrity, validity and usability of analytical results to be given in support of the TechCity Site, Kingston in Ulster County, New York project. These services will include sample analysis by EPA and SW-846 approved methodologies for the analysis of metals, phenols, and GC volatile parameters. A project analyte list for this project is given in Table 3.2. Analytical methods are outlined in Table 7.5.

This QAPP presents, in specific terms, the policies, organization, objectives, functional guidelines and specific Quality Assurance and Quality Control activities designed to achieve the data quality requirements of the client and meet all project objectives.

Table 3.2 Project Analyte List

SW846 Method 8021B Halogenated Compound List

Volatiles	CAS Number	Water ug/L
1. Cloromethane	74-87-3	1.0
2. Bromomethane	74-83-9	1.0
3. Dichlorodifluoromethane	75-71-8	1.0
4. Vinyl Chloride	75-01-4	1.0
5. Chloroethane	75-00-3	1.0
6. Methylene Chloride	75-09-2	1.0
7. Trichlorofluoromethane	75-69-4	1.0
8. 1,1- Dichloroethene	75-35-4	1.0
9. 1,1-Dichloroethane	75-34-3	1.0
10. 1,2-Dichloroethene, Total	540-59-0	1.0
11. Chloroform	67-66-3	1.0
12. 1,2-Dichloroethane	107-06-2	1.0
13. 1,1,1-Trichloroethane	71-55-6	1.0
14. Carbon Tetrachloride	56-23-5	1.0
15. Bromodichloromethane	75-27-4	1.0
16. 1,2-Dichloropropane	78-87-5	1.0
17. cis-1,3-Dichloropropene	10061-01-5	1.0
18. Trichloroethene	79-01-6	1.0
19. Dibromochloromethane	124-48-1	1.0
20. trans-1,3-Dichloropropene	10061-02-6	1.0
21. 1,1,2-Trichloroethane	79-00-5	1.0
22. 2-Chloroethylvinyl Ether	100-75-8	1.0
23. Bromoform	75-25-2	1.0
24. 1,1,2,2-Tetrachloroethane	79-34-5	1.0
25. Tetrachloroethene	127-18-4	1.0
26. Chlorobenzene	108-90-7	1.0
27. 1,3-Dichlorobenzene	541-73-1	1.0
28. 1,2-Dichlorobenzene	95-50-1	1.0
29. 1,4-Dichlorobenzene	106-46-7	1.0
30. Dibromomethane	74-95-3	1.0
31. 1,1,1,2-Tetrachloroethane	630-20-6	1.0
32. 1,2,3-Trichloropropane	96-18-4	1.0
33. Bromobenzene	108-86-1	1.0
34. Benzyl Chloride	100-44-7	1.0
35. 4-Chlorotoluene	95-49-8	1.0
36. Freon 113	76-13-1	1.0
37. Freon 123A	354-23-4	1.0
38. 2-Chlorotoluene	95-49-8	1.0

Table 3.2 Project Analyte List (cont.)

SW846 Method 8021B Aromatic Compound List

Volatiles	CAS Number	Water ug/L
1. Benzene	71-43-2	1.0
2. Ethylbenzene	100-41-4	1.0
3. Toluene	108-88-3	1.0
4. Total xylenes	1330-20-7	1.0

Table 3.2 Project Analyte List (cont.)

	INORGANICS	CAS Number	Water ug/L
1.	Antimony	7440-36-0	60
2.	Arsenic	7440-38-2	10
3.	Cadmium	7440-43-9	5
4.	Lead	7439-92-1	3
5.	Silver	7440-22-4	10

MISCELLANEOUS COMPOUND LIST

		CAS Number	Water mg/L
1.	Total Phenol	Not listed	0.010

4.0 ORGANIZATION AND PERSONNEL

4.1 QA Policy and Objectives

4.1.1 The primary objective of analytical Quality Assurance/Quality Control is to ensure the integrity and usefulness of the analytical results. Data quality is assessed for precision, accuracy, completeness, representativeness and comparability.

4.1.2 The routine analysis of replicate and spiked samples will provide precision and accuracy data for assessing the validity of analytical result. These Quality Control measures, their control limits and frequency are summarized in Tables 7.2 and 7.3. The control limits listed in these tables are established by the NYSDEC ASP program or are experimentally determined criteria.

4.1.3 Strict quality control requirements are established to ensure the reliability and credibility of the analytical results. All sample analysis reports contain documentation of a series of QC operations that are performed to demonstrate that the laboratory has met these stringent requirements in the analysis of samples.

4.2 QA Management

4.2.1 Organization and Responsibilities

The responsibilities of the individuals associated with this Quality Assurance Project Plan (QAPP) are described below and illustrated in Figure 4.3:

The Customer Service Representative has overall responsibility for management of the analytical requirements of the project. The duties and responsibilities of the Customer Service representative are to:

A. Administer and supervise all requirements of the analytical tasks to ensure meeting the client objectives on schedule.
B. Act as liaison between the laboratory and the client to discuss and resolve any problems that may occur.
C. Work with laboratory supervisors in planning and conducting progress meetings.
D. Take part in corrective actions.

The Sample Management Supervisor acts as sample custodian for the laboratory. The duties and responsibilities of the Sample Management Supervisor are to:

A. Sign for the incoming field samples and verify the data entered on the chain-of-custody forms.

4.2.1 Organization and Responsibilities (cont.)

B. Advise the Project Manager of discrepancies, omissions or inappropriate samples.
C. Oversee sample information entry into the laboratory sample database.
D. Generate computerized sample tracking data entry forms.

The System Manager is responsible for:

A. The management and quality control of all computing systems.
B. The installation, operation and maintenance of software and programs.

The QA/QC Director is responsible for reviewing and advising on all aspects of QA/QC. The duties and responsibilities of the QA/QC director are to:

A. Assist the Customer Service Representative in specifying QA/QC procedures to be used during sample analysis.
B. Implement quality control procedures and techniques to assure that the laboratory achieves established standards of quality.
C. Evaluate data quality and maintain records on related QC charts and other pertinent information.
D. Monitor laboratory activities to determine conformance with the authorized quality assurance policy, and to implement appropriate steps to ensure adherence to quality assurance programs.
E. Coordinate internal audits with the Customer Service Representative.
F. Review performance evaluation results.
G. Administer intralaboratory and interlaboratory QA efforts.
H. Prepare quality assurance report to management.

The Laboratory Supervisors are responsible for meeting all the technical and analytical terms and conditions for sample analysis. Their areas of responsibilities are to:

A. Organize the personnel, equipment and materials in a manner required to fulfill the analytical requirements of sample analysis.
B. Oversee all aspects of laboratory analyses and provide technical support when necessary.
C. Review analytical data for validity and clarity.
D. Maintain contact with the Customer Service Representative in areas of technical concern, and advise the Customer Service Representative of analytical progress, needs of potential problems that occur.

4.2.1 Organization and Responsibilities (cont.)

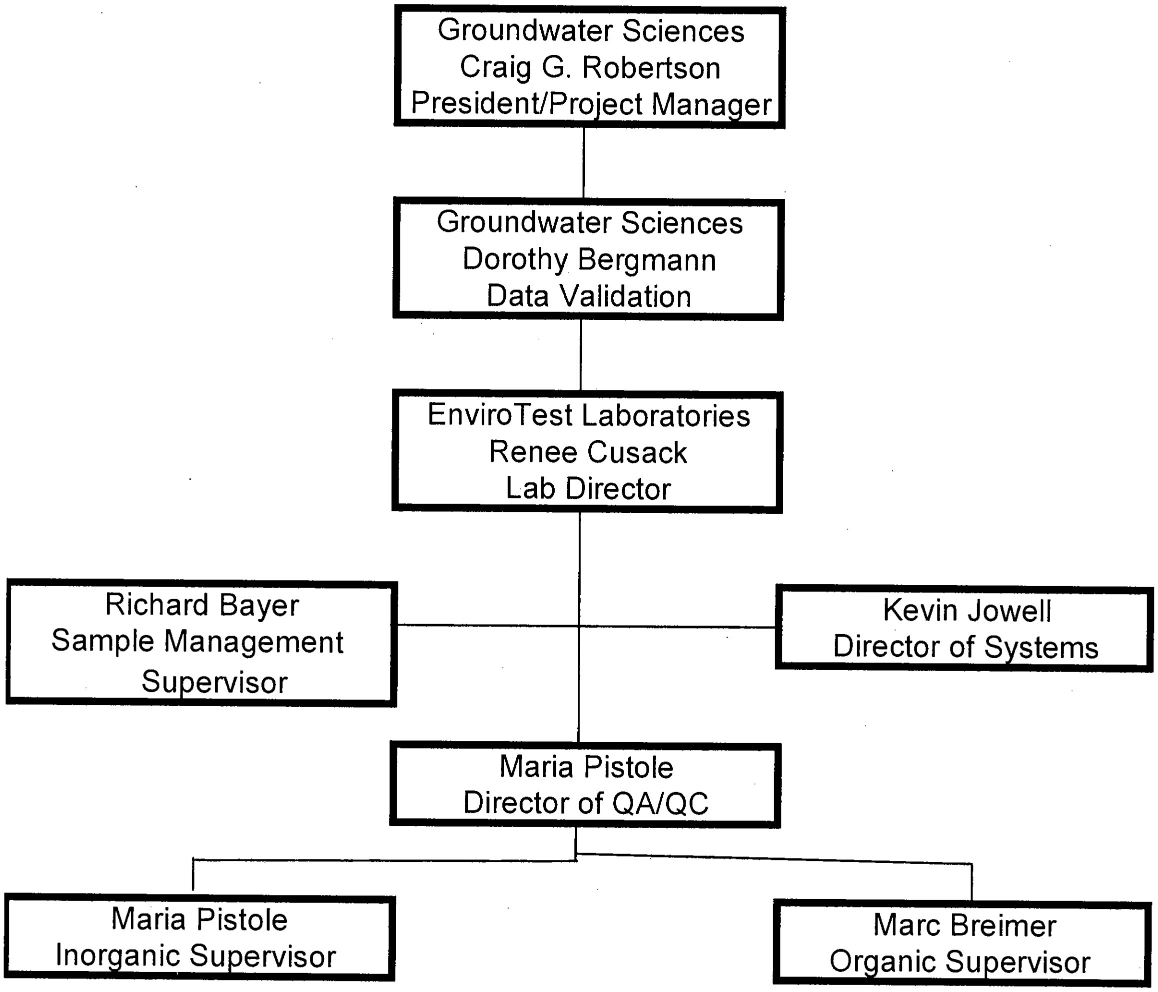
The Sample Analysts are responsible for the analysis of samples. The analysts will:

A. Schedule, prepare and analyze samples according to the requirements as defined in the contract.
B. Advise the laboratory supervisor of progress, needs and potential problems that occur.
C. Verify that the laboratory QC and analytical procedures are being followed as specified.
D. Review sample QC data, at least daily, including inspection of raw chromatograms and calibration curves.
E. Inform laboratory supervisors if the daily review indicates a decline in data quality and implement actions.

4.2.2 QA Document Control Procedures

The goal of the program is to assure that all documents for a group of samples will be accounted for. Before releasing analytical result, the laboratory assembles and cross checks the information of custody records, lab bench sheets, analyst and instrument logs and other relevant data to ensure that pertaining to each particular sample is consistent throughout the record.

Figure 4.3
Project Organizational Chart



Note: For latest update of Project Organizational Chart please contact your customer service representative.

4.2.3 QA Program Assessment Procedures

A. Levels of QC Efforts - Every attempt will be made to have all data generated be valid data. The precision of laboratory analysis will be evaluated using sample duplicates and matrix spike duplicates. Analytical accuracy will be monitoring using recovery of analytes from system monitoring compounds, matrix spikes, blank spikes, EPA reference check standards and Performance Evaluation (PE) samples. These QA efforts will assist in determining the reliability of the analytical data.

B. Accuracy and Precision - Accuracy is a measure of the degree of agreement between the analyzed value and the true or accepted reference value where it is known. Accuracy is usually expressed as a percent recovery. Precision is a measure of the mutual agreement among individual measurements of the same parameter under similar conditions, usually expressed as a relative percent difference or as standard deviation. Accuracy and precision in the laboratory are assessed by the regular analysis of known standards and duplicate samples.

C. Completeness - Completeness is a measure of the amount of valid data obtained from the analytical measurement system, expressed as a percentage of the number of valid measurements that should have been or were planned to be collected. EnviroTest will make every attempt to generate valid data from all samples received. However, realistically, some samples may be lost in laboratory accidents or some results may be deemed questionable based on internal QC procedures. Due to the variable nature of the completeness value, the objective will be to have data completeness for all samples received for analysis as high as possible to meet completeness objectives as described by the client.

D. Representativeness - Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the sample. Sampling will be performed by the client. Sample handling protocols (e.g., storage, preservation and transportation) have been developed to preserve the representativeness of the collected samples. Proper documentation will establish that protocols have been followed and that sample identification and integrity have been assured.

E. Comparability - Comparability is a QA objective wherein all sample data is comparable with other representative measurements made by EnviroTest or another organization. EnviroTest Laboratories, Inc. will achieve comparability by operating within the instrument linear range and by strict adherence to analytical protocols. The use of published analytical methods, standards reporting units and thorough documentation will ensure meeting this objective.

Table 4.2 Container Types, Preservatives & Holding Times

Analysis	Bottle Type	Preservative	Holding Times
Metals	Plastic liter or 250 ml	Nitric acid to pH <2	6 months
Volatile Organics	3 glass 40 mL vials	HCL, Cool 4 °C	14 days from date of collection
Total Phenol	Amber 250 mL	Sulfuric Acid to pH <2	26 days from collection

4.3 Personnel

4.3.1 Education and Experience

Douglas Tawse – MBA Business Administration, University of New Hampshire, Durham, NH; B.A. Business Administration, University of New Hampshire, Durham, NH
Responsibilities: President
Experience: Over 30 years in the Environmental and Business Field

Ronald Bayer – M.S., Environmental Sciences, Syracuse University, B.A., Chemistry, SUNY at Cortland
Responsibilities: VP Operations
Experience: Over 30 years in the Environmental and Business Field.

Renee M. Cusack – B.S., Biology, Mount Saint Mary College, NY
Responsibilities: Laboratory Director
Experience: Over 30 years in the Environmental Field

Kevin Jowell - B.S. Information Technology, University of Phoenix, Phoenix, AZ
Responsibilities: Systems Administrator, Data Management
Experience: 10 years I.T., 8 years analytical

Maria Pistole - B.S. Biology, Minor Chemistry, Marist College, Poughkeepsie, NY
Responsibilities: Quality Manager, Inorganic Supervisor
Experience: Over 25 years Environmental Field, 13 years EnviroTest

Marc Breimer – Ph.D. Chemistry, SUNY Binghamton, NY, B.S. Chemistry, SUNY Binghamton, NY
Responsibilities: Organics Manager
Experience: 9 years Environmental Field, 7 years EnviroTest

Debra R. Bayer – A.A.S. Management, State University of New York, Delhi, NY
Responsibility: Customer Service/ Sample Management Manger
Experience: 24 years

Richard Bayer -High School Graduate
Responsibilities: Field Service Manager
Experience: Over 30 years in the Environmental Field

Note: For latest update of Personnel please contact your customer service representative.

5.0 FACILITIES AND EQUIPMENT

5.1 Instrumentation and Equipment

Instrument Type	**Manufacturer**	**Model**	**Purchase Date**	**Autosampler**	**Method Performed**
ICP	Perkin Elmer S/N 069N9012702	3300XL Optima Trace		Yes	6010B, 200.7
	Thermo Scientific S/N 20113414	3000 Optima Trace	1998	Yes	6010B, 200.7
ICP/MS	Perkin Elmer Sciex S/N P1610402	ELAN 9000	2004	Yes	6020, 200.8
Mercury Analyzer	Leeman S/N 010-00073-1	Hydra AA	2002	Yes	7471A, 7470, 245.1
Ion Chromatograph	Dionex S/N 880721	DX-120	2001	Yes	300.0
TOC	OI Analytical S/N 1010	1010	2002	Yes	5310C
TKN Digestion System	LACHAT Instruments Block Digestor S/N 1800-763	BD-46	2003	No	LAC 10-107-062D
UV/VIS	Thermo Spectronic S/N 3SGD117031	Genesys 20	1996	No	HACH 8000, 375.4, 4500NO2B, 4500CN-E, 3500CR-D, 5540C, 4500PE, 365.3, 354.1, NYS89-9, 4500S-E
Flow Injection System	Lachat S/N A83000-1011	Quick Chem 8000	1998	Yes	LAC 10-107-06-2, LAC 10-210-00-1-A, LAC 10-204-00-1-A, lac-10-510-00-1
Autotitrator (pH, Alkalinity, turbidity, calcium hardness	Man-Tech (ATZ) S/N MS-OEI-582	PC – Titrate PC-1000	2003	Yes	4500HB, 150.1, 2320B, 130.2, 1, 2130B B,
pH Meter	Fisher S/N 5228013	Accumet Meter		No	4500HB, 9045C, 150.1
	Corning S/N 32723	pH Meter 340		No	4500HB, 9045C 150.1
Turbidimeter	HACH s/n 07120C023206	2100N	2008	No	2130B, 180.1
Turbidimeter	HACH S/N	2100A		No	2130B, 180.1
Conductivity Meter	Thermo Orion S/N 205922	Model 150		No	2510B

Instrument Type	Manufacturer	Model	Purchase Date	Autosampler	Method Performed
Automated Distillation Apparatus	Westco S/N	Easy Digest 40/20	2003	No	4500NH3, Phenol, LACHAT 10-210-001A
COD	HACH S/N 1159604	REACTOR	2006	No	410.2, 410.4, HACH 8000
COD	HACH S/N 5283	REACTOR	2005	No	410.2, 410.4, HACH 8000
Automated BOD Analyzer	Mandel Scientific Instruments S/N 164334	BOD Magic/YSI 5100	2003	No	405.1, 5210B
Ifrared	Perkin Elmer S/N 500504	1420	2003	No	418.1
Hot Block Digestor	Environmental Express		1998	No	3005A, 3010A, 3020A
	Environmental Express		1998	No	3005A, 3010A, 3020A
Utrasonic Processor	Misonic S/N 62771	XL-2020		No	95.3
Auto Shaker	Glas-Col S/N 279668	3D-Shaker		No	Extractions
GC/MS Volatiles	Hewlett-Packard MSD S/N 3022A29134	5970		Yes	524/624/8260
GC/MS Volatiles	Hewlett-Packard MS3 S/N US00006787	5972		Yes	524/624/8260
GC/MS Volatiles	Hewlett-Packard MS4 S/N CN10803090	5975	2008	Yes	524/624/8260
GC Semivolatiles	Hewlett-Packard (A) S/N 3033A32718	5890A Dual FID		Yes	8015 Alcohol 8015 DRO
	Hewlett-Packard (E) S/N 3018A21718	5890 FID		Yes	8015 Alcohol 8015 DRO
GC Volatiles	OI Analytical S/N US00003177 GC 5	6890 ELCD/PID		Yes	502.2/8021 601/602
	Hewlett Packard S/N 3022A28968 GC 6	5890 PID/FID		Yes	8015GRO 8021Stars/502.2 PID only
	Hewlett-Packard (J) S/N 3336A61811 GC 4	5890A PID/ELCD		Yes	8021/502.2/601/602
	OI Analytical S/N US10343086 GC 7	6890 ELCD/PID		Yes	502.2/8021 601/602
	OI Analytical S/N US10402016 GC 8	6890 ELCD/PID		Yes	502.2/8021 601/602

Note: For latest update of instrumentation and equipment please contact your customer service representative

5.1 Instrumentation and Equipment Cont.

Laboratory Information Management System

Lab Management System: T.A.L.S. - Automated Compliance and Reporting Systems
Microsoft SQL Server 2005
Windows Active Directory- based network

Computers/Workstations: 36 IBM compatibles

Printers/Copiers: 16 Hewlett-Packard (various models)
Toshiba eStudio 451c large capacity all-in-one copier/printer/scanner

5.2 Maintenance Activities and Schedules

5.2.1 A complete listing of instrumentation may be found in Table 5.1. Instrument preventative maintenance and careful calibration help to assure accurate measurements from laboratory instruments. Laboratory instrumentation is serviced by the applicable instrument manufacturer or licensed service organization.

5.2.2 Preventative maintenance procedures such as lubrication, source cleaning, detector cleaning and the frequency of such maintenance are performed according to the procedures delineated in the manufacturer's instrument manual or when deemed necessary by the analyst.

5.2.3 Instrument logbooks are in the laboratory at all times. They contain records of usage, calibration, maintenance and repairs. Adequate supplies of spare parts such as GC columns, syringes, septa, injection port liners, and electronic parts are maintained in the laboratory so that they are available when needed.

5.3 Waste Disposal Facilities

5.3.1 Laboratory hazardous waste products are properly disposed of according to applicable local, state, and federal hazardous waste regulations by a NYSDEC and EPA Registered hazardous waste hauler.

5.3.2 Prior to disposal EnviroTest stores all hazardous waste samples separately from non-hazardous samples. Also, all waste solvents and standards are labeled, segregated and secured for lab packing according to specific laboratory SOPs.

6.0 DOCUMENT CONTROL

6.1 Laboratory Notebook Policy

6.1.1 All observations and results recorded by EnviroTest Laboratories (ETL) are entered into the laboratory data entry system or into permanent laboratory notebooks. Data recorded are referenced with the project laboratory number, date and analyst's signature at the top of the page. All pertinent data are maintained in the project file.

6.1.2 All logbook and other document entries are made in ink. Any corrections made in a logbook will be made by crossing a line through the error and entering the correct information. The person will subsequently date and initial the correction. Corrections made to other data records are made by crossing a single line through the error, entering the correct information and initialing and dating the correction.

6.2 Samples Tracking/ Custody Procedures

- Samples are received at the laboratory by the sample custodian or designee who removes the samples from the shipping containers together with all accompanying documentation such as chain-of-custody (COC) forms, analysis request forms, etc.
- The condition of the custody seal is examined and recorded on the COC.
- The temperature of the samples upon receipt will be recorded on the COC.
- The sample will be tested for the presence of residual chlorine (when required) and recorded on the COC.
- The pH of the sample (when required) will be taken upon receipt. Any inappropriate pH reading will be recorded on the COC. Necessary pH adjustments will be made as required and documented on the COC, or when adjusted at bench level; Lab bench sheet or logbook.
- The samples are inspected for general condition and the letter or COC received with any samples is examined for discrepancies between package contents and the enclosed documents.
- Discrepancies, omissions, or inappropriate samples discovered will be noted and discussed with the Customer Service Representative who will contact the client to resolve the problem.
- If the client cannot be reached, the samples will be assigned to cold storage (4 degrees +- 2 degrees C) until the problem is resolved.

6.2 Samples Tracking/ Custody Procedures (cont.)

- Samples delivered directly by the sample collector are received and inspected by the Sample Receipt Technician or designee in the presence of the sample collector. Discrepancies, omissions, or inappropriate samples should be noted and discussed with the sample collector to resolve the problem.
- Samples receipted through COC by the Sample Receipt Technician or designee will be assigned an ETL laboratory number.
- The Sample Receipt Technician or designee will complete the ETL COC with the ETL laboratory number and corresponding individual sample number. The ETL sample number will be written on the client sample bottle or adhered via printed label to the client sample bottle.
- All documents will be reviewed a second time to ensure that there are no transposition errors. The Customer Service Representative or designee will validate the accuracy of the sample log-in procedure.
- The samples will be entered by sample entry into the laboratory sample data-base upon successful completion of the sample log-in procedure. Sample entry will prepare a laboratory chronicle for all projects that will be used for regulatory purposes. All documents, sample tags, shipping labels, etc. will be stapled to the original COC.
- Once in the possession of the Laboratory, all samples and extracts are stored and refrigerated in areas that are accessible only to Laboratory personnel. The building is locked during non-routine working hours.
- Access to the Laboratory facilities is limited to Laboratory personnel.
- All Samples are stored at the Laboratory for a minimum of 30 days after receipt and are not disposed of until at least one week after the final report has been issued.
- Samples are preserved per requirements or specific regulatory programs.

6.3 Procedures for Preparation, Review, Revision and Distribution of SOPs

6.3.1 Standard Operation Procedures are prepared to provide direction for the step-by-step execution of an operation, analysis or action which is used as the method for performing laboratory routines and analyses. All EnviroTest SOPs reflect current laboratory operations. The QA/QC department prepares SOPs with initial review conducted by the applicable Section Supervisor. The Laboratory Director conducts final review and approval. All SOPs are reviewed regularly by the appropriate section Supervisor and updated as necessary when laboratory procedural modifications are made. The SOPs are archived electronically for future reference and appropriate SOPs are made available as a reference material for laboratory analysts.

7.0 ANALYTICAL METHODOLOGY

7.1 Calibration Procedures and Frequency

Instrument or method calibration is performed in accordance with the specific analytical methods and as outlined below.

7.1.1 Volatile Organics- GC, Method 8021B

A. Initial calibration for GC Volatiles consist of 6 calibration standards containing each target analyte plus surrogate compounds. Calibration standards must include concentrations at or below the reporting level, if these limits/levels are known. The validity of the initial calibration is verified by:

- % relative standard deviation (RSD) of the calibration factor (RRF) for target compound.*
- Assessment of the relative retention time (RRT) shift for each compound between each standard run.
- Analysis of a standard obtained from a second source

*In the event that linearity through the origin is suspect and the average response factor does not meet acceptance criteria, calibration of affected compounds shall be by linear regression so long as the linear fit is > 0.990.

B. Continuing calibration is performed when the initial calibration is not performed on the day of analysis. A continuing calibration check must be performed at the beginning and end of each analytical batch. The validity of the continuing calibration is verified by:

- assessment of % difference (%D) of the calibration factor versus the initial calibration average calibration factor for each compound

- RRT shift for each compound between successive calibration runs.
- The continuing calibration verification checks must include concentrations at the mid-point concentration of the initial calibration.

C. Standard Preparation Procedures

Calibration Standards
- Purchase commercially available certified stock solutions.
- Prepare working standards by dilution of the stock standards.
- Verify the working standards by analysis of a calibration check standard prepared independently from standards.

7.1.2 Metals - ICPMS

A. Daily Optimization of ICPMS consists of a Daily Performance Check before and after Tune/Mass Calibration. Results must fall within manufacturer's limits.

B. Initial calibration for ICPMS metals consists of a method blank and 3 calibration standards. The validity of the initial calibration is verified by:

- The analysis of an independently prepared standard immediately after calibration (ICV).
- Results must be within 90% to 110% of true value for each metal analyzed for analysis to begin.

C. Continuing calibration is performed by analysis of the Calibration Check Verification (CCV) standard at a frequency of 10% of sample volume, or every 2 hours, whichever is more frequent and at close of analytical run. The concentration of the CCV is at or near the mid-range of the calibration curve for each metal. The validity of the calibration and analysis of preceding samples is verified by CCV results within 85% to 115% of true value.

D. Standards Preparation Procedures

Calibration Standards

- Prepare calibration standards by dilution of the stock standard.
- The calibration standards are prepared in reagent grade water, with the same acid concentrations as the digested sample.

7.1.3 Total Phenol

A. The standard curve for phenol consists of a blank and 6 calibration standards. The standard curve is prepared each time the instrument is setup.

B. The validity of the calibration is verified by the analysis of a known sample which is distilled with each batch of samples to be analyzed.

Table 7.2 Quality Control Objectives

GC Volatile Organics – GC 8021 Hallogenated

Sample Type	Parameter	Control Limit
Trip Blank (b)	Any project analyte	$\leq$ MDL
Method Blank (b)	Any project analyte	$\leq$ MDL
		Max. %Diff
Continuing Calibration	All compounds except the following:	20
	Dichlorodifluoromethane	50
	Chloromethane	50
	2-Chloroethylvinylether	50
	Bromomethane	50

MDL = Method Detection Limit

(b) – Unless otherwise requested the trip blank and method blank are aqueous samples prepared by EnviroTest Laboratories which are submitted for analysis by the laboratory

Table 7.2 Quality Control Objectives (cont.)

GC Volatile Organics – GC 8021 Hallogenated (cont.)

Sample Type	Parameter	Control Limit	
		Aqueous % Recovery	
System Monitoring Compounds	Dibromofluoromethane	64-120	
	4-Bromofluorobenzene	59-121	
		Aqueous %Recovery	RPD
Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank All compounds except those below:		70-130	≤20
	1,2-Dichlorobenzene	67-124	≤21
	1,3-Dichlorobenzene	60-138	≤21
	1,4-Dichlorobenzene	75-127	≤21
	Clorobenzene	74-124	≤21
	1,1-Dichloroethene	74-126	≤22
	Trichloroethene	68-138	≤24
	Methylene chloride	63-128	≤21
	Tetrachloroethene	69-125	≤21

CRDL – Contract Required Quantitation Limit
RF – Response Factor
RPD – Relative Percent Difference

Table 7.2 Quality Control Objectives (cont.)

GC Volatile Organics – GC 8021 Aromatics

Sample Type	Parameter	Control Limit
Trip Blank (b)	Any project analyte	≤ MDL
Method Blank (b)	Any project analyte	≤ MDL
Continuing Calibration	All compounds	Max. %Diff 20

MDL = Method Detection Limit

(b) – Unless otherwise requested the trip blank and method blank are aqueous samples prepared by EnviroTest Laboratories which are submitted for analysis by the laboratory

Table 7.2 Quality Control Objectives (cont.)

GC Volatile Organics – GC 8021 Aromatics (cont.)

Sample Type	Parameter	Control Limit	
		Aqueous	
		<u>% Recovery</u>	
System Monitoring Compounds	4-Bromofluorobenzene	57-121	
		Aqueous	
		<u>%Recovery</u>	<u>RPD</u>
Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank	Benzene	78-122	≤22
	Toluene	70-122	≤24
	Ethylbenzene	77-127	≤21
	Xylenes, total	72-120	≤20

CRDL – Contract Required Quantitation Limit
RF – Response Factor
RPD – Relative Percent Difference

Table 7.2 Quality Control Objectives (cont.)

Wet Chemistry - Phenols

Quality Control Measure	Control Limit
Calibration Blank	≤ CRDL
Spike Recovery	55-143%
Initial Calibration Verification (ICV) (an independent reference)	91-111%
Continuing Calibration Verification (CCV)	90-111%
Laboratory Control Sample (LCS)	56-144%

CRDL – Contract Required Detection Limit

Table 7.2 Quality Control Objectives (cont.)

Metals - ICPMS

Sample Type	Element	Control Limit
Preparation Blank	All	≤ CRDL (b)
Analytical Spike	All	70-130%
Initial Calibration Verification (ICV)	All	90-110%
Continuing Calibration (CCV)	All	85-115%
Laboratory Control Sample (LCS)	All	85-115%
Duplicate Samples	All	≤20% RPD

CRDL – Contract Required Detection Limit

(b) The absolute value of the blank must be <CRDL or <10X the lowest concentration in the preparation batch.

Table 7.3 Quality Control Measures and Frequency

Volatile Organics

Sample Type	Frequency
Trip Blank	One per bottle set
Laboratory Method Blank	One per 12 hour time period
Continuing Calibration	One per 12 hour time period
System Monitoring Compounds	Added to each sample, matrix spike, matrix Spike duplicate, blank and standard.
Matrix Spike/Matrix Spike Duplicate and Blank Spike	One per: each case of field samples received; each 20 field samples in a case; ea each group of samples of a similar concentration level (soils only); or each 14 calendar day period during which samples were received – whichever is more frequent.
GC/MS Tuning (GC/MS Volatiles only)	Once per day or per 12 hour period, whichever is more frequent.
Performance Evaluation Samples	As required for State Certifications
Laboratory Evaluation Samples	As required by the analytical methodology

Table 7.3 Quality Control Measures and Frequency (cont.)

Metals – ICPMS

Sample Type	Frequency
Preparation Blank	One per matrix, batch, or one for every 20 samples, whichever is more frequent
Analytical Spike Recovery	One per matrix, batch, or one for every 20 samples, whichever is more frequent.
Duplicate Precision	One per matrix, or per batch (if sample Quantity allows)
Initial Calibration Verification	Once for each time instrument is calibrated
Continuing Calibration Verification	One per every 10 analyses and at close of analytical run
Performance Evaluation Samples	As required for State Certifications
Laboratory Control Samples	One per matrix, batch, or one for every 20 samples, whichever is more frequent

Table 7.3 Quality Control Measures and Frequency (cont.)

Wet Chemistry - Phenols

Sample Type	Frequency
Preparation Blank	One per twenty samples of similar matrix
Spike	One per twenty samples of similar matrix
Duplicate	One per twenty samples of similar matrix
Initial Calibration Verification	One for each time the instrument is calibrated
Continuing Calibration Verification	One per every ten analyses
Laboratory Control Sample	One per twenty samples of similar matrix
Performance Evaluation Samples	As required for State Certifications

7.2 Analytical Procedures

7.2.1 The analytical procedures to be used in this project are contained in the Test Methods for Evaluation Solid Waste, USEPA-SW846, Third Edition, September 1986 with all current revisions and the New York State Department of Environmental Conservation, Analytical Services Protocol, September 1989, 10/95 revisions. Other methods may be taken from Methods for Chemical Analysis of Water and Wastewater, EPA-600/4-79-020, March 1983 and Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992 or Methods for the Determination of Organic Compound in Drinking Water, Supplement 2, PB92-207703, August 1992.

Table 7.5 Summary of Analytical Methods

Analysis	Aqueous	Groundwater Liquid/Solid Matrices
ICPMS Metals	EPA- 200.8 (1)	SW846 6020 (2)
Phenols	LAC-10-210-001-A (6)	
Volatile Organics		SW-846-8021B (2)

1. "Methods for Chemical Analysis of Water and Wastewater", EPA-600/4-79-020, March 1983.
2. "Test Methods for Evaluating Solid Waste", USEPA-SW846, Third Edition, September 1986 with all current revisions.
3. "Standard Methods for the Examination of Water and Wastewater", 18th Edition, 1992.
4. "Methods for the Determination of Organic Compounds in Drinking Water", Supplement II, PB92-207703, August 1992.
5. Quick Chem method 10-210-00-1-A, Zellweger Analytics, revised 9/6/96.
6. Quick Chem method 10-210-00-1-A, Zellweger Analytics, revised 12/18/00.
7. EPA Method 420.4 Revision 1.0 August 1993.

8.0 DATA GENERATION

8.1 Data Reduction

8.1.1 Analysis results will be reduced to the concentrations units specified in the analytical procedures using the equations provided in the analytical references listed in section 7.2. All calculations will be independently checked by senior laboratory staff.

8.2 Data Validation

8.2.1 Data validation is the process by which analytical data are evaluated and accepted or rejected based on a set of criteria. ETL personnel use the following criteria in the validation of laboratory data:

- use of published or approved analytical procedures
- use of properly operating and calibrated instrumentation
- precision and accuracy achieved comparable to that achieved in similar analytical programs
- precision, accuracy and blank contamination meeting the analysis specified criteria as and/or the criteria found in the applicable method.
- completeness of data set.

8.2.2 All data will be validated by laboratory supervisors and the QA/QC Department prior to being released for reporting purposes to the ETL Laboratory Director. The persons validating the data will have sufficient knowledge of the technical work to identify questionable values. All analyses requiring ETL protocols will be validated in accordance with the requirements of those protocols.

8.3 Data Reporting and Authorization Procedures

8.3.1 Figure 7.3 depicts the analytical data reduction, validation and reporting process. Key personnel who will handle data gathering and evaluation are shown in the ETL Organizational Chart. ETL uses a computerized sample tracking for routine tracking and reporting of analysis data.

Reports will include:

- statement of methods for each parameter
- initialed chain-of-custody form
- minimum detection limits for each method
- sample extraction and analysis dates

8.3 Data Reporting and Authorization Procedures (cont.)

Specific Requirements- Organics
- sample Form I and chromatograms
- blank results and chromatograms
- calibration summary and chromatograms
- surrogate summary
- method blank summary
- MS/MSD/MSB form I and chromatograms

Specific Requirements- Metals
- sample form I
- calibration summary and raw data
- method blank summary
- ICP interference check sample results
- laboratory control sample results
- serial dilution summary (if applicable)

Specific Requirements- Phenols
- sample Form I
- supporting raw data

The reports issued will include a cover page/case narrative which will outline the case specifics or corrective actions.

8.3.2 EnviroTest uses a custom designed data management system for reporting inorganic and organic data according to the protocol.

8.3.3 Data acceptance is based on the specific criteria contained within the specific analytical method protocols and requirements. The data must be adequate to meet the precision and accuracy requirements of the specific analytical project under which the samples are submitted. The data will be complete, in terms of the analytical work performed versus what was requested and be representative of the sampling site under consideration.

9.0 QUALITY CONTROL

9.1 Internal Quality Control

9.1.1 Quality control is the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process. Quality Control checks are the application of ETL Quality Control program for laboratory analysis in order to ensure the generation of valid analytical results on project samples. These checks are performed by project participants throughout the program, under the guidance of the Quality Assurance Manager.

9.1.1.1 Proficiency Testing

Proficiency Test (PT) samples are analyzed as required for accreditation. As required by NELAC ETL participates in the PT program semi-annually for each PT Field of Testing (FoT) for which it is accredited, according to the NELAC PT FoT published guidelines. Under SDWA, the laboratory also analyzes a PT sample by each method once per year, if the laboratory uses more than one method for the analyte.

In addition to the PT program required for NELAC accreditation, ETL participates in a number of additional PT programs, as appropriate for the laboratory.

PT samples are handled and tested in the same manner (procedural, equipment, staff) as environmental samples. PT test sample data is archived using the requirements for project and raw data record retention.

9.1.2 Quality Control Samples

A. Blank Samples

Blanks are used to assess contamination introduced in transit, storage or in the laboratory.

- Preparation Blanks – For inorganic analyses, these deionized water blanks are prepared using the same reagents and analytical procedures as the samples, in order to assess possible laboratory contamination.
- Laboratory Method Blanks – For organic analyses, theses blanks are "clean" samples, prepared in the laboratory to include surrogates, and analyzed

according to a prescribed method in order to assess possible laboratory contamination.

- Laboratory Holding Blank – For organic analyses, these blanks are placed in cold storage with the volatile organic samples during the holding time to assess contamination which may be introduced in storage.
- Storage Blank – For organic analyses, these blanks are placed in the sample container storage area to assess contamination that may be introduced in storage.
- Calibration Blanks – For all analyses, these blanks are used in instrument calibration and contain all the reagents used in preparing instrument calibration standards except the parameters of interest.

B. Initial and Continuing Calibration Verification

Verification samples are analyzed during each analysis run to assure calibration accuracy for each analyte. For inorganic analysis, these are prepared from a source other than that used for calibration.

C. System Monitoring Compounds

For organic analyses, all samples are spiked with surrogate compounds prior to sample preparation in order to assess the behavior of actual components in individual samples during the entire preparative and analysis scheme. Surrogate standard compounds are chemically similar to compounds of interest (target compounds).

D. Matrix Spikes/Analytical Spikes

For all analyses at frequencies particular to each method, spiking solutions are added to samples in order to evaluate any matrix effects of the sample on the analytical method. Matrix spikes and analytical spikes are performed using actual elements of interest or target compounds.

E. Duplicate Samples

For all analyses, a second aliquot of a sample carried through all sample preparation procedures to verify the precision of the analytical method. At least one sample in each analysis batch of 20 or fewer samples is analyzed in duplicate.

F. Laboratory Control Samples

For inorganic analyses, at least one sample in each preparation batch of 20 or fewer samples is prepared and analyzed for each analyte of interest, in order to verify the preparation and analytical methods.

G. Blank Spikes

For organic analyses, reagent water is spiked with all the target analytes.

Reagents used in the laboratory are normally of analytical reagent grade or higher purity. Each lot of acid or analytical solvent received is checked for acceptability prior to lab use. All reagents are labeled with the date received and date opened. The quality of the laboratory water is continuously monitored through the use of an in-line conductivity meter.

9.2 Internal Quality Assurance

9.2.1 To monitor quality, the QA/QC Department conducts internal quality assurance audits including:

A. Internal Data Audit - Data authenticity audits shall be performed on 100% of all analysts by the QA Department or designee independent from the operations. Performing data authenticity checks will typically include verifying raw data, evaluating calculation tools and independently reproducing the final results and comparing it to the Hard copy on randomly selected batches of data.

B. Internal Laboratory Audits - The QA/QC Directory will perform laboratory audits annually or as needed. This involves evaluation of:

- sample storage
- chain of custody
- instrument maintenance
- documentation
- precision
- accuracy

In addition the QA/QC manager will meet frequently with the project manager and laboratory supervisor to review QA/QC data summaries and other pertinent information.

10.0 QUALITY ASSURANCE

10.1 System and Performance Audits

10.1.1 System Audits

A system audit is an evaluation of the various components of a laboratory's measurements system to assess proper selection and use. This audit will consist of an on-site review of a laboratory's quality assurance system and physical facilities for sampling, calibration and measurements. System audits are performed on a regular basis by the various regulatory agencies. The audit may included several or all of the components listed below:

- Personnel, facilities and equipment
- Chain - of - custody procedures
- Instrument calibration and maintenance
- Standards preparation and verification
- Analytical procedures
- Quality control procedures
- Data handling procedures
- Documentation control procedures

10.1.2 Performance Audits

Performance audits provide a systematic check of laboratory operations and measurement systems by comparing independently obtained data with routinely obtained data. To fulfill the PT requirements for NELAC accreditation, EnviroTest routinely participates in laboratory performance evaluations received from the NYSDOH ELAP as part of the Potable and Non-Potable Water/Solid & Hazardous Waste/Air & Emissions Chemistry Proficiency Programs. EnviroTest also analyzes proficiency samples to maintain participation in the NYSDEC CLP program. A schedule for EnviroTest's participation in these performance evaluations is detailed in Table 10.1.

Table 10.1 Laboratory Performance Evaluation Schedule (1 year)

Source	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
NYSDOH Potable		X		X
NYSDOH Non-Potable Solid & Hazardous Waste Chemistry	X		X	

10.2 Specific Routine Procedures to Assess Data Precision, Accuracy and Completeness

10.2.1 Accuracy and Precision

Accuracy is a measure of the degree of agreement between the analyzed value and the true or accepted reference value where it is known. Accuracy is usually expressed as a percent recovery. Precision is a measure of the mutual agreement among individual measurements of the sample parameter under similar conditions, usually expressed as a relative percent difference or as standard deviation. Accuracy and precision in the laboratory are assessed by the regular analysis of known standards and duplicate samples.

10.2.2 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical measurement system, expressed as a percentage of the number of valid measurements that should have been or were planned to be collected. EnviroTest will make every attempt to generate valid data from all samples received. However, realistically, some samples may be lost in laboratory accidents or some results may be deemed questionable based on internal QC procedures. Due to the variable nature of the completeness value, the objective will be to have data completeness for all samples received for analysis as high as possible to meet completeness objectives as described by the client.

10.3 Corrective Action

An important part of any quality assurance program is a well-defined, effective policy for correcting quality problems. This is depicted in the figure 1. EnviroTest maintains a closed-loop corrective action system, which operates under the directions of the QA Manager. While the entire quality assurance program is designed to avoid problems, it also serves to identify and correct those that may exist. Usually these quality problems fall into two categories, immediate corrective action or long- term corrective action.

Specific quality control procedures are designed to help analysts detect the need for corrective action. Often an analyst's experience will be most valuable in identifying suspicious data or malfunctioning equipment; and an immediate corrective action may then be taken. The actions should be noted in laboratory notebooks but no other formal documentation is required unless further corrective action is necessary.

The need for long-term action may be identified by standard QC procedures, control charts, performance or system audits. Any quality problem that cannot be solved by immediate corrective action falls into this long-term category. EnviroTest uses a system to insure that the condition is reported to a person who is part of the closed-loop action and follow up plan (figure 1)

The essential steps in the closed –loop corrective action system are:

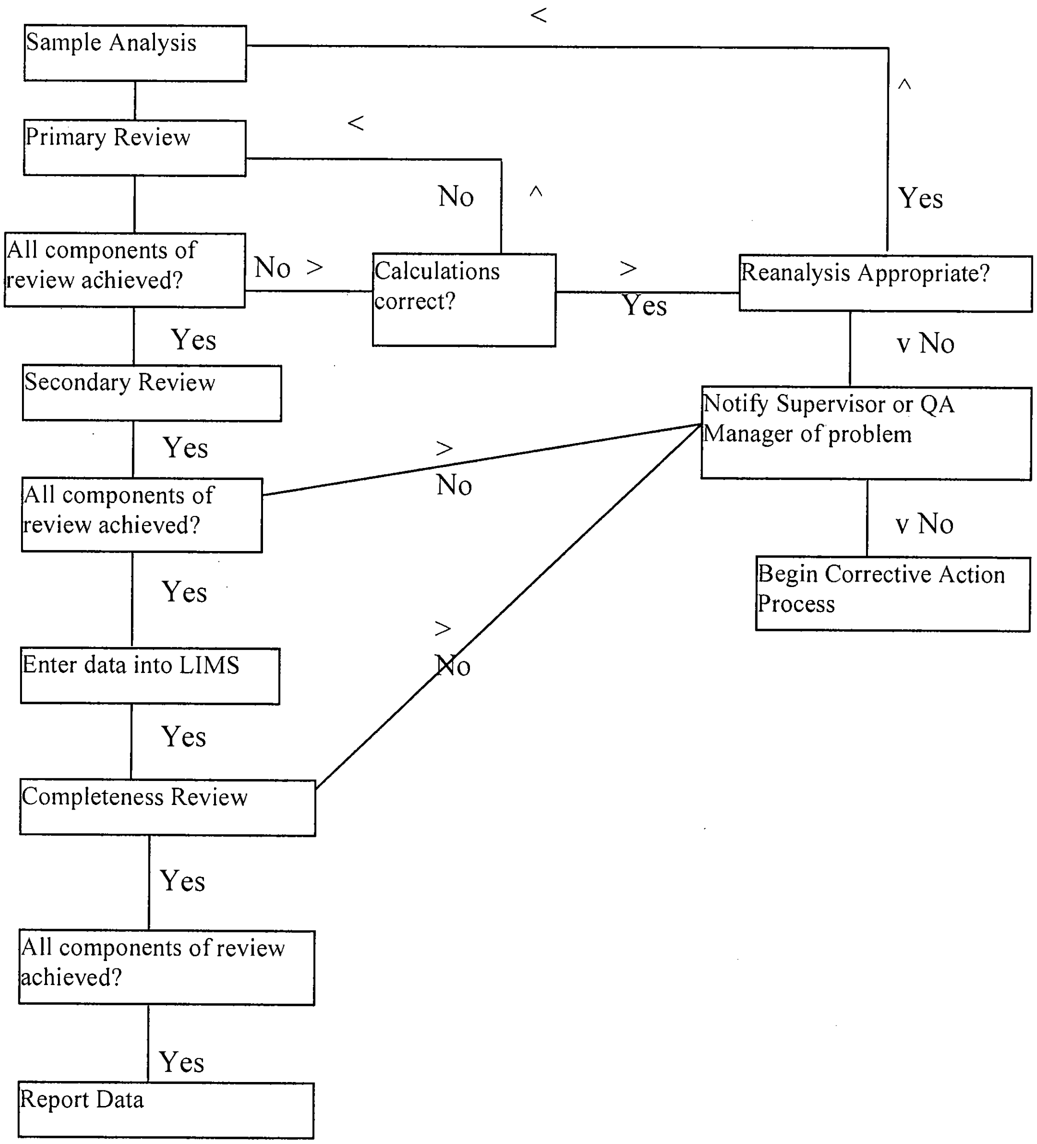
- the problem will be identified
- responsibility for investigating the problem will be assigned.
- The cause of the problem will be investigated and determined.
- A corrective action to eliminate the problem will be determined
- Responsibility for implementing the corrective action will be assigned and accepted.
- The effectiveness of the corrective action will be established and corrective action implemented
- The fact that the corrective action has eliminated the problem will be verified
- The complete process of establishing and implementing corrective action will be documented.

This process of corrective action will be used to make all corrections deemed necessary by the EnviroTest Project Manager or QA/QC Department.

10.4 Quality Assurance Reporting Procedures

Data review is preformed at three discrete levels after initial generation and calculation and prior to final report release: analytical Section Supervisor (Organics and Inorganics); QA/QC Director: Laboratory Director. Data Review encompasses the quality control elements detailed in the specific methods of analysis and also includes such items as holding time compliance, accuracy of calculations, transcription checks, and correct concentration units.

Figure 10.5: EnviroTest Decision Processes, Procedures and Responsibility for Initiation of Corrective Action



LABORATORY QUALITY ASSURANCE PROJECT PLAN

May 16, 2002
(Revised August 21, 2007)

WARNING: The information contained herein is of a highly confidential and proprietary nature. Lancaster Laboratories, Inc. specifically prohibits the dissemination or transfer of this information to any person or organization not directly affiliated with the project for which it was prepared.

GROUP A

PROJECT MANAGEMENT

A1. Title and Approval Sheet

Laboratory Quality Assurance Project Plan

Lancaster Laboratories, Inc.

Approving Official:

Kathleen M. Loewen

Kathleen Loewen, B.S., Quality Assurance Director

8/21/07

Date

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	Data Validation and Usability			
D1	Data Review, Verification, and Validation	2	2	07/20/07
D2	Verification and Validation Methods	1	1	07/01/04
D3	Reconciliation with User Requirements	4	1	07/01/04
	Appendix A – Example Report Forms	120		

A3. Distribution List

This is a generic QA Project Plan; therefore, a distribution list will not be included. A list of organizations and persons that receive the generic QA Project Plan is maintained at Lancaster Laboratories.

A4. Project/Task Organization

The objectives of the laboratory Quality Assurance Program are to establish procedures which will ensure that data generated in the laboratory are within acceptable limits of accuracy and precision, to ensure that quality control measures are being carried out, and to ensure accountability of the data through sample and data management procedures. To this end, a Quality Assurance Department has been established. The Quality Assurance Director reports directly to the President of Lancaster Laboratories and has no direct responsibilities for data production, thus avoiding any conflict of interest. The Quality Assurance Director is the responsible party for maintaining the official, approved QA project plan.

The attached organizational charts show key managerial personnel. Resumes of key individuals may be found in the *Environmental Quality Policy Manual.*

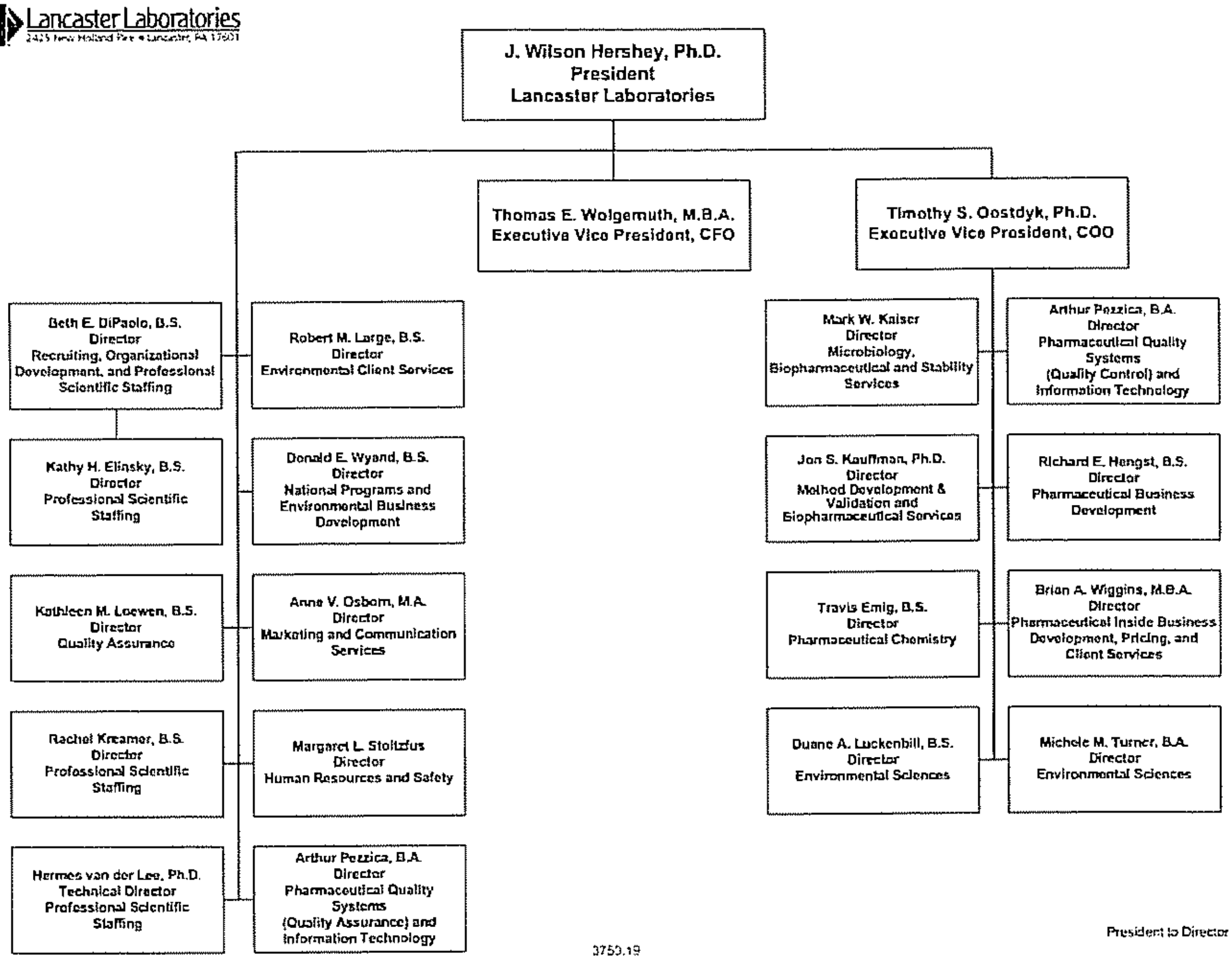
The Sample Administration Group will be responsible for receiving samples, signing the external chain of custody, checking sample condition, assigning unique laboratory sample identification numbers, and initiating internal chain-of-custody forms if requested. Sample Support personnel will be responsible for assigning storage locations, checking and adjusting preservation, homogenizing the sample as needed, and discarding samples. The Bottles Group is responsible for pre-preserving bottles as required by the method, preparing trip blanks and field blanks when required, and packing the bottle kits, then sending them to the client's requested location.

Managers listed in each technical area are responsible for performing laboratory analyses, quality control as specified in the methods, instrument calibration, and technical data review. Data is reported using a computerized sample management system, which tracks sample progress through the laboratory and generates client reports when all analyses are complete. Quality control data is entered onto the same system for purposes of charting and monitoring data quality.

The Quality Assurance Department is responsible for reviewing quality control data, conducting audits in the laboratory and reporting findings to management, maintaining current copies of all analytical methods, reviewing and approving Standard Operating Procedures (SOPs), submitting blind samples to the laboratory, and ensuring that appropriate corrective action is taken when quality problems are observed.

Data package deliverables are available upon request. The Quality Assurance Department reviews a representative sampling of the deliverables for completeness and to ensure that all quality control checks were performed and met specifications. This step includes a review of holding times, calibrations, instrument tuning, blank results, duplicate results, matrix spike results, surrogate results, and laboratory control samples (where applicable). Every attempt to meet specifications will be made, and any item outside of the specifications will be noted in the narrative. The laboratory will not validate data with regard to usability since this generally requires specific knowledge about the site. All data is archived according to corporate procedures.

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

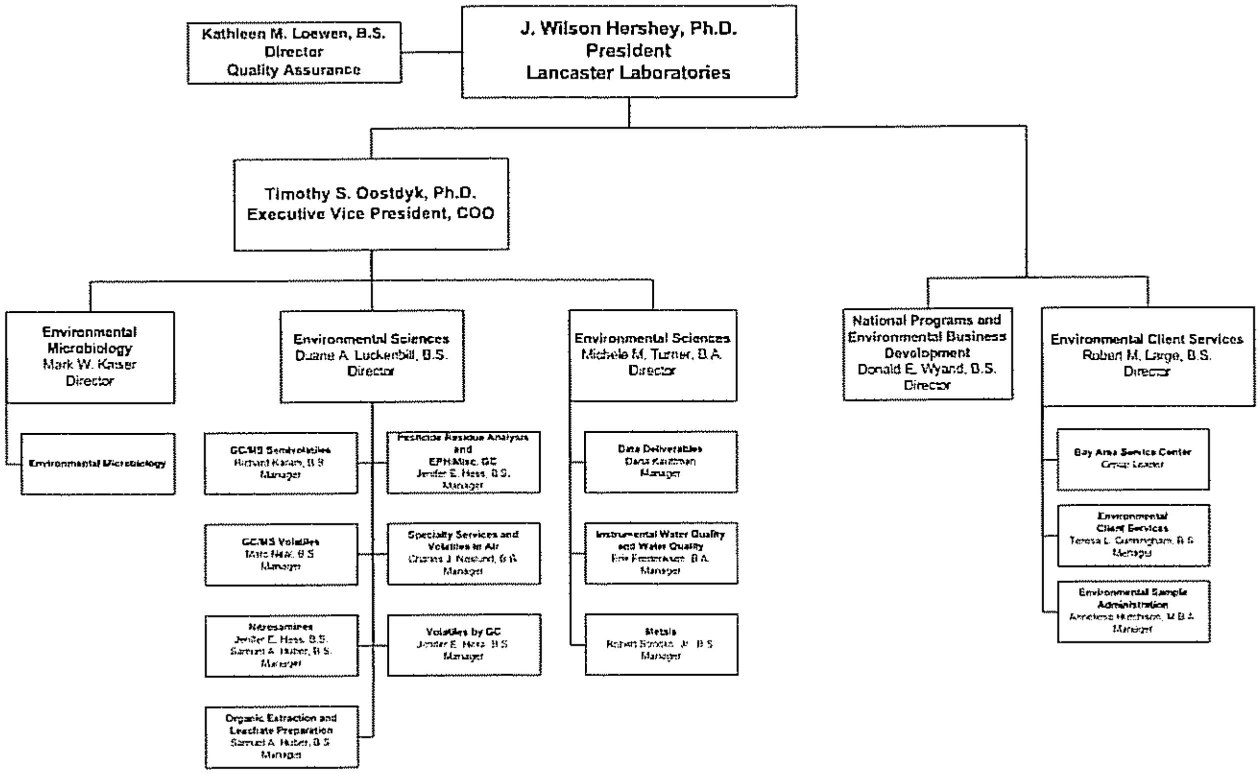


President to Director

3750.19

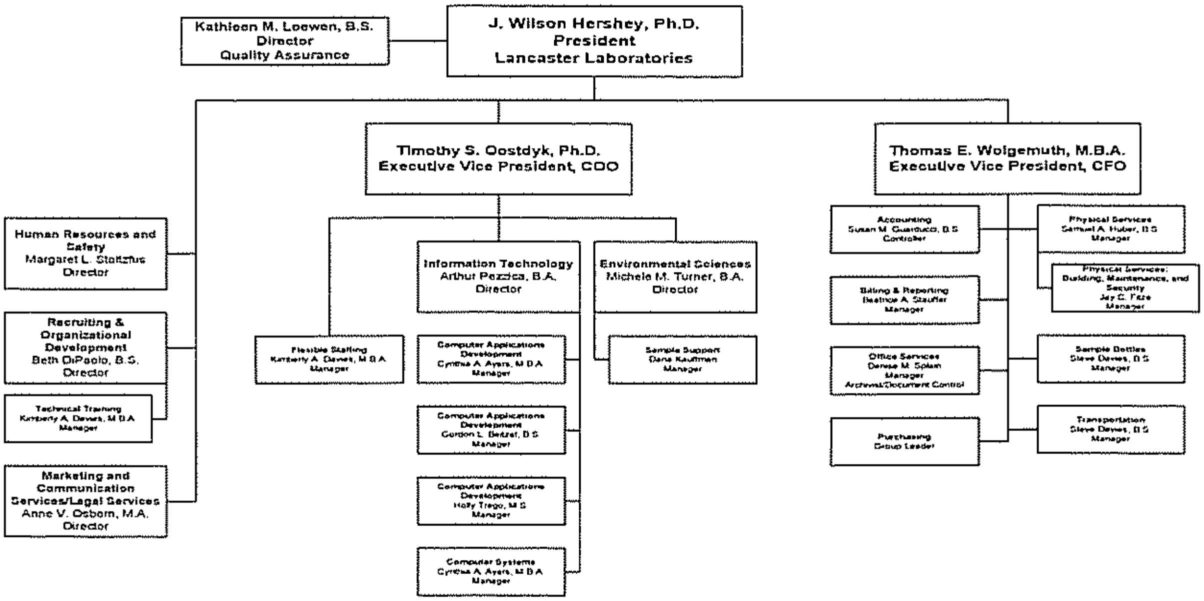
Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

Environmental Sciences



Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

Support Services



3702.00

A5. Problem Definition/Background

The purpose of this generic QA Project Plan is to provide specific quality assurance and quality control procedures involved in the generation of data of acceptable quality and completeness. This QA Project Plan provides the laboratory requirements to meet *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5, March 2001 and EPA's *Guidance for Quality Assurance Project Plans*, EPA QA/G-5, December 2002.

The procedures in this QA Project Plan have been standardized to make them applicable to all types of environmental monitoring and measurement projects. However, under certain site-specific conditions, not all of the procedures discussed in this document may be appropriate. In such cases, it will be necessary to adapt the procedures to the specific conditions of the investigation.

The analyses in this document are representative of what the laboratory performs but are not all encompassing. It is intended to provide a client with an overview of systems and procedures at Lancaster Laboratories. It is not project or site-specific and may not address all analyses required for a particular project. If additional analytical information is necessary, arrangements can be made with Lancaster Laboratories to generate a project specific or site specific QAPP.

A6. Project/Task Description

Tests will be performed according to the analytical methodology set forth in the *USEPA Test Methods for Evaluating Solid Waste—Physical/Chemical Methods, SW-846, 3rd edition, Update III, December 1996; Methods for Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020; and Standard Methods for the Examination of Water and Wastewater, 20th edition.* SW-846 provides specific analytical procedures to be used and defines the specific application of these procedures. Proven instruments and techniques will be used to identify and measure the concentrations of volatiles, semivolatiles, and pesticide compounds and/or the inorganic elements. The laboratory will employ state-of-the-art GC/MS and/or GC techniques to perform all organic analysis. Inorganic analyses will be performed using inductively coupled plasma (ICP), cold vapor AA, and ICP-MS. Instrumental wet chemistry will be using an auto-analyzer spectrophotometer, TOC analyzer, and Ion Chromatography. Classic wet chemistry will use appropriate instrumentation. The client is responsible for providing specifics on the project site. In addition to the technical references noted, LLI processes are in accordance with the current NELAC standards.

A7. Quality Objectives and Criteria

Quality assurance is the overall program for assuring reliability of monitoring and measurement data. Quality control is the routine application of procedures for obtaining set standards of performance in the monitoring and measurement process. Data quality requirements are based on the intended use of the data, the measurement process, and the availability of resources. The quality of all data generated and processed during this investigation will be assessed for precision, accuracy, representativeness, comparability, and completeness. These specifications will be met through precision and accuracy criteria as specified in Element B5. Detection limits are presented in Element B4.

To ensure attainment of the quality assurance objectives, SOPs are in place detailing the requirements for the correct performance of laboratory procedures. As described in LOM-SOP-LAB-201, "Writing and Reviewing Lancaster Laboratories Policies and Operating Procedures," the laboratory SOPs are written and organized into a four-tiered hierarchy:

1. Corporate policies and *Quality Policy Manuals*

2. Laboratory Operations Manual SOPs

3. Departmental Procedures

4. Quality Records (notebooks, logbooks, forms, etc.)

All SOPs are approved by the QA Department prior to implementation. The distribution of current SOPs and archiving of outdated ones are controlled by the Office Services Group through a master file. Additional information is provided in the *Environmental Quality Policy Manual* (*EQPM*), including general information on Document Control, Archiving, an index of our SOPs, etc. Table A7-1 provides an index of SOPs in place in support of the Quality Assurance objectives. These requirements are supplemented by the procedures in the laboratory and analytical SOPs.

Table A7-1

Document #	Document Title
EQPM	Environmental Quality Policy Manual
LOM-SOP-ES-209	Investigation and Corrective Action of Noncompliant Data
LOM-SOP-ES-212	Internal Chain-of-Custody Documentation
LOM-SOP-ES-213	Quality Control Records
LOM-SOP-ES-215	Subcontracting to Other Laboratories
LOM-SOP-ES-216	Proficiency Test Samples
LOM-SOP-ES-219	Documentation for the Parallax Analysis Information Function
LOM-SOP-ES-220	Sample Storage and Discard
LOM-SOP-ES-221	Analytical Methods for Nonstandard Analyses
LOM-SOP-ES-222	Instrument and Equipment Maintenance and Calibration
LOM-SOP-ES-223	Missed Holding Time Reports
LOM-SOP-ES-224	Data Rounding, Parallax Entry, Verification and Reporting
LOM-SOP-ES-225	Reagents and Standards
LOM-SOP-ES-226	Validation and Authorization of Analytical Methods
LOM-SOP-LAB-201	Writing and Reviewing Lancaster Laboratories Policies and Operating Procedures
LOM-SOP-LAB-202	Document Control
LOM-SOP-LAB-203	Data and Record Storage, Security, Retention, Archival, and Disposal
LOM-SOP-LAB-204	Regulatory Training
LOM-SOP-ES-229	Employee Training Program
LOM-SOP-ES-230	Investigation and Corrective Action Reporting for Laboratory Problems
LOM-SOP-LAB-218	Procurement of Laboratory Supplies

Table A7-1 – Continued

Document #	Document Title
LOM-SOP-LAB-220	Laboratory Notebooks, Logbooks, and Documentation
LOM-SOP-ES-231	Handling of Client Technical Complaints (Investigations and Response)
LOM-SOP-LAB-224	Compliance with Good Laboratory Practice (GLP) Regulations
LOM-SOP-LAB-226	Guidelines for Analytical Decision Making
SOP-CS-049	Implementation of the Computer Services Division Validation Master Plan

A8. Specialized Training/Certification

Lancaster Laboratories has a core curriculum of training that contains the basic courses relevant to all the employees. This in part, includes teaching the quality policy, quality assurance/quality control, ethics training, chemical hygiene training, health and safety classes, and any function specific training (i.e. GC, Statistics). Much of this training is performed at Lancaster Laboratories through the Human Resources Group. The following list shows examples of course offerings:

- Laboratory Technician Program: Designed for new employees who need to develop laboratory skills or who need a refresher on laboratory basics.
- Practical Process Improvement Training: This course introduces why quality is important, explains Lancaster Laboratories quality philosophy and processes, and shows how to apply quality thinking and techniques on the job.
- Putting Our Values to Work: This seminar is designed to introduce new employees to the Statement of Values by examining how it translates to everyday jobs and includes ethical decision making.
- Chemical Hygiene Plan: Introduces the new employee to LLI's Chemical Hygiene Plan and the OSHA Lab Standard regulation and requirements.
- CPR: This course includes CPR history, relevance of CPR, cardiovascular disease, adult one-rescuer CPR, airway obstruction, safety in CPR, and use of the Automated External Defibrillator (AED).
- 24-hour HAZWOPER Emergency Response: Part of a proactive safety and emergency preparedness effort, this training is provided to a core group of people and volunteers who may respond to emergencies.
- Statistical Analysis: Topics include: rounding, mean standard deviation, normal distribution, z-scores, estimate, confidence intervals, hypothesis testing, one sample t-test, F-test, two sample t-test, paired t-test, ANOVA, outlier, calibration, etc.
- Gas Chromatography: Principles in GC, separation, qualitative/quantitative analysis, hardware, software, troubleshooting techniques, and the applications for GC use at Lancaster Laboratories.
- GC/MS Basics: Review of the fundamentals for GC/MS analysis.
- HPLC: Principles and practices on HPLC and the applications at Lancaster Laboratories.

If the training can not be accomplished at Lancaster Laboratories, then the employee may have off-site training. Within each technical or support group, the employee also receives on-the-job training before performing work independently. The details of this training are noted in each departmental group's SOPs.

The analysts must perform an initial demonstration of capability before using any test method; this is reviewed and signed by the technical department's management and Quality Assurance. The analyst must also complete an annual demonstration of capability for each test method per matrix.

All training and proficiencies are documented in each employee's training records as described in LOM-SOP-ES-229, "Employee Training Program."

A9. Documents and Records

The group leaders in each technical area are responsible for overseeing the performance of analysis, quality control as specified in the method, instrument calibration, and technical data review. There is a secondary review on 100% of all data by a supervisor or experienced analyst prior to reporting the results. The Laboratory Information Management System (LIMS) tracks sample progress through the laboratory and generates client reports. During analysis, raw data must be recorded in indelible ink in bound notebooks or on printouts from instruments and is then entered into the LIMS against sample number and analytical method. Many instruments' data systems can transfer data directly to the LIMS, eliminating manual transcription. Quality control data is entered into the same system for purposes of charting and monitoring data quality. When all analyses are completed and have been verified by a supervisor or designee, the computer generates a report. The client receives a copy of the report containing the results of the analysis plus comments entered by the analyst where necessary. Copies of the reports and associated raw data are retained in secured archives.

Currently Lancaster Laboratories has over fifteen different reporting formats. Table A9-1 shows some of the formats available. Unless a specific report format is requested, the standard laboratory procedure is to report results to the limit of quantitation (LOQ) using report type 0 (see Table A9-1). However, it is possible to estimate to a value below the LOQ, if lower values are needed. Estimates are made to the reported method detection limit (MDL) which is based on annual MDL studies performed per method/matrix and instrument. An example analysis report is included in Appendix A.

The data packages are consistent with EPA CLP, NJDEP, and other state or agency formats. Custom formats are also accommodated. The data package types differ in the level of raw data and QC that would be submitted. Table A9-2 shows the formats offered and the information that can be included in a data package. Appendix A shows examples of the data package forms used for various types of methodology (i.e., GC/MS Volatiles, pesticides, etc.) The data packages are available as hard copy deliverables or a *.pdf* file on CDROM.

After the data package has been compiled, a content review and QA/QC compliance review on 100% of the data packages is performed by the Data Deliverable department or by other fully-trained staff. During the content review, the field chain of custody is compared to the reports to check the analysis performed, dates/times of collection, and sample designation. In addition to making sure data from all the appropriate departments is present, the following are also checked: method summary/reference, title page, table of contents, sample reference list, sample administration receipt documentation logs, and internal chains of custody (if required). In addition to making sure the data for all analyses are included, the following are also checked during the QA/QC compliance review: spot check results on the report against the raw data, ensure analyses performed within holding time, check quality control summary forms for compliance issues, and read the case narrative to make sure all nonconformances and anomalies are addressed.

In addition, the Quality Assurance Department reviews a representative sampling of the deliverables for completeness and to be sure that all batch quality control checks were performed and met specifications. This step includes review of holding times, calibrations, instrument tuning, blank results, duplicate results, matrix spike results, surrogate results, and laboratory control samples (where applicable). Every attempt to meet specifications will be made, and any item outside of the specifications will be noted in the case narrative. The laboratory will not validate data with regard to usability since this generally requires specific knowledge about the site.

Analytical results are delivered to the client in several electronic formats. LLI supports more than twelve industry-standard EDD formats and well over 100 custom EDD formats. The data for the EDD and hardcopy reports are retrieved directly from our LIMS. LLI offers data deliverables in many custom formats using a standard ASCII formatted structure (tab-delimited text; comma-delimited text; fixed length), structures for Microsoft Excel spreadsheets, and Microsoft Access database tables. In addition, LLI offers these industry standard EDD formats:

- EDF (California/COELT)
- Enviro Data (Geotech)
- EquIS, and its many variations, including:
    - Delaware "3DM"
    - EPA Region 2 "MEDD"
    - EPA Region 5 "ED MAN"
- ERPIMS (AFCEE)
- GIS/Key
- HazSite (HZRESULT table) for NJDEP
- Locus EIM
- TerraBase (Integrate)

We ensure the quality of our electronic data by providing 100 percent manual quality review of all data fields for new formats and a 10 percent review thereafter.

LLabWeb.com allows a client to access their verified analytical results round-the-clock through Lancaster Laboratories computer system using a secure Internet browser. Only analytical results on samples that are completed and verified can be accessed by this system.

A corporate procedure is in place for documentation, error correction, and control of logbooks (LOM-SOP-LAB-220, "Laboratory Notebooks, Logbooks, and Documentation"). The Office Services Group is responsible for maintaining the document and version control of the QA project plan and SOPs. All documents are assigned a revision number and date by the Office Services Group. They record all individuals or departments that have been issued a copy of a document and track that old versions are returned when the new one is issued. They are also responsible for maintaining the archive system to securely store records from all areas of the laboratory. LOM-SOP-LAB-203, "Data and Record Storage, Security, Retention, Archival, and Disposal" describes procedures for transferring data from the laboratories to the archives and maintaining the archives (including record retention schedule and disposal). The length of time for retention of hardcopy data is 10 years. All copies that are disposed of are incinerated. The Data Deliverables Group scans copies of the data packages onto CD-ROM for archiving. Electronic data files are saved and stored off-site for a minimum of 5 years.

Table A9-1
Data Reporting Formats

		Entered Result					
		Negative	**Exactly Zero**	**MDL**	**LOQ**	**Above LOQ**	**Limit Shown on Report**
Report Format	**0**	<LOQ				Rounded Result	LOQ
	1	N.D.		<LOQ		Rounded Result	LOQ
	3	N.D.		Result with "J" Qualifier		Rounded Result	LOQ
	4	N.D.		Result with "J" Qualifier		Rounded Result	MDL
	10	N.D. if TMDL >MDL N.D. # if MDL >TMDL				Rounded Result	Greater of MDL or TMDL
	12	MDL with "U" Qualifier		Result with "J" Qualifier		Rounded Result	MDL

Key:

MDL = Method Detection Limit
LOQ = Limit of Quantitation
BMQL = Below Minimum Quantitation Limit
TMDL = Target Method Detection Limit
J = Estimated Value
U = Client requested replacement for "<"

Table A9-2
Data Package Formats

Type I, NJ Regulatory (non-CLP)
- Title page
- Sample reference list
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- Method summary/references
- Analysis reports/laboratory chronicles
- Case narrative
- Quality control summary; duplicates, matrix spike, matrix spike duplicate, blank, LCS, and surrogate recovery summary forms; GC/MS tuning summary and internal standard area summary
- Sample data; all raw sample data including instrument printouts and MDL summary form
- Standard Data; initial and continuing calibration summary forms, all raw initial and continuing calibrations and standardization data including instrument printouts
- Quality control raw data; all raw quality control sample data including printouts, preparation logs, run logs

Type III, NJ Reduced Deliverables (non-CLP)
- Title page
- Sample reference list
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- Method summary/reference
- Analysis reports/laboratory chronicles
- Case narrative and conformance/nonconformance summary
- Quality control summary; duplicate, matrix spike, matrix spike duplicate, blank, LCS, and surrogate recovery forms; GC/MS tuning summary and internal standard area summary; summaries for calibration and standardization
- Sample data; MDL summary form, all raw sample data including instrument printouts for GC, GC/MS, and TPH only (including calibration raw data)
- Quality control raw data; blank raw data for GC, GC/MS, and TPH only, preparation logs

Type IV, Full CLP Deliverables
- Title page
- Sample reference list
- Case narrative
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- All CLP reporting forms; QC analytical results and calibration summaries
- Sample data; all raw data including instrument printouts
- Standard Data; all raw initial and continuing calibrations and standardization data including instrument printouts
- Quality control raw data; all raw quality control sample data including printouts, preparation logs, run logs

Table A9-2 – Continued
Data Package Formats

Type V, Reduced CLP Deliverables

- Title page
- Sample reference list
- Case narrative
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- All CLP reporting forms; QC analytical results and calibration summaries
- Sample raw data; all raw sample data including instrument printouts for organics only
- Quality control raw data; blank raw data for organics only, preparation logs

Type VI, Raw Data Only

- Title page
- Sample data; all raw sample data including instrument printouts
- Quality control raw data; blank raw data, LCS raw data

GROUP B

MEASUREMENT/DATA ACQUISITION

B1. Sampling Process Design

In order for meaningful analytical data to be produced, the samples analyzed must be representative of the system from which they are drawn. It is the responsibility of the client to ensure that the samples are collected according to accepted or standard sampling methods. The client should evaluate the number, location, and type of samples to be collected. The appropriate number and frequency of field QC samples should also be determined by the client.

For non-standard matrices such as fish, worms, biota, large concrete or wood chunks, or other assorted waste, a discussion should take place with the laboratory to identify special handling requirements and confirm method performance for the particular matrix.

B2. Sampling Methods

The sampling methods should be selected by the client with regard to the intended application of the data.

The laboratory will provide the appropriate sample containers, required preservative, chain-of-custody forms, shipping containers, labels, and custody seals for the sampling. Trip blanks will be prepared by the laboratory and accompany sample containers at the project required frequency. Analyte free water will also be provided for field blanks. Temperature blanks will be included for monitoring cooler temperature upon receipt of the samples back at the laboratory. Pre-cleaned containers, with vendor supplied traceability documentation are available upon request. Because the laboratory does not stock this type of traceable container, 2 weeks prior notice is required.

Before use, each lot of preservative is documented and checked for contaminants. The appropriate bottle will be preserved with the new preservative and filled with deionized water to represent a sample. A similar container (that does not contain preservative) will be filled with deionized water to be used as a blank check. Analysis results are documented and reviewed for each preservative lot number.

A list of containers, preservatives, and holding times follows in Table B2-1.

Table B2-1
Sample Containers, Preservatives, and Holding Times for Aqueous and Solid Samples

Fraction	Vol. Req. (mL) Wt. Req. (g)	Container P=Plastic G=Glass	Preservation[a]	Holding Time[d] From Date of Collection Water	Soil
Volatiles	3 × 40 mL 100 g[f]	G	Cool, 4°C[b] pH <2 w/ HCl	14 Days	14
Pesticides	2 × 1000 mL 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14
Herbicides	2 × 1000 mL 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14
Halocarbons (Volatiles by GC)	3 × 40 mL N/A	G	Cool, 4°C[b] pH <2 w/ HCl[c]	14 Days	N/A
Aromatics/Petroleum (Volatiles by GC)	3 × 40 mL 100 g[f]	G	Cool, 4°C[b] pH <2 w/ HCl	14 Days	14
Semivolatiles (Acid/Base Neutrals)	2 × 1000 mL 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14
PAHs (HPLC)	2 × 1000 mL 100 g	G	Cool, 4°C $Na_2S_2O_3$	7 Days to extraction[e]	14
Metals	100 mL 100 g	P,G	HNO_3 to pH <2	6 Months Hg 28 Days	6
Cyanide	500 mL 100 g	P,G	Cool, 4°C NaOH to pH >12 ascorbic acid	14 Days	14
Sulfide	500 mL 100 g	G	Cool, 4°C (NaOH, ZnAC Waters Only)	7 Days	N/A
Phenol	1000 mL 100 g	G	Cool, 4°C H_2SO_4 to pH <2	28 Days	28
TPH	2 × 1000 mL 100 g	G	Cool, 4°C pH <2 w/ HCl	7 Days	14
Hexane Extractable Materials (HEM)	2 × 1000 mL 100 g	G	Cool, 4°C pH <2 w/ HCl	28 Days	28
TPH-GRO	3 × 40 mL 100 g	G	Cool, 4°C pH <2 w/ HCl	7 Days	14
TPH-DRO	2 × 1000 mL 200 g	G	Cool, 4°C pH <2 w/ HCl	14 Days to extraction[e]	14
TOC	125 mL 20 g	G	Cool, 4°C H_2SO_4 to pH <2	28 Days	28
Total Nitrite/Nitrate	120 mL	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days[g]	N/A

[a] pH Adjustment with acid/base is performed on water samples only.

[b] Sodium thiosulfate needed for chlorinated water samples

[c] Due to the inaccurate recovery of 2-chloroethyl vinyl ether in the presence of HCl, Halocarbon samples analyzed for this compound should not be preserved.

[d] Samples will be analyzed as soon as possible after collection. The times listed are the maximum times that samples will be held before analysis and still be considered valid.

[e] Analysis 40 days from extraction.

[f] This is for soil bulk jars for method 5030A. For methods 5035 and 5035A see below.

[g] Holding time is 48 hours from time of collection for unpreserved samples.

NOTE: For volatiles analysis, the container should be filled completely, with no headspace. All sample containers, preservatives, and mailers will be supplied at no additional charge upon request, except for the special containers with traceability documentation. There is an additional charge for this type of container.

Soil Sampling for Volatile Organics by SW-846 5035 and 5035A

These are methods for collection and analysis of soils and solid waste samples for volatile organic compounds. Method 5035 is described in Update III to the Third Edition of SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, and is required for all analytical methods using purge and trap techniques (8021B, 8015B, and 8260B). Method 5035A is published by EPA on their website and provides more detail and clarification (e.g. temperature preservation).

The volatile analysis is performed over two ranges:

	GC/MS (8260)	GC (8021 or 8015B)
Low Level	5 – 300 µg/kg	Not Available
High Level	>250 µg/kg	>20 µg/kg

The different levels require different sampling techniques. The low-level method can only handle samples within a specific concentration range (these samples CANNOT be diluted); therefore, a high-level sample MUST be collected to ensure that all the target analytes can be quantified.

Naturally occurring carbonates in some soils may cause effervescence (foaming) on contact with the sodium bisulfate ($NaHSO_4$) solution used as preservative for the low-level preparation. This interference makes it necessary for the laboratory to use the high-level prep or an alternative technique for low level.

Lancaster Laboratories supports the following options for the two levels:

Low-Level (LL) Options		No. of Containers*	Sample Size (g)	Holding Time†
1	LL EnCore	2	5	48 hours
	HL EnCore	1	5	48 hours
2	LL Field Preserved $NaHSO_4$	2	5	14 days
	HL Field Preserved Methanol	1	5	14 days
3	LL VOA Vial with Water	2	5	48 hours
	HL Methanol VOA Vial	1	5	14 days
High-Level (HL) Options		No. of Containers*	Sample Size (g)	Holding Time†
4	Field Preserved Methanol	1	10	14 days
5	Field Preserved Methanol	1	5	14 days
6	Field Preserved Methanol	1	15	14 days
7	HL Encore	1	5	48 hours
8	HL Encore	1	25	48 hours

*Additional containers will be needed for MS/MSD.

†Because of the need to preserve the samples within 48 hours of collection, it is imperative that samples be returned to the laboratory within one day of sample collection. Once preserved the holding time is 14 days from collection. Although not recommended, samples can be submitted in bulk containers. The holding time for these samples is 14 days from collection.

If samples are collected in EnCore or other approved core samplers, a small quantity of soil must be collected for a moisture determination and to determine if the soil effervesces with the addition of sodium bisulfate. If the soils do react, they will be frozen until analysis in place of chemical preservation.

Options 1, 2, 6, 7, 8, and 9 follow EPA 5035. Options 3, 4, and 5 follow EPA method 5035A.

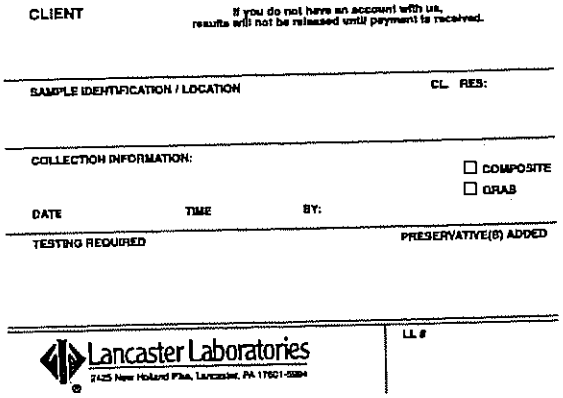
B3. Sampling Handling and Custody Requirements

Samples are unpacked and inspected in the sample receipt area. At this time, the samples are examined for breakage and agreement with the associated client paperwork. The cooler temperatures will be checked upon receipt and recorded. As the samples are unpacked, the sample label information will be compared to the chain-of-custody record and any discrepancies or missing information will be documented. If necessary, the cooler will be closed and placed in cold storage until instructions and resolution of any discrepancies are received from the client.

A member of our Sample Administration Group will act as sample custodian for the project. To ensure accountability of our results, a unique identification number is assigned to each sample as soon as possible after receipt at the laboratory. Upon entry into our LIMS and assignment of the seven digit sample number, labels are generated, along with an acknowledgement summarizing samples entered and the analyses scheduled. When samples requiring preservation by either acid or base are received at the laboratory, the pH will be checked and documented, with the exception of samples designated for volatile analysis, which are checked at the time of analysis. Samples requiring refrigeration will be stored at 2° to 4°C. The use of our computer system in tracking samples (by the Lancaster Labs sample number assignment) will control custody of the sample from receipt until the time of its disposal. The security system on our laboratory building allows us to designate the entire facility as a secure area since all exterior doors are either locked or attended. Therefore, hand-to-hand chain-of-custody is not part of our routine procedure, but is available upon request. If requested, hand-to-hand chain-of-custody will be provided as per attached LOM-SOP-ES-212, "Internal Chain-of-Custody Documentation." The laboratory chain-of-custody will begin with the preparation of bottles. The procedures for sample log-in, storage, and chain-of-custody documentation are detailed in the *EQPM* (see sections 5.2 and 5.3 in Figure B3-2) and the QA standard operating procedures included in Element B3 (LOM-SOP-ES-220, "Sample Storage and Discard" and LOM-SOP-ES-212, "Internal Chain-of-Custody Documentation"). Examples of sample labels and a custody seal are shown in Figure B3-1.

Figure B3-1

Sample Label (Field)



CLIENT

If you do not have an account with us, results will not be released until payment is received.

SAMPLE IDENTIFICATION / LOCATION

CL RES:

COLLECTION INFORMATION:

☐ COMPOSITE
☐ GRAB

DATE
TIME
BY:

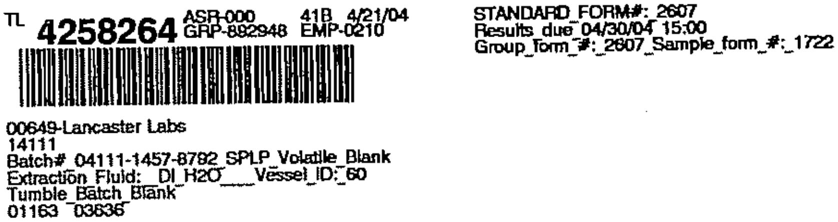
TESTING REQUIRED

PRESERVATIVE(S) ADDED

Lancaster Laboratories
2425 New Holland Pike, Lancaster, PA 17601-5994

LL #

Sample Label (Laboratory)



TL 4258264 ASR-000 41B 4/21/04
GRP-892948 EMP-0210

00649-Lancaster Labs
14111
Batch#_04111-1457-8792_SPLP_Volatile_Blank
Extraction_Fluid:__DI_H2O___Vessel_ID:_60
Tumble_Batch_Blank
01163 03636

STANDARD_FORM#:_2607
Results_due_04/30/04_15:00
Group_form_#:_2607_Sample_form_#:_1722

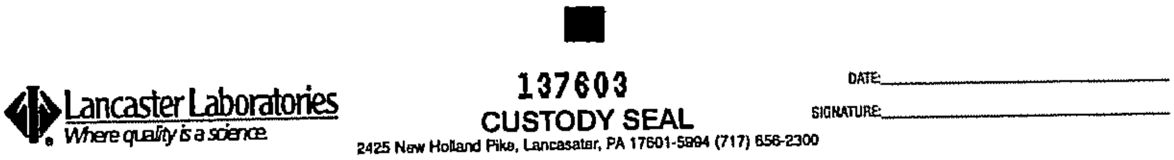
Outgoing on Cooler or Kit (blue)

Lancaster Laboratories
Where quality is a science.

CUSTODY SEAL
2425 New Holland Pike, Lancasater, PA 17601-5994 (717) 656-2300

DATE:
SIGNATURE:

Incoming on Cooler Containing Samples (yellow)



Lancaster Laboratories
Where quality is a science.

137603
CUSTODY SEAL
2425 New Holland Pike, Lancasater, PA 17601-5994 (717) 656-2300

DATE:
SIGNATURE:

Figure B3-2

5.2. Sample Receipt and Entry

Samples can be received at the laboratory 24 hours a day, 7 days a week, 365 days of the year. Receipt can occur in one of three ways:

- Lancaster Laboratories courier services (i.e., Transportation Department)
- Personal delivery
- Commercial courier

All samples received for testing are delivered to the Sample Administration Department immediately upon arrival. This group is responsible for the unpacking and organizing of the samples. This process includes checking custody seals if present, paperwork agreement, signing the chain of custody, recording cooler temperatures, documenting the condition of containers, accounting for all sample bottles, observing any safety hazards, and reporting any problems to Client Services for communication to the client. For non-compliant samples, the client is given the option to resample or have the sample analyzed and reported with a comment. This receipt process is documented.

As soon as practical after sample receipt, all samples are entered into our laboratory information management system (LIMS). Samples awaiting log-in are stored in temporary holding areas, at appropriate storage conditions to maintain sample integrity. If there is doubt about the suitability of items received or if items do not conform to the description provided or the testing required is not clear or specified, the client will be contacted and the conversation documented.

At the time of entry, the LIMS will assign a unique Lancaster Laboratories' identification number to each sample. This number is sequentially assigned. Upon entry of pertinent client information and assignment of a unique sample number, a label will print identifying each container, which is attached to the sample container.

Samples are tracked to the minute upon arrival. This will allow the client to see exactly how long it took the samples to pass through receipt, unpacking, and entry.

A sample acknowledgement will print from the LIMS per sample delivery group (SDG). This notification is sent to the client to confirm sample receipt and entry on the day following sample log-in. Internally, appropriate personnel will audit all applicable sample entry and client paperwork.

5.3. Sample Identification and Tracking

A sample label is generated for each sample and; in addition to the assigned Lancaster Laboratories' sample number, the following information is printed on the label: client name, sample identification assigned by the client, sample collection information, storage area, bottle code ID, analyses requested, and any applicable notes to laboratory personnel.

To ensure accountability of results, the unique sample number assigned is used to identify the sample in all laboratory data documentation, including notebooks, instrument printouts, and final reports. The sample number will also be used to identify additional containers of the sample that may be created during sample preparation and analysis (e.g., subsamples, extracts, digests).

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

LOM-SOP-ES-220.03
Supersedes Date: 11/08/04
Effective Date: NOV 1 5 2006
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LABORATORY OPERATIONS MANUAL – ENVIRONMENTAL SCIENCES
Sample Storage and Discard

Table of Contents

Approvals

Prepared by: Barbara Reedy — Senior Specialist — Date: 10/31/06

Approved by: Dana M Kauffman — Environmental Sciences Management — Date: 10-31-06

Approved by: Dorothy M Love — Quality Assurance — Date: 11/1/06

Revision Log:

Ver. #	Effective Date	Change
00	08/15/02	Previous Issue – SOP-QA-103.04
01	11/12/03	Major changes are as follows: • Updated to LOM-SOP format. • Separated out Pharmaceutical references.
02	11/08/04	Major changes are as follows: • Update the cross references section and the SOPs referenced within the SOP • Update the procedure section
03	NOV 15 2006	Major changes are as follows: • Made some minor wording changes to Section A of the procedure

LOMSOPES220_03.DOC
103106

Reference:

Chemical Hygiene Plan, Lancaster Laboratories, current version.

Cross Reference:

Document	Document Title
LOM-SOP-ES-201	Forensic Laboratory Services
LOM-SOP-ES-212	Internal Chain-of-Custody Documentation
LOM-SOP-LAB-220	Laboratory Notebooks, Logbooks, and Documentation

Purpose:

Sample integrity can be compromised by improper storage conditions. The objective of this procedure is to prevent sample deterioration and mix-up prior to analysis. The laboratory information management system (LIMS) is used to assign storage locations to assist in the orderly storage of samples. Systems are also in place to ensure organized retrieval of samples for analysis and discard/return to client at an appropriate date.

Scope:

This procedure applies to Lancaster Laboratories Environmental Business units. The content of this procedure will describe general systems that are in place for sample storage, retrieval, return, and discard. Additional procedures within Sample Support describe the specific storage operations and requirements. Forensic storage is described in LOM-SOP-ES-201.

Safety Precautions:

Refer to the corporate *Chemical Hygiene Plan* which provides safety information. Contact your supervisor if you have questions or concerns about a sample.

Personnel Training and Qualifications:

Personnel who handle client samples must be familiar with the requirements of this procedure.

Procedure:

A. Sample storage and transfer

1. Sample Administration will gather information into the LIMS at the time of sample entry about the approximate size of samples to be received in a group and the type of storage they require (e.g., refrigerator, freezer, or room temperature).

2. The LIMS will assign a storage location for each container and record the length of time the samples must be retained after the analysis report has been issued.

3. Samples will be stored in a assigned storage location, when not in the laboratory area.

4. In the event that a sample storage location change is needed due to a temperature adjustment, a sample custodian or sample administrator will access the appropriate LIMS program and choose a new location. After a successful change in location has occurred, a new label will be reprinted and adhered to the sample. The sample containers will then be transferred to the new storage location.
5. Analysts requiring the use of a sample container may determine its location by referring to a departmental sample status sheet, LIMS, or SA entry paperwork.
6. To prevent unnecessary deterioration of the samples, the contents needed for analysis shall be removed and the sample returned to storage with a minimum of delay.

B. Security of storage areas

There are varying degrees of additional security requirements for storage areas, which are in addition to the building security. This additional security may be driven by various regulatory agencies or client requirements. The following are different levels of security which are in place at the laboratory.

1. Samples are stored in a controlled access area and are tracked by an automated sample retrieval storage system (ASRS). Samples are barcoded in and out of this system to track retrieval, return, and disposal.
2. Forensic storage areas are locked and admission to these areas is permitted only to sample custodians. See LOM-SOP-ES-201 for further details on forensic storage. Most of the samples stored in these areas require chain-of-custody documentation as outlined in LOM-SOP-ES-212. Samples may not be removed from this area without signing a chain-of-custody form. A chain-of-custody record may also be kept for samples, at the request of the client, even if the samples are not for forensic purposes.

C. Sample discard

1. When the retention time for sample storage has expired, a discard list will be generated from the LIMS. The retention dates are based upon client requirements or defaulted to a given number of days past the date when the final analysis report is generated, if no client requirement is given.
2. These samples will be removed from their assigned storage area by a sample custodian or analyst, and either disposed of or returned to the client.
3. Hazardous samples shall either be returned to clients, decontaminated, or disposed of by personnel trained in hazardous waste discard assessment or health and safety personnel.

D. Storage conditions

1. The temperature of each sample storage location requiring a temperature control is continuously monitored by the Andover system or it is checked during each normal working day by an assigned person responsible for the sample storage area. This information shall be recorded. Temperature monitoring documentation shall be recorded in ink and changes shall be made in accordance with the error correction procedure outlined in LOM-SOP-LAB-220.

2. The following temperature ranges need to be maintained within storage units, unless otherwise specified.

Refrigerator Storage	Freezer Storage	Room Temperature
2° to 4°C	-10° to -20°C	NA

NOTE: Storage conditions of -40° ± 10°C and -80° ± 10°C are also available.

3. If the temperature recorded does not fall within these ranges, corrective action must be taken and documented as per policy.

4. Temperature records must be reviewed by a second qualified person and this information must be permanently archived.

5. In the event that additional storage areas are needed as "overflow" storage, systems must be put into place before samples can be stored. These areas must also be monitored for acceptable storage conditions.

6. If a client requests storage conditions which are outside the temperature ranges defined above, arrangements will be made to accommodate the request, if possible.

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2425 New Holland Pike • Lancaster, PA 17601

LOM-SOP-ES-212.03
Supersedes Date: 03/23/05
Effective Date: APR 14 2006
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LABORATORY OPERATIONS MANUAL – ENVIROMENTAL SCIENCES SECTION
Internal Chain-of-Custody Documentation

Table of Contents

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

LOM-SOP-ES-212.03
Supersedes Date: 03/23/05
Effective Date: APR 14 2006
Page 2 of 14

Approvals

Prepared by: Elaine Stoltzfus
Specialist
Date: 3/31/06

Approved by:
Executive Management
Date: 3/31/06

Approved by:
Quality Assurance
Date: 3/31/06

Revision Log:

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		Previous issue: SOP-QA-104.05
01	02/20/03	Major changes are as follows: • Removed Pharmaceutical Information • Updated to LOM-SOP format • Minor clarifications throughout • Updated Figure 3 and 5
02	03/23/05	Major changes are as follows: • Updated Cross Reference section • Clarified Procedure section A Initial documentation • Updated Figures 2, 4, and 5 • Incorporated Procedural Amendment
03	APR 14 2006	Major changes are as follows: • Updated Form numbers in Cross Reference section • Revised Procedure, Section B, Number 3 concerning filing the original copy of the external client COC/analysis request • Updated employee titles • Updated Figures • Updated computer terms Parallax and Evolution to Laboratory Information Management System (LIMS) • Updated and clarified wording throughout document

LOMSOPES212_03.DOC
033106

Reference:

Environmental Quality Policy Manual, Lancaster Laboratories, Inc., current version.

Cross Reference:

Document	Document Title
LOM-SOP-LAB-220	Laboratory Notebooks, Logbooks, and Documentation
Form 2016	Secure Storage Chain of Custody Original Sample
Form 2102	Analysis Request/Environmental Services Chain of Custody
Form 2174	Sample Administration Receipt Documentation Log
Form 2231	Department Storage Chain of Custody Metals
Form 2236	Secure Storage Chain of Custody Leachates
Form 2237	Department Storage Chain of Custody Water Quality
Form 2349	Chain-of-Custody Transfer Record
Form 2354	Secure Storage Chain of Custody Supplemental Information
Form 2355	Secure Storage Chain of Custody Subsample
Form 2365	Master List of Chains of Custody
Form 2667	Sample Storage Off-Shift Entry Logbook

Purpose:

In order to demonstrate reliability of data which may be used as evidence in a legal case, required by a regulatory agency, or required by a client, an accurate written record tracing the possession of samples must be maintained from the time they are received at the laboratory until the last requested analysis is verified. The purpose of a chain of custody (COC) is to ensure traceability of samples while they are in the possession of the laboratory.

Scope:

This procedure describes the initiating and maintaining of COC documentation for samples that require this level of traceability. It applies to the Environmental Division of Lancaster Laboratories when a client or regulatory agency requests an accurate written record tracing the possession of samples from the time they are received at the laboratory until the last requested analysis is verified.

Definitions:

A sample is in custody if it is in any one of the following states:

1. In actual physical possession
2. In view after being in physical possession
3. Locked up so no one can tamper with it
4. In a secured area, restricted to authorized personnel (e.g., in the ASRS).

Personnel Training and Qualifications:

Training for this procedure consists of reading this SOP. Supervisory review of all COC documentation should be done until the trainer is satisfied that proficiency has been achieved. Training of all laboratory personnel is the responsibility of the department manager. Documentation that this training has been completed must be kept in the employee's training record.

Procedure:

NOTE: Many of the COC forms listed in this SOP are available on Lab Links; therefore, they are not attached to the end of this SOP. Forms 2016, 2231, 2236, 2237, 2349, 2354, 2355, 2365 should be printed from Lab Links when needed to ensure the latest version of the form is being used at all times.

A. Initial documentation

1. Chain-of-custody documentation shall be kept upon the request of the client or for any samples that are known to be involved in a legal dispute. As with all analytical data, it is extremely important that this documentation is filled out completely and accurately with every sample bottle transfer. Everyone who handles the COC is responsible to check for documentation compliance to the point of their acquisition. If changes need to be made to the COC, they must be made in accordance to the error correction procedure addressed in LOM-SOP-LAB-220. It is the responsibility of the person who made an error in documentation to correct the error.

2. If requested by the client, the COC documentation will begin with the preparation of sampling containers. The person packing the bottle order for shipment to the client initiates Form 2102 (Figure 1). If the delivery of containers is via Lancaster Laboratories Transportation Department, the Sample Container Record (SCR) Number (written on Form 2102, Section 6) will be utilized to track the person preparing the bottle order. The Lancaster Laboratories' drivers must sign Form 2102, Section 9 when they relinquish the bottles to the client. Drivers must also sign COC forms when they pick up samples from the client for transportation to the laboratory.

3. When samples arrive at the laboratory for analysis, a member of the Sample Administration (SA) personnel will receive them and sign the external COC form that accompanies the samples, if provided. If our Transportation department picked up the samples, the driver must sign the COC to relinquish the samples to Sample Administration.

4. The Sample Administration Group will track the custody of samples between receipt and entry into LIMS on Form 2174 (Figure 2). The client's sample designation will be used for identification purposes until a unique Lancaster Laboratories number is assigned.

5. Samples will be entered into the Sample Management System as described in *Environmental Quality Policy Manual*. Sample Administration will enter an analysis number for "Laboratory Chain of Custody" if requested. A lab note will print to inform analysts of the need for COC documentation. This note will also be automatically printed on the sample labels.

B. Creating the internal COC

1. At the time of sample entry, Sample Administration personnel shall initiate Form 2365 for each sample group. They shall also initiate an Internal Laboratory Chain of Custody Form 2016 (Figure 3) for each type of bottle in the sample group.

2. The samples will then be temporarily stored in a secure location that is named SA HOLD. This change of custody from sample entry personnel to SA HOLD shall be documented on the chain, as well as any interim exchanges for rush analysis. The internal COC forms will then accompany the samples until the last requested analysis is verified.

3. If samples need to be checked out from the Sample Administration Group (for rush or short hold time analyses) before Lancaster Laboratories' numbers have been assigned to them, SA is responsible for starting a Form 2016 COC form. They will note the available header information and the samples being relinquished (documented by the client sample designation).

4. After the original copy of the external client COC/analysis request form is scanned into LIMS, it will be filed within Client Services. If requested, the original copy of the external client COC/analysis request form will be sent to Billing and Reporting to be sent to the client with their report.

C. Documentation of custody changes

1. The COC needs signed each time the sampla bottle is placed into storage and removed from storage. The sample bottle exchange may be person to person or person to place, but never place to place. A person's signature is required on each line of the COC. Two examples of how to document changes in sample custody are shown in Figures 3 and 4. Each change-of-sample custody must be accurately documented in a consistent format. All signatures documenting changes of custody will use the following format:

Signatures: First initial, full last name, employee number
Date: Month/day/year
Time: Documented as military time
Ink: Black ink is preferred, red ink and pencil are not acceptable

a. The samples will be moved from temporary SA HOLD storage to the permanent storage area known as MAIN STORAGE. Sample Storage personnel shall document this transfer of custody from SA HOLD to MAIN STORAGE on the COC. Any movement within the MAIN STORAGE area itself is tracked through bar codes and a validated LIMS tracking system.

b. When an analyst receives samples from Main Storage, they must completely and accurately fill out the information requested on the COC for each sample bottle. In the technical areas, the COC needs signed each time the sample bottle physically changes hands.

c. When samples are returned to storage, this process must again be followed.

2. Sample handling should be kept to a minimum. Analysts requiring use of a sample will requisition it through the LIMS requisition program. During the hours when the Sample Storage area is staffed, Sample Support personnel will receive the computerized requisition and remove the sample from the ASRS. The Sample Support personnel will ensure that the sample number and bottle type listed on the COC form matches the sample number and bottle type being distributed.

3. Each analyst must accurately documant each specific test (analysis) that is performed in conjunction with the associated sample numbers before the samples are returned to MAIN STORAGE.

4. When an analyst requires the use of samples during hours when the Sample Storage area is not normally staffed (such as weekends or holidays), the analyst must place a requisition for the required samples earlier in the day or on the previous day. The requisition should be for the real time and date needed.

   If a Sample Support staff member or a Sample Support designee is not available when an analyst needs the samples from MAIN STORAGE, he/she will contact the security person on duty to unlock the Main Storage unit. The analyst must sign Logbook Form 2667 (Figure 5) and fill out the required information to document entry into the storage unit. The security person must co-sign as a witness. Once the notebook is signed, the analyst may enter MAIN STORAGE and retrieve the samples. The analyst retrieving the samples must also completely and accurately fill out the information requested on the COC for each COC sample bottle.

   When the analyst is ready to return his/her samples to MAIN STORAGE, security must again be contacted. The process of signing Logbook Form 2667 must again be followed. The analyst returning the samples must again completely and accurately fill out the information requested on the COC for each COC sample bottle.

5. The following changes of custody will be handled as noted below:

   a. Documentation is required for all shift changes. Signatures involving transfers from one shift to another shall be the responsibility of the analyst who originally acquired the samples from MAIN STORAGE.

b. Occasionally, a sample container will be needed for analysis by an analyst in one department while it is in the custody of an analyst in another department. It will be the responsibility of the first person who received the sample to note on the COC the specific sample numbers requested by the second person and to sign the "Released By" column. The second person will sign the "Received By" column and note the time, date, and reason for sample transfer. After the second person is finished with the sample, the sample will be returned back to the first person or to MAIN STORAGE.

c. In situations when a sample group needs to be split between departments working on different analyses, Sample Support personnel are responsible for starting a Form 2354 supplemental COC. The supplemental chain will accompany that portion of the sample group that is needed by a second department, when the first department has part of the sample group and the original sample COC. This supplementel COC will be created only when absolutely necessary to minimize paperwork and confusion. This chain must also be documanted on the master list of chains (Form 2365).

d. If COC samples are stored in other areas of the laboratory or in a specific department, they must be stored in a secured area. Whan samples are entered into to this area, the "Recaived By" column will be noted as "Department XX storage." When samples are taken from a departmental storage area, the "Released By" column of the COC is documented as "Department XX storage."

D. Additional COC issues

1. Analysts in possession of samples shall remove the aliquot required for their analysis and return the samples to MAIN STORAGE with a minimum of delay. During this time of possession, samples must fall under the definition of sample custody.

2. If additional containers of the sample are created (e.g., subsamples, extracts, distillates, leachates, digests, etc.), then an additional COC form must be created by the department if they do not document this information on the original COC form. This form will be marked with the container type and will be initiated to eccompany the new sample container. Many departments in the lab have specifically designed COC forms that will be used if new containers are created (Forms 2231, 2236, 2237, 2355 are examples). All changes of custody involving new containers in the departmant (e.g., analysis, storage, vials on instruments, etc.) must be documented on a departmental specific COC form or on the original COC form.

E. Completion of the process

1. After sample analysis, COC samples shall be returned with their proper chains to the Sample Support Group as soon as possible. At this time, it is the responsibility of the Sample Support Group to review the COC forms to ensure that all documentation on the forms is complete before they file the forms in their area.

   All chains should either end with a note of "All Sample Consumed," "Discerd," or "Storage" for the final reason of transfer.

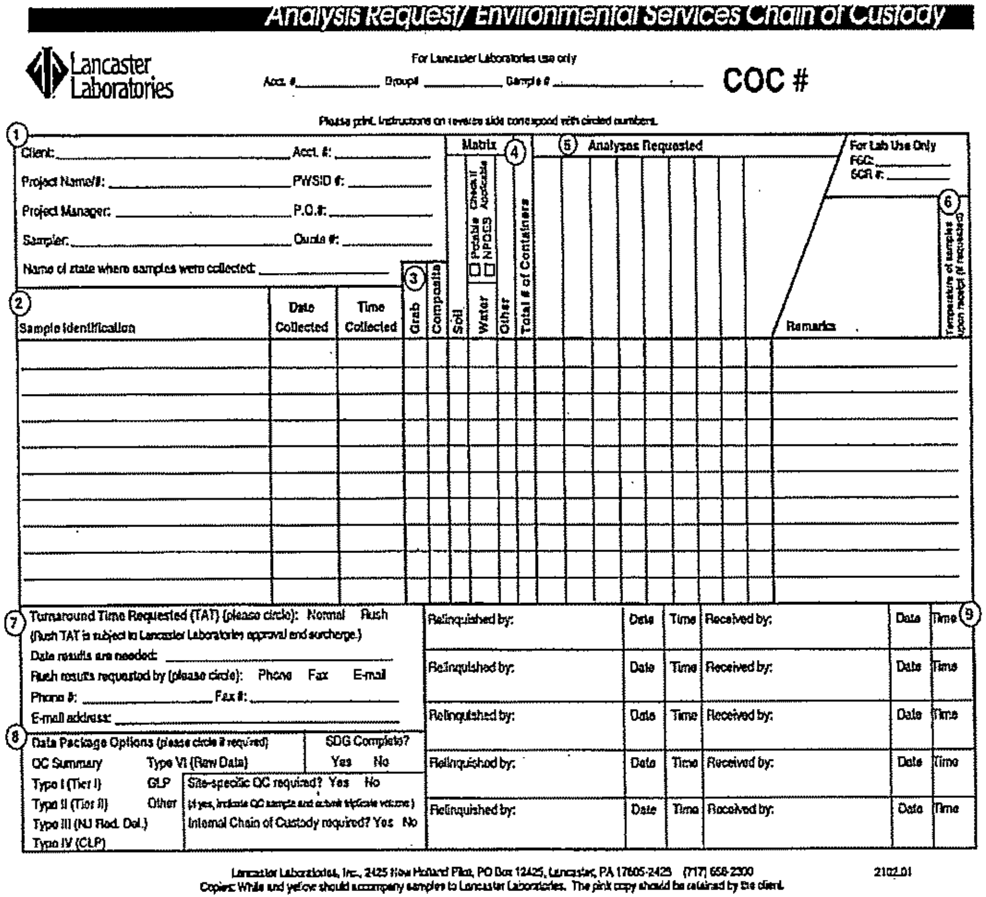
2. All completed COC forms for the original sample containers will be retained in files within Sample Support until the Data Deliverables Group personnel retrieves these forms so a copy can be included in the data package. The personnel retrieving the COC needs to fill out Form 2349 so the Sample Support Group has a record of the COC leaving their area. The Data Deliverables Group also retrieves all departmental created COC forms so a copy can be included in the data package. The original copy of all COC forms will be retained on file by the laboratory.

   NOTE for the Date Deliverables Group personnel who collect COC forms for data packages: If you find a completed COC form that does not get a data package, send the COC form to the project manager for that account. The project manager will determine whether copies of the COCs get sent to the client with the reports.

3. All personnel who handle sample containers shall make every attempt to ensure that all changes of custody are accurately and completely documented. Disciplinary action may be taken for employees who fail to comply with these important requirements.

4. In the event that a signature or other information is inadvertently not recorded on a COC form, then the Sample Support Group and the Data Package Group, in conjunction with the technicel groups, shall determine what information is missing. Checking computer requisition records, raw data, or the Sample Support work schedule are useful tools for this. The responsible party shall add the missing information or make the necessary correction at the bottom of the COC form, in addition to noting the situation that caused the error in documentation. The person making this note needs to sign and date the information using the current date. Any errors in COC documentation that cause noncompliances must be noted in the case narrative of the sample data package.

Figure 1



Analysis Request/ Environmental Services Chain of Custody

Lancaster Laboratories

For Lancaster Laboratories use only
Acct. #________ Group# ________ Sample # ________

COC #

Please print. Instructions on reverse side correspond with circled numbers.

① Client: ________ Acct. #: ________
Project Name/#: ________ PWSID #: ________
Project Manager: ________ P.O.#: ________
Sampler: ________ Quote #: ________
Name of state where samples were collected: ________

For Lab Use Only
FSC: ________
SCR #: ________

② Sample Identification	Date Collected	Time Collected	③ Grab	Composite	Matrix ④ Soil	Water ☐ Potable ☐ NPDES Check if Applicable	Other	Total # of Containers	⑤ Analyses Requested	Remarks	⑥ Temperature of samples upon receipt (if requested)

⑦ Turnaround Time Requested (TAT) (please circle): Normal Rush
(Rush TAT is subject to Lancaster Laboratories approval and surcharge.)
Date results are needed: ________
Rush results requested by (please circle): Phone Fax E-mail
Phone #: ________ Fax #: ________
E-mail address: ________

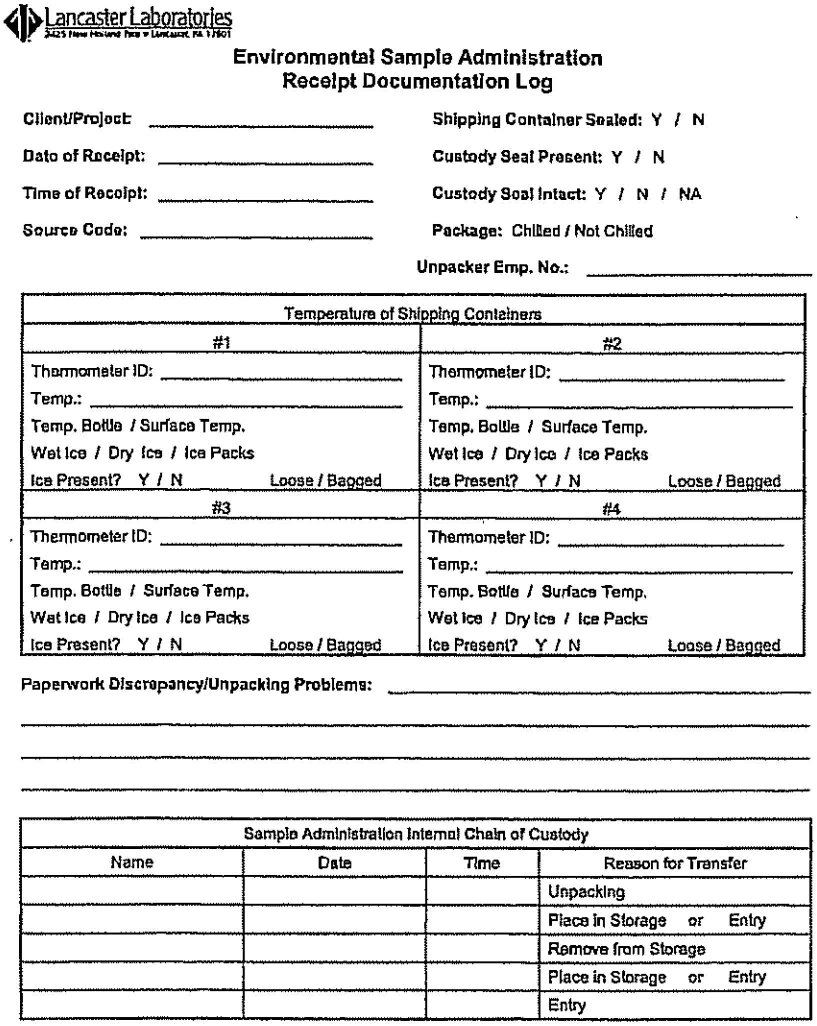
⑧ Data Package Options (please circle if required)
QC Summary Type VI (Raw Data)
Type I (Tier I) GLP
Type II (Tier II) Other
Type III (NJ Red. Del.)
Type IV (CLP)

SDG Complete? Yes No
Site-specific QC required? Yes No
(If yes, indicate QC sample and submit triplicate volume.)
Internal Chain of Custody required? Yes No

Relinquished by:	Date	Time	Received by:	Date	Time ⑨
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

Lancaster Laboratories, Inc., 2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300 2102.01
Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client.

Figure 2



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Environmental Sample Administration
Receipt Documentation Log

Client/Project: ______________________

Date of Receipt: ______________________

Time of Receipt: ______________________

Source Code: ______________________

Shipping Container Sealed: Y / N

Custody Seal Present: Y / N

Custody Seal Intact: Y / N / NA

Package: Chilled / Not Chilled

Unpacker Emp. No.: ______________________

Temperature of Shipping Containers	
#1	#2
Thermometer ID: ____________ Temp.: ____________ Temp. Bottle / Surface Temp. Wet Ice / Dry Ice / Ice Packs Ice Present? Y / N Loose / Bagged	Thermometer ID: ____________ Temp.: ____________ Temp. Bottle / Surface Temp. Wet Ice / Dry Ice / Ice Packs Ice Present? Y / N Loose / Bagged
#3	#4
Thermometer ID: ____________ Temp.: ____________ Temp. Bottle / Surface Temp. Wet Ice / Dry Ice / Ice Packs Ice Present? Y / N Loose / Bagged	Thermometer ID: ____________ Temp.: ____________ Temp. Bottle / Surface Temp. Wet Ice / Dry Ice / Ice Packs Ice Present? Y / N Loose / Bagged

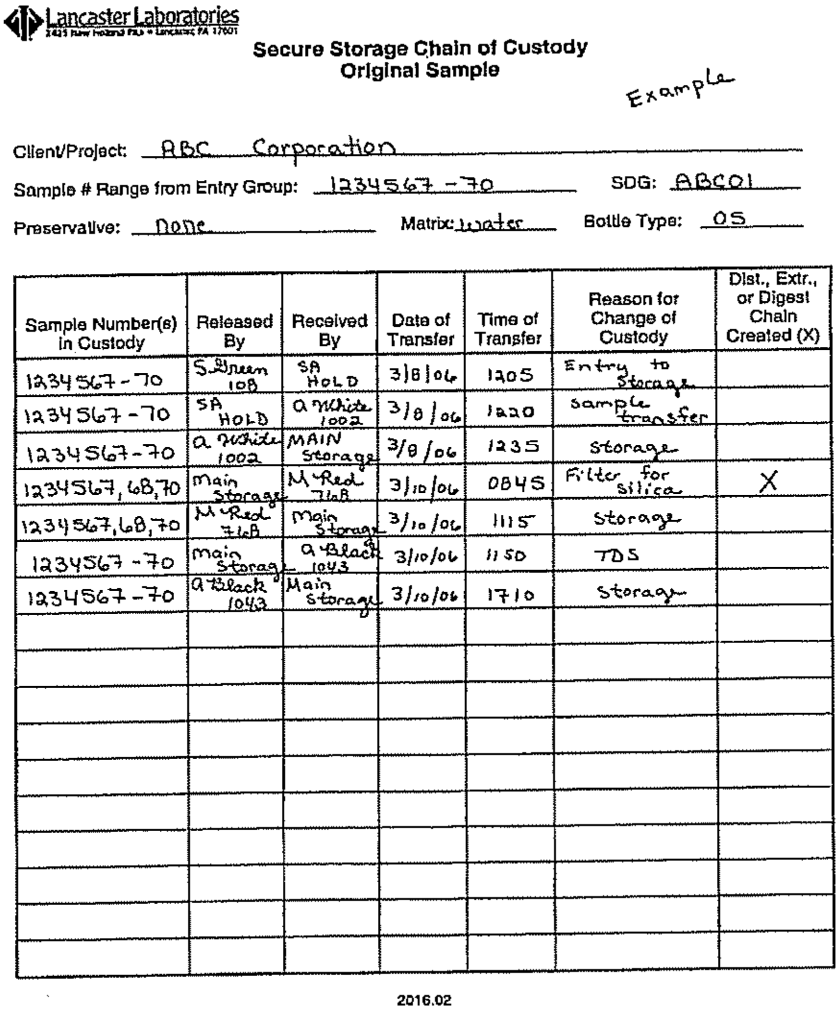
Paperwork Discrepancy/Unpacking Problems: ______________________

Sample Administration Internal Chain of Custody

Name	Date	Time	Reason for Transfer
			Unpacking
			Place in Storage or Entry
			Remove from Storage
			Place in Storage or Entry
			Entry

2174.01

Figure 3



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Secure Storage Chain of Custody
Original Sample

Example

Client/Project: ABC Corporation

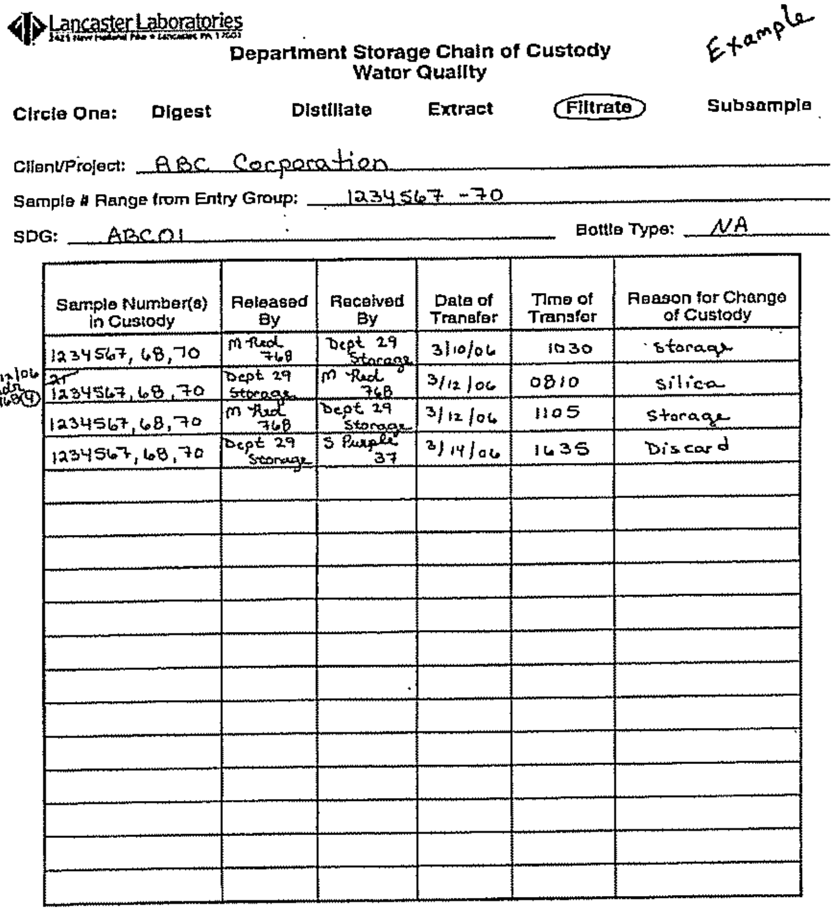
Sample # Range from Entry Group: 1234567-70 SDG: ABC01

Preservative: None Matrix: water Bottle Type: 05

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody	Dist., Extr., or Digest Chain Created (X)
1234567-70	S. Green 108	SA HOLD	3/8/06	1205	Entry to Storage	
1234567-70	SA HOLD	a White 1002	3/8/06	1220	sample transfer	
1234567-70	a White 1002	MAIN Storage	3/8/06	1235	Storage	
1234567, 68, 70	main Storage	M Red 716B	3/10/06	0845	Filter for silica	X
1234567, 68, 70	M Red 716B	main Storage	3/10/06	1115	Storage	
1234567-70	main Storage	a Black 1043	3/10/06	1150	TDS	
1234567-70	a Black 1043	Main storage	3/10/06	1710	Storage	

2016.02

Figure 4



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Department Storage Chain of Custody
Water Quality

Example

Circle One: Digest Distillate Extract [✓ Filtrate] Subsample

Client/Project: ABC Corporation

Sample # Range from Entry Group: 1234567 -70

SDG: ABC01 Bottle Type: NA

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody
1234567, 68, 70	M Red 768	Dept 29 Storage	3/10/06	1030	Storage
3/12/06 mdr 768 (4) ~~21~~ 1234567, 68, 70	Dept 29 Storage	M Red 768	3/12/06	0810	Silica
1234567, 68, 70	M Red 768	Dept 29 Storage	3/12/06	1105	Storage
1234567, 68, 70	Dept 29 Storage	S Purple 37	3/14/06	1635	Discard

2237.01

Figure 5

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

Sample Storage
Off-Shift Entry Logbook

Date	Person Requesting Entry (Signature)	Time In	Time Out	Security (Signature)	Sample Nos. or Requisition Taken

NOTE: Only fill in sample numbers if you are taking things out of the SA walkin. Sample numbers are not needed for returned samples or samples that have been requisitioned.

DO NOT TAKE SAMPLES UNTIL THE pH HAS BEEN CHECKED

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B4. Analytical Methods Requirements

The analytical procedures to be used for organics and inorganics are those described in the *USEPA SW-846 3rd Edition, Update III, 1996; Standard Methods for the Examination of Water and Wastewater, 20th edition;* and *Methods for the Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020* for the preparation and analysis of water, sediment, and soil for the client specified compounds. Copies of the analytical procedures are located in the laboratory and available for use by analysts. Copies of analytical methods are available upon request. Quantitation and detection limits for the following methods are noted in Tables B4-2 through B4-25. These are evaluated annually and are subject to change, as per the guidelines given in 40 CFR Part 136 Appendix B.

Inorganic Analysis

Metals by Inductively Coupled Plasma (ICP) – This is a technique for the simultaneous determination of elements in solution after acid digestion. The basis of the method is the measurement of atomic emission by an optical spectroscopic technique. Characteristic atomic line emission spectra are produced by excitation of the sample in a radio frequency inductively coupled plasma. Method 6010B, See Table B4-1 for list of elements and prep methods.

Mercury by Cold Vapor Atomic Absorption – Organic mercury compounds are oxidized and the mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of a spectrophotometer and absorbance (peak height) is measured. Method 7470A/7471A.

Metals by Inductively Coupled Plasma Mass Spectrometer (ICP/MS) – This is a technique for the simultaneous determination of elements in solution after acid digestion. The method involves the breakdown of molecules into elemental ions in a plasma followed by a mass spectrometric measurement. Characteristic mass spectra are produced by the element's natural isotopes. Method 6020.
See Table B4-1 for list of elements and prep methods.

Miscellaneous Wet Chemistry

Moisture – A known sample weight is placed in a drying oven maintained at 103° to 105°C for 8 to 24 hours. The sample is reweighed after drying and this value is divided by the original weight. The result is used to calculate analytical concentration on a dry-weight basis. Method 160.3 (modified).

Cyanide, total – Distillation of the sample releases the cyanide from cyanide complexes as HCN. The liberated HCN and simple cyanides are converted to cyanogen chloride by reaction with chloramine T. This reacts with pyridine and barbituric acid reagent to give a red colored complex. The absorbance is read at 570 nm and is compared to a standard curve using an automated spectrophotometer. Method 9012A.

Phenolics, total – This method is based on automated distillation of phenol and the subsequent reaction with 4-aminoantipyrine and ferriccyanide in basic buffer to produce a red colored complex. The absorbance is read at 505 nm and is compared to a standard curve using an automated spectrophotometer. Method 9066.

Sulfide, total – The sample is acidified and a known excess of iodine is added. The iodine reacts with sulfide in acid solution, oxidizing sulfide to sulfur. The excess iodine is back-titrated with sodium thiosulfate. SM20 4500 S_2F.

Total Petroleum Hydrocarbons – Samples are extracted with freon and the resulting solution is treated with silica gel to remove fatty acids and other polar compounds. The remaining nonpolar compounds are designated as petroleum hydrocarbons and are quantitatively measured using Fourier Transform Infrared Spectroscopy (FTIR), Method 418.1 (modified for soils).

Hexane Extractable Materials (HEM) – For HEM a one liter sample is acidified to a pH <2 and serially extracted with *n*-hexane in a separatory funnel. The solvent is evaporated from the extract, and the residual HEM is weighed. For SGT-HEM a one liter sample is serially extracted with *n*-hexane in a separatory funnel. The extract is mixed with silica gel, filtered through sodium sulfate, the solvent evaporated from the extract, and the residual SGT-HEM is weighed. Method 1664A.

Total Organic Carbon (TOC) – Following acidification, the sample is purged with nitrogen to remove inorganic carbon. Persulfate is injected to oxidize organic carbon to carbon dioxide which is detected by IR. Method 9060.

Total Nitrite/Nitrate – Using an autoanalyzer, the sample is passed through a column containing granulated copper-cadmium to reduce nitrate to nitrite. The nitrite ion reacts with sulfanilamide to yield a diazo compound which couples with *n*-1-naphylethylenediamine dihydrochloride to form a soluble, highly colored dye. The absorbance is read at 540 nm and compared to a standard curve.
Method 353.2.

Organic Analysis

Volatiles by GC/MS – This method determines the concentration of volatile (purgeable) organics. The analysis is based on purging the volatiles onto a Tenax/silica gel trap, desorbing the volatiles onto a gas chromatographic column which separates them and identifying the separated components with a mass spectrometer. Method 8260B/5030B/5035.

Semivolatiles by GC/MS – This method determines the concentration of semivolatile organic compounds that are separated into an organic solvent and are amenable to gas chromatography. The method involves solvent extraction of the sample to isolate analytes and GC/MS analysis to determine semivolatile compounds present in the sample. Method 8270C/3550B/3510C.

Volatiles by GC – This method determines the concentration of volatile (purgeable) organic compounds. The analysis is based on purging the volatiles from the sample onto an appropriate sorbent trap and desorbing the volatiles onto a gas chromatographic column. Using an appropriate temperature program, the compounds are separated by the column and both qualitative and quantitative detection is achieved with a photoionization and/or electrolytic conductivity detector. Method 8021B/5030B/5035. Non-halogenated organics are analyzed by flame ionization detectors. Method 8015B/5030B/5035.

TPH-GRO – This method determines the concentration of gasoline range organics (2-methylpentane to 1,2,4-trimethylbenzene). The analysis is based on purging the volatiles from the sample onto an appropriate sorbent trap and desorbing the volatiles onto a gas chromatographic column. Using an appropriate temperature program, the compounds are separated by the column and both qualitative and quantitative detection is achieved with a flame ionization detector. BTEX may be determined simultaneously on systems equipped with a photoionization detector in tandem with the FID. Method 8015B/5030B/5035.

TPH-DRO – This method determines the concentration of diesel range organics (C-10 to C-28 hydrocarbons). The procedure includes solvent extraction of the sample and analysis of the extract on a gas chromatograph/flame ionization detector (GC/FID) using a megabore capillary column. Method 8015B.

Pesticides, PCBs, and Herbicides – These methods determine the concentration of organochloride pesticides, polychlorinated biphenyls, herbicides, and organophosphate pesticides. The procedures include solvent extraction of the sample, analysis of the extract on a gas chromatograph/electron capture detector (GC/EC) using a capillary column, and confirmation on a GC/EC using a second capillary column. A nitrogen-phosphorus detector is used for organophosphates. If the compound concentration is sufficient, confirmation may be performed on GC/MS upon request. Pesticides methods 8081A/3550B/3510C and 8141A/3550B/3510C. PCBs Method 8082/3550B/3510C. Herbicides Method 8151A/3550B.

PAHs by HPLC – The sample aliquot is extracted with methylene chloride. The extract is filtered (soils), dried, concentrated by evaporation and exchanged into acetonitrile. The extract is analyzed by reverse-phase HPLC with both UV and fluorescence detectors. Methods 8310/3550B/3510C.

Table B4-1

Inorganic Analytical Method Numbers

	ICP	ICP/MS
Aluminum	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Antimony	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Arsenic	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Barium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Beryllium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Cadmium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Calcium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Chromium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Cobalt	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Copper	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Iron	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Lead	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Magnesium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Manganese	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Molybdenum	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Nickel	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Potassium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Selenium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Silver	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Sodium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Thallium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Tin	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Vanadium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Zinc	6010B/3005A/3010/3050B	6020/3010MOD/3050B

The number of parameters analyzed and the method used will be determined by the site-specific requirements.

Mercury by Cold Vapor – 7470A/7471A.

Table B4-2

Metals Compound List (TAL)

Analyte	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Aluminum	0.2	0.08	20	3.4
Antimony	0.02	0.0097	2.	0.9
Arsenic	0.02	0.01	2.	0.91
Barium	0.005	0.00062	0.5	0.023
Beryllium	0.005	0.00094	0.5	0.068
Cadmium	0.005	0.00091	0.5	0.065
Calcium	0.2	0.1	20	13
Chromium	0.015	0.0023	1.5	0.58
Cobalt	0.005	0.0021	0.5	0.13
Copper	0.01	0.0022	1.	0.18
Iron	0.2	0.052	20	4.7
Lead	0.015	0.00685	1.5	0.441
Magnesium	0.1	0.014	10	1.9
Manganese	0.005	0.00036	0.5	0.056
Molybdenum	0.010	0.0056	1.0	0.0105
Mercury[1]	0.0002	0.000056	0.100	0.0105
Nickel	0.01	0.0056	1.	0.61
Potassium	0.5	0.05	50	3.3
Selenium	0.02	0.0094	2.	0.98
Silver	0.005	0.0016	0.5	0.17
Sodium	1.	0.43	100	35
Thallium	0.020	0.0135	2.00	1.33
Vanadium	0.005	0.0015	0.5	0.16
Zinc	0.02	0.0081	2.	0.66
Cyanide, total[2]	0.01	0.005	0.5	0.18

Analyzed by ICP

1Analyzed by Cold Vapor

[2] Analyzed by automated spectrophotometer

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis, will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQs and MDLs are evaluated annually and subject to change.

Table B4-3
Inorganic Priority Pollutants List

	Waters		Soils***	
Analyte	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Antimony	0.02	0.0097	2.	0.9
Arsenic	0.02	0.01	2.	0.91
Beryllium	0.005	0.00094	0.5	0.068
Cadmium	0.005	0.00091	0.5	0.065
Chromium	0.015	0.0023	1.5	0.58
Copper	0.01	0.0022	1.	0.18
Lead	0.015	0.00685	1.5	0.441
Mercury*	0.0002	0.000056	0.100	0.0105
Nickel	0.01	0.0056	1.	0.61
Selenium	0.02	0.0094	2.	0.98
Silver	0.005	0.0016	0.5	0.17
Thallium	0.020	0.0135	2.00	1.33
Zinc	0.02	0.0081	2.	0.66
Cyanide, total†	0.01	0.005	0.5	0.18
Phenolics, total†	0.03	0.009	3.5	1.2

*Mercury is analyzed by Cold Vapor.

Except for Cyanide, Phenolics, and Mercury, all other elements analyzed by ICP.

†Cyanide and Phenolics analyzed by distillation followed by automated colorimetry.

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-4

Inorganic Appendix IX Analyte List

Analyte	Waters		Soils***	
	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Antimony	0.02	0.0085	2.	0.66
Arsenic	0.01	0.0049	1.	0.5
Barium	0.005	0.00042	0.5	0.032
Beryllium	0.005	0.00034	0.5	0.059
Cadmium	0.005	0.00087	0.5	0.054
Chromium	0.005	0.0022	0.5	0.2
Cobalt	0.005	0.0016	0.5	0.14
Copper	0.01	0.0021	1.	0.19
Lead	0.02	0.0093	2.	0.79
Mercury*	0.0002	0.00016	0.1	0.0028
Nickel	0.01	0.0038	1.	0.2
Selenium	0.01	0.0047	1.	0.47
Silver	0.005	0.0018	0.5	0.15
Thallium	0.02	0.0089	2.	0.93
Tin	0.02	0.005	10.	0.41
Vanadium	0.005	0.0017	0.5	0.16
Zinc	0.005	0.0041	2.	0.18
Cyanide, total†	0.01	0.005	0.5	0.18
Sulfide, total††	2.	0.53	30	8.4

*Mercury is analyzed by Cold Vapor.

Except for Cyanide, Sulfide, and Mercury, all other elements are analyzed by ICP.

†Cyanide is analyzed by distillation followed by automated colorimetry.

††Sulfide is analyzed by 9034 (modified), titrimetric analysis.

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-5

Metals by ICP/MS List

Analyte	Waters		Soils***	
	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Aluminum	0.1	0.013	10	0.74
Antimony	0.001	0.000038	0.1	0.005
Arsenic	0.002	0.00067	0.2	0.017
Barium	0.0005	0.000072	0.5	0.094
Beryllium	0.0002	0.000052	0.02	0.0028
Cadmium	0.00025	0.000099	0.025	0.0038
Calcium	0.075	0.023	75	18
Chromium	0.002	0.00026	0.2	0.031
Cobalt	0.0001	0.000012	0.01	0.00013
Copper	0.001	0.0002	0.1	0.035
Iron	0.075	0.025	20	2.1
Lead	0.001	0.000047	0.1	0.015
Magnesium	0.01	0.003	2.	0.43
Manganese	0.00075	0.00013	0.2	0.016
Molybdenum	0.001	0.000031	0.1	0.0044
Nickel	0.0002	0.00043	0.2	0.05
Potassium	0.05	0.011	5	0.6
Selenium	0.002	0.0005	0.2	0.037
Silver	0.0005	0.000023	0.05	0.0035
Sodium	0.2	0.067	20	5
Strontium	0.0005	0.000074	0.1	0.0098
Thallium	0.0005	0.000037	0.05	0.00094
Tin	0.0005	0.00013	1.	0.07
Titanium	0.001	0.00031	0.2	0.036
Vanadium	0.005	0.0011	0.05	0.0029
Zinc	0.015	0.0017	2.	0.25

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

Method 6020 (ICP/MS) – LOQ and MDLs are evaluated annually and subject to change.

Table B4-6
Miscellaneous Chemistry Analyte List

Parameter	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Cyanide, total	0.01	0.005	0.5	0.18
Hexane Extractable Materials (1664A)	5.	1.4	N/A	N/A
Moisture	N/A	N/A	0.5 wt.%	0.5 wt.%
Phenolics, total	0.04	0.012	3.5	1.2
Sulfide, total	2.	0.53	N/A	N/A
TOC	2.	0.5	170	60
Total Nitrite/Nitrate	0.1	0.04	N/A	N/A
TPH (418.1)	1.5	0.5	69	23

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-7

Volatile Full Compound List by GC/MS (8260B)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Dichlorodifluoromethane	5.	2.	5.	2.
Chloromethane	5.	1.	5.	2.
Vinyl Chloride	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Chloroethane	5.	1.	5.	2.
Trichlorofluoromethane	5.	2.	5.	2.
1,1-Dichloroethene	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
Methylene Chloride	5.	2.	5.	2.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
2,2-Dichloropropane	5.	1.	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
Bromochloromethane	5.	1.	5.	1.
1,1,1-Trichloroethane	5.	0.8	5.	1.
Carbon Tetrachloride	5.	1.	5.	1.
1,1-Dichloropropene	5.	1.	5.	1.
Benzene	5.	0.5	5.	0.5
1,2-Dichloroethane	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
Dibromomethane	5.	1.	5.	1.
Bromodichloromethane	5.	1.	5.	1.
Toluene	5.	0.7	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
Tetrachloroethene	5.	0.8	5.	1.
1,3-Dichloropropane	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,2-Dibromoethane	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
1,1,1,2-Tetrachloroethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.

Table B4-7 – Continued

Volatile Full Compound List by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
m+*p*-Xylene	5.	0.8	5.	1.
o-Xylene	5.	0.8	5.	1.
Styrene	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Isopropylbenzene	5.	1.	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
Bromobenzene	5.	1.	5.	1.
1,2,3-Trichloropropane	5.	1.	5.	1.
n-Propylbenzene	5.	1.	5.	1.
2-Chlorotoluene	5.	1.	5.	1.
1,3,5-Trimethylbenzene	5.	1.	5.	1.
4-Chlorotoluene	5.	1.	5.	1.
tert-Butylbenzene	5.	1.	5.	1.
1,2,4-Trimethylbenzene	5.	1.	5.	1.
sec-Butylbenzene	5.	1.	5.	1.
p-Isopropyltoluene	5.	1.	5.	1.
1,3-Dichlorobenzene	5.	1.	5.	1.
1,4-Dichlorobenzene	5.	1.	5.	1.
n-Butylbenzene	5.	1.	5.	1.
1,2-Dichlorobenzene	5.	1.	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
1,2,4-Trichlorobenzene	5.	1.	5.	1.
Hexachlorobutadiene	5.	2.	5.	2.
Naphthalene	5.	1.	5.	1.
1,2,3-Trichlorobenzene	5.	1.	5.	1.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-8
Volatile Priority Pollutant Compound List by GC/MS (8260B)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
2-Chloroethylvinyl ether	10	2.	10	2.
Acrolein	100	40	100	20
Acrylonitrile	20	4.	20	4.
Benzene	5.	0.5	5.	0.5
Bromodichloromethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Carbon tetrachloride	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Chloroethane	5.	1.	5.	2.
Chloroform	5.	0.8	5.	1.
Chloromethane	5.	1.	5.	2.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
cis-1,3-Dichloropropene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.
Methylene chloride	5.	2.	5.	2.
Tetrachloroethene	5.	0.8	5.	1.
Toluene	5.	0.7	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Trichlorofluoromethane	5.	2.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Xylene (total)	5.	0.8	5.	1.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-9

Appendix IX Volatile Compounds by GC/MS (8260B)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Chloromethane	5.	1.	5.	2.
Bromomethane	5.	1.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Dichlorodifluoromethane	5.	2.	5.	2.
Chloroethane	5.	1.	5.	2.
Methyl iodide	5.	1.	5.	3.
Acrolein	100	40	100	20
Acrylonitrile	20	4.	20	4.
Acetonitrile	100	25	100	25
Methylene chloride	5.	2.	5.	2.
Acetone	20	6.	20	7.
Trichlorofluoromethane	5.	2.	5.	2.
Carbon disulfide	5.	1.	5.	1.
Propionitrile	100	30	100	30
1,1-Dichloroethene	5.	0.8	5.	1.
Allyl chloride	5.	1.	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
Methacrylonitrile	50	10	50	5.
2-Butanone	10	3.	10	4.
Dibromomethane	5.	1.	5.	1.
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,4-Dioxane	250	70	250	70
Carbon tetrachloride	5.	1.	5.	1.
Isobutyl alcohol	250	100	250	100
Vinyl acetate	10	2.	10	2.
Bromodichloromethane	5.	1.	5.	1.
2-Chloro-1,3-butadiene	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.

Table B4-9 – Continued

Appendix IX Volatile Compounds by GC/MS (8260B)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Trichloroethene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,2-Dibromoethane	5.	1.	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
Benzene	5.	0.5	5.	0.5
cis-1,3-Dichloropropene	5.	1.	5.	1.
Methyl methacrylate	5.	1.	5.	1.
1,1,1,2-Tetrachloroethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
trans-1,4-Dichloro-2-butene	50	15	50	10
1,2,3-Trichloropropane	5.	1.	5.	1.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Tetrachloroethene	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
Toluene	5.	0.7	5.	1.
Ethyl methacrylate	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Pentachloroethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
Styrene	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-10

TCL3.2 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Chloromethane	5.	1.	5.	2.
Bromomethane	5.	1.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Chloroethane	5.	1.	5.	2.
Methylene chloride	5.	2.	5.	2.
Acetone	20	6.	20	7.
Carbon disulfide	5.	1.	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
2-Butanone	10	3.	10	4.
1,1,1-Trichloroethane	5.	0.8	5.	1.
Carbon tetrachloride	5.	1.	5.	1.
Bromodichloromethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
Benzene	5.	0.5	5.	0.5
cis-1,3-Dichloropropene	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Tetrachloroethene	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.

Table B4-10 – Continued

TCL3.2 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Toluene	5.	0.7	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Ethylbenzene	5.	0.8	5.	1.
Styrene	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-11

TCL4.3 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
1,2,4-Trichlorobenzene	5.	1.	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
1,2-Dibromoethane	5.	1.	5.	1.
1,2-Dichlorobenzene	5.	1.	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
1,3-Dichlorobenzene	5.	1.	5.	1.
1,4-Dichlorobenzene	5.	1.	5.	1.
2-Butanone	10	3.	10	4.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Acetone	20	6.	20	7.
Benzene	5.	0.5	5.	0.5
Bromodichloromethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Carbon disulfide	5.	1.	5.	1.
Carbon tetrachloride	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Chloroethane	5.	1.	5.	2.
Chloroform	5.	0.8	5.	1.
Chloromethane	5.	1.	5.	2.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
cis-1,3-Dichloropropene	5.	1.	5.	1.
Cyclohexane	5.	2.	5.	1.

Table B4-11 – Continued

TCL4.3 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Dibromochloromethane	5.	1.	5.	1.
Dichlorodifluoromethane	5.	2.	5.	2.
Ethylbenzene	5.	0.8	5.	1.
Freon 113	10	2.	10	2.
Isopropylbenzene	5.	1.	5.	1.
Methyl Acetate	5.	1.	5.	2.
Methyl *t*-butyl ether	5.	0.5	5.	0.5
Methylcyclohexane	5.	1.	5.	1.
Methylene chloride	5.	2.	5.	2.
Styrene	5.	1.	5.	1.
Tetrachloroethene	5.	0.8	5.	1.
Toluene	5.	0.7	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Trichlorofluoromethane	5.	2.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-12

Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Acenaphthene	5	1.	170	33
Acenaphthylene	5	1.	170	33
Acetophenone	5	2.	170	67
Aramite[2]	15	5.	1700	33
2-Acetylaminofluorene	5	2.	170	67
4-Aminobiphenyl	5	2.	500	170
Aniline	5	1.	500	170
Anthracene	5	1.	170	33
Benzidine	60	20	3300	1200
Benzo(a)anthracene	5	1.	170	33
Benzo(b)fluoranthene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Benzyl alcohol	15	5.	500	170
bis (2-Chloroethoxy)methane	5	1.	170	33
bis(2-Chloroethyl)ether	5	1.	170	33
bis(2-Chloroisopropyl)ether	5	1.	170	33
bis(2-Ethylhexyl)phthalate	5	2.	330	67
4-Bromophenyl phenylether	5	1.	170	33
Butylbenzylphthalate	5	2.	170	67
4-Chloroaniline	5	1.	170	67
Carbazole	5	1.	170	33
Chlorobenzilate	10	3.	170	33
4-Chloro-3-methylphenol	5	1.	170	67
2-Chloronaphthalene	5	2.	170	33
2-Chlorophenol	5	1.	170	33
4-Chlorophenyl phenylether	5	2.	170	33
Chrysene	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
3 or 4-methyl phenol[3]	5	2.	170	67

Table B4-12 – Continued

Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Diallate (*cis/trans*)	5	1.	170	33
Dibenzofuran	5	1.	170	33
Di-*n*-butylphthalate	5	2.	170	67
Dibenz(a,h)anthracene	5	1.	170	33
1,2-Dichlorobenzene	5	1.	170	33
1,3-Dichlorobenzene	5	1.	170	33
1,4-Dichlorobenzene	5	1.	170	33
3,3'-Dichlorobenzidine	5	2.	330	100
2,4-Dichlorophenol	5	1.	170	33
2,6-Dichlorophenol	5	2.	170	67
Diethylphthalate	5	2.	170	67
Dimethoate	10	3.	500	170
p-(Dimethylamino)azobenzene	5	2.0	170	67
7,12-Dimethylbenz(a)anthracene	5	2.	170	33
3,3'-Dimethylbenzidine	25	10.	1000	330
a,a-Dimethylphenethylamine[2]	50	2.	1700	100
2,4-Dimethylphenol	10	3.	170	67
Dimethylphthalate	5	2.	170	67
1,3-Dinitrobenzene	5	2.	170	67
4,6-Dinitro-2-methylphenol	15	5.	500	170
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	5	1.	170	67
2,6-Dinitrotoluene	5	1.	170	33
Di-*n*-octylphthalate	5	2.	170	67
1,2-Diphenylhydrazine[4]	5	1.	170	33
Ethylmethanesulfonate	5	2.	170	67
Fluoranthene	5	1.	170	33
Fluorene	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
Hexachloroethane	5	1.	170	33

Table B4-12 – Continued

Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Hexachloropropene	5	2.	330	100
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Isodrin	5	1.	170	33
Isophorone	5	1.	170	33
Isosafrole	5	2.	170	67
Methapyrilene	50	15	5000	1700
3-Methylcholanthrene	5	2.	170	67
Methylmethanesulfonate	5	1.	170	33
2-Methylphenol	5	1.	170	67
1-Methylnaphthalene	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
Naphthalene	5	1.	170	33
1,4-Naphthoquinone	30	10	3300	830
1-Naphthylamine	15	5.	500	170
2-Naphthylamine	15	5.	500	170
2-Nitroaniline	5	1.	170	33
3-Nitroaniline	5	1.	170	67
4-Nitroaniline	5	1.	170	67
Nitrobenzene	5	1.	170	33
2-Nitrophenol	5	1.	170	33
4-Nitrophenol	30	10	500	170
4-Nitroquinoline-1-oxide	60	20	1000	330
n-Nitrosodi-*n*-butylamine	5	2.	170	67
n-Nitrosodiethylamine	5	2.	170	67
n-Nitrosodimethylamine	5	2.	170	67
n-Nitrosodiphenylamine[1]	5	2.	170	33
n-Nitrosodi-*n*-propylamine	5	1.	170	33
n-Nitrosomethylethylamine	5	2.	170	67
n-Nitrosomorpholine	5	2.	170	67
n-Nitrosopiperidine	5	2.	170	67
n-Nitrosopyrrolidine	5	2.	170	67
5-Nitro-o-toluidine	5	3.	500	170

Table B4-12 – Continued

Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2,2'-oxybis(1-Chloropropane)	5	1.	170	33
Pentachlorobenzene	5	2.	170	67
Pentachloronitrobenzene	5	2.	170	67
Pentachlorophenol	15	3.	500	170
Phenacetin	5	2.	170	67
Phenanthrene	5	1.	170	33
Phenol	5	1.	170	33
1,4-Phenylenediamine	250	75	33000	12000
2-Picoline	5	2.	330	100
Pronamide	5	1.	170	33
Pyrene	5	1.	170	33
Pyridine	5	2.	170	67
Safrole	5	2.	170	67
1,2,4,5-Tetrachlorobenzene	5	2.	170	67
2,3,4,6-Tetrachlorophenol	5	2.	170	67
Tetraethyldithiopyrophosphate	5	1.	170	67
Thionazin	5	2.	170	67
o-Toluidine	5	1.	670	200
1,2,4-Trichlorobenzene	5	1.	170	33
2,4,5-Trichlorophenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
O,O,O-Triethylphosphorothioate	5	2.	170	67
1,3,5-Trinitrobenzene	15	5.	500	170

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1] *n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

[2] Aramite and a,a-dimethylphenethylamine can be determined upon request.

[3] 3-methylphenol and 4-methylphenol cannot be resolved under this analysis. The combined total of both compounds is reported as 4-methylphenol.

[4] 1,2-Diphenylhydrazine cannot be distinguished from azobenzene, therefore, the value reported represents the combined total of both.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-13

Semivolatile Priority Pollutant Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2-Chlorophenol	5	1.	170	33
Phenol	5	1.	170	33
2-Nitrophenol	5	1.	170	33
2,4-Dimethylphenol	10	3	170	33
2,4-Dichlorophenol	5	1.	170	67
4-Chloro-3-methylphenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
2,4-Dinitrophenol	60	20	2000	670
4-Nitrophenol	30	10	500	170
4,6-Dinitro-2-methylphenol	15	5.	500	170
Pentachlorophenol	15	3.	500	170
n-Nitrosodimethylamine	5	2.	330	67
bis(2-Chloroethyl)ether	5	1.	170	33
1,3-Dichlorobenzene	5	1.	170	33
1,4-Dichlorobenzene	5	1.	170	33
1,2-Dichlorobenzene	5	1.	170	33
bis(2-Chloroisopropyl)ether	5	1.	170	33
Hexachloroethane	5	1.	170	33
n-Nitrosodi-*n*-propylamine	5	1.	170	33
Nitrobenzene	5	1.	170	33
Isophorone	5	1.	170	33
bis (2-Chloroethoxy)methane	5	1.	170	33
1,2,4-Trichlorobenzene	5	1.	170	33
Naphthalene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
2-Chloronaphthalene	5	2	170	33
Acenaphthylene	5	1.	170	33
Dimethylphthalate	5	2.	170	67
2,6-Dinitrotoluene	5	1.	170	33
Acenaphthene	5	1.	170	33
2,4-Dinitrotoluene	5	1.	170	67

Table B4-13 – Continued

Semivolatile Priority Pollutant Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (μg/L)	MDL (μg/L)	LOQ* (μg/kg)	MDL (μg/kg)
Fluorene	5	1.	170	33
4-Chlorophenyl phenylether	5	2	170	33
Diethylphthalate	5	2.	170	67
1,2-Diphenylhydrazine	5	1.	170	33
n-Nitrosodiphenylamine[1]	5	2.	170	33
4-Bromophenyl phenylether	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Phenanthrene	5	1.	170	33
Anthracene	5	1.	170	33
Di-*n*-butylphthalate	5	2.	170	67
Fluoranthene	5	1.	170	33
Pyrene	5	1.	170	33
Benzidine	60	20	3300	1200
Butylbenzylphthalate	5	2.	170	67
Benzo(a)anthracene	5	1.	170	33
Chrysene	5	1.	170	33
3,3'-Dichlorobenzidine	5	2	330	100
bis(2-Ethylhexyl)phthalate	5	2.	330	67
Di-*n*-octylphthalate	5	2.	170	67
Benzo(b)fluoranthene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Dibenz(a,h)anthracene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1] *n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-14

Appendix IX Semivolatile Compounds by GC/MS (8270C)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Acenaphthene	5	1.	170	33
Acenaphthylene	5	1.	170	33
Acetophenone	5	2.	170	67
2-Acetylaminofluorene	5	2.	170	67
4-Aminobiphenyl	5	2.	500	170
Aniline	5	1.	500	170
Anthracene	5	1.	170	33
Aramite^2	15	5	1700	33
Benzo(a)anthracene	5	1.	170	33
Benzo(b)fluoranthene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Benzyl alcohol	15	5.	500	170
bis (2-Chloroethoxy)methane	5	1.	170	33
bis(2-Chloroethyl)ether	5	1.	170	33
bis(2-Chloroisopropyl)ether	5	1.	170	33
bis(2-Ethylhexyl)phthalate	5	2.	330	67
4-Bromophenyl phenylether	5	1.	170	33
Butylbenzylphthalate	5	2.	170	67
4-Chloroaniline	5	1.	170	67
Chlorobenzilate	10	3.	170	33
4-Chloro-3-methylphenol	5	1.	170	67
2-Chloronaphthalene	5	2	170	33
2-Chlorophenol	5	1.	170	33
4-Chlorophenyl phenylether	5	2	170	33
Chrysene	5	1.	170	33
2-Methylphenol	5	1.	170	67
3- or 4-Methylphenol^3	5	2.	170	67
Diallate (*cis/trans*)	5	1.	170	33
Dibenzofuran	5	1.	170	33

Table B4-14 – Continued

Appendix IX Semivolatile Compounds by GC/MS (8270C)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Di-*n*-butylphthalate	5	2.	170	67
Dibenz(a,h)anthracene	5	1.	170	33
1,2-Dichlorobenzene	5	1.	170	33
1,3-Dichlorobenzene	5	1.	170	33
1,4-Dichlorobenzene	5	1.	170	33
3,3'-Dichlorobenzidine	5	2	330	100
2,4-Dichlorophenol	5	1.	170	33
2,6-Dichlorophenol	5	2.	170	67
Diethylphthalate	5	2.	170	67
Dimethoate	10	3.	500	170
p-(Dimethylamino)azobenzene	5	2.	170	67
7,12-Dimethylbenz(a)anthracene	5	2.	170	33
3,3'-Dimethylbenzidine	25	10	1000	330
a,a-Dimethylphenethylamine[2]	50	2	1700	100
2,4-Dimethylphenol	10	3	170	67
Dimethylphthalate	5	2.	170	67
1,3-Dinitrobenzene	5	2	170	67
4,6-Dinitro-2-methylphenol	15	5.	500	170
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	5	1.	170	67
2,6-Dinitrotoluene	5	1.	170	33
Di-*n*-octylphthalate	5	2.	170	67
Ethylmethanesulfonate	5	2.	170	67
Fluoranthene	5	1.	170	33
Fluorene	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
Hexachloroethane	5	1.	170	33
Hexachloropropene	5	2.	330	100
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Isodrin	5	1.	170	33

Table B4-14 – Continued

Appendix IX Semivolatile Compounds by GC/MS (8270C)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Isophorone	5	1.	170	33
Isosafrole	5	2	170	67
Methapyrilene	50	15	5000	1700
3-Methylcholanthrene	5	2.	170	67
Methylmethanesulfonate	5	1.	170	33
1-Methylnaphthalene	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
Naphthalene	5	1.	170	33
1,4-Naphthoquinone	30	10	3300	830
1-Naphthylamine	15	5.	500	170
2-Naphthylamine	15	5.	500	170
2-Nitroaniline	5	1.	170	33
3-Nitroaniline	5	1.	170	67
4-Nitroaniline	5	1.	170	67
Nitrobenzene	5	1.	170	33
2-Nitrophenol	5	1.	170	33
4-Nitrophenol	30	10	500	170
4-Nitroquinoline-1-oxide	60	20	1000	330
n-Nitrosodiethylamine	5	2.	170	67
n-Nitrosodimethylamine	5	2.	170	67
n-Nitrosodi-*n*-butylamine	5	2.	170	67
n-Nitrosodi-*n*-propylamine	5	1.	170	33
n-Nitrosodiphenylamine[1]	5	2.	170	33
n-Nitrosomethylethylamine	5	2.	170	67
n-Nitrosomorpholine	5	2.	170	67
n-Nitrosopiperidine	5	2.	170	67
n-Nitrosopyrrolidine	5	2.	170	67
5-Nitro-*o*-toluidine	5	3.	500	170
Pentachlorobenzene	5	2.	170	67
Pentachloronitrobenzene	5	2.	170	67
Pentachlorophenol	15	3.	500	170
Phenacetin	5	2.	170	67

Table B4-14 – Continued

Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Phenanthrene	5	1.	170	33
Phenol	5	1.	170	33
1,4-Phenylenediamine	250	75	33000	12000
2-Picoline	5	2.	330	100
Pronamide	5	1.	170	33
Pyrene	5	1.	170	33
Pyridine	5	2.	170	67
Safrole	5	2.	170	67
1,2,4,5-Tetrachlorobenzene	5	2.	170	67
2,3,4,6-Tetrachlorophenol	5	2.	170	67
Tetraethyldithiopyrophosphate	5	1.	170	67
Thionazin	5	2.	170	67
o-Toluidine	5	1.	670	200
1,2,4-Trichlorobenzene	5	1.	170	33
2,4,5-Trichlorophenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
O,O,O-Triethylphosphorothioate	5	2.	170	67
1,3,5-Trinitrobenzene	15	5.	500	170

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1] *n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

[2] Aramite and a,a-dimethylphenethylamine can be determined upon request.

[3] 3-methylphenol and 4-methylphenol cannot be resolved under this analsis. The combined total of both compounds is reported as 4-methylphenol.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-15

TCL3.2 Semivolatiles by GC/MS (8270C)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,2,4-Trichlorobenzene	5	1.	170	33
1,2-Dichlorobenzene	5	1.	170	33
1,3-Dichlorobenzene	5	1.	170	33
1,4-Dichlorobenzene	5	1.	170	33
2,2'-Oxybis(1-Chloropropane)	5	1.	170	33
2,4,5-Trichlorophenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
2,4-Dichlorophenol	5	1.	170	33
2,4-Dimethylphenol	10	3	170	67
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	5	1.	170	67
2,6-Dinitrotoluene	5	1.	170	33
2-Chloronaphthalene	5	2	170	33
2-Chlorophenol	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
2-Methylphenol	5	1.	170	67
2-Nitroaniline	5	1.	170	33
2-Nitrophenol	5	1.	170	33
3,3'-Dichlorobenzidine	5	2	330	100
3-Nitroaniline	5	1.	170	67
4,6-Dinitro-2-methylphenol	15	5.	500	170
4-Bromophenyl-phenylether	5	1.	170	33
4-Chloro-3-methylphenol	5	1.	170	67
4-Chloroaniline	5	1.	170	67
4-Chlorophenyl-phenylether	5	2	170	33
4-Methylphenol	5	2.	170	67
4-Nitroaniline	5	1.	170	67
4-Nitrophenol	30	10	500	170
Acenaphthene	5	1.	170	33
Acenaphthylene	5	1.	170	33
Anthracene	5	1.	170	33
Benzo(a)anthracene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Benzo(b)fluoranthene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
bis(2-Chloroethoxy)methane	5	1.	170	33

Table B4-15 – Continued

TCL3.2 Semivolatiles by GC/MS (8270C)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
bis(2-Chloroethyl)ether	5	1.	170	33
bis(2-Ethylhexyl)phthalate	5	2.	330	67
Butylbenzylphthalate	5	2.	170	67
Carbazole	5	1.	170	33
Chrysene	5	1.	170	33
Dibenz(a,h)anthracene	5	1.	170	33
Dibenzofuran	5	1.	170	33
Diethylphthalate	5	2.	170	67
Dimethylphthalate	5	2.	170	67
Di-*n*-butylphthalate	5	2.	170	67
Di-*n*-octylphthalate	5	2.	170	67
Fluoranthene	5	1.	170	33
Fluorene	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
Hexachloroethane	5	1.	170	33
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Isophorone	5	1.	170	33
Naphthalene	5	1.	170	33
Nitrobenzene	5	1.	170	33
n-Nitroso-di-*n*-propylamine	5	1.	170	33
n-Nitrosodiphenylamine[1]	5	2.	170	33
Pentachlorophenol	15	3.	500	170
Phenanthrene	5	1.	170	33
Phenol	5	1.	170	33
Pyrene	5	1.	170	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1] *n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-16

TCL4.3 Semivolatiles by GC/MS (8270C)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1'-Biphenyl	5	1.	170	33
2,2'-Oxybis(1-Chloropropane)	5	1.	170	33
2,4,5-Trichlorophenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
2,4-Dichlorophenol	5	1.	170	33
2,4-Dimethylphenol	10	3	170	67
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	5	1.	170	67
2,6-Dinitrotoluene	5	1.	170	33
2-Chloronaphthalene	5	2	170	33
2-Chlorophenol	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
2-Methylphenol	5	1.	170	67
2-Nitroaniline	5	1.	170	33
2-Nitrophenol	5	1.	170	33
3,3'-Dichlorobenzidine	5	2	330	100
3-Nitroaniline	5	1.	170	67
4,6-Dinitro-2-methylphenol	15	5.	500	170
4-Bromophenyl-phenylether	5	1.	170	33
4-Chloro-3-methylphenol	5	1.	170	67
4-Chloroaniline	5	1.	170	67
4-Chlorophenyl-phenylether	5	2	170	33
4-Methylphenol	5	2.	170	67
4-Nitroaniline	5	1.	170	67
4-Nitrophenol	30	10	500	170
Acenaphthene	5	1.	170	33
Acenaphthylene	5	1.	170	33
Acetophenone	5	2.	170	67
Anthracene	5	1.	170	33
Atrazine	5	2	170	33
Benzaldehyde	5	1.	170	67
Benzo(a)anthracene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Benzo(b)fluoranthene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
bis(2-Chloroethoxy)methane	5	1.	170	33
bis(2-Chloroethyl)ether	5	1.	170	33

Table B4-16 – Continued

TCL4.3 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
bis(2-Ethylhexyl)phthalate	5	2.	330	67
Butylbenzylphthalate	5	2.	170	67
Caprolactam	15	5.	170	33
Carbazole	5	1.	170	33
Chrysene	5	1.	170	33
Dibenz(a,h)anthracene	5	1.	170	33
Dibenzofuran	5	1.	170	33
Diethylphthalate	5	2.	170	67
Dimethylphthalate	5	2.	170	67
Di-*n*-butylphthalate	5	2.	170	67
Di-*n*-octylphthalate	5	2.	170	67
Fluoranthene	5	1.	170	33
Fluorene	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
Hexachloroethane	5	1.	170	33
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Isophorone	5	1.	170	33
Naphthalene	5	1.	170	33
Nitrobenzene	5	1.	170	33
n-Nitroso-di-*n*-propylamine	5	1.	170	33
n-Nitrosodiphenylamine[1]	5	2.	170	33
Pentachlorophenol	15	3.	500	170
Phenanthrene	5	1.	170	33
Phenol	5	1.	170	33
Pyrene	5	1.	170	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1] *n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-17

Volatiles Halocarbons and Aromatics by GC (8021B)

	Waters	
Compound Name	LOQ* (µg/L)	MDL (µg/L)
1,1,1-Trichloroethane	2.	0.5
1,1,2,2-Tetrachloroethane	2.	0.5
1,1,2-Trichloroethane	2.	0.5
1,1-Dichloroethane	2.	0.5
1,1-Dichloroethene	2.	0.5
1,2-Dichlorobenzene	2.	0.5
1,2-Dichloroethane	2.	0.5
1,2-Dichloropropane	2.	0.5
1,3-Dichlorobenzene	2.	0.5
1,4-Dichlorobenzene	2.	0.5
Benzene	2.	0.5
Bromodichloromethane	2.	0.5
Bromoform	2.	0.5
Bromomethane	5.	0.5
Carbon Tetrachloride	2.	0.5
Chlorobenzene	2.	0.5
Chloroethane	2.	0.5
Chloroform	2.	0.5
Chloromethane	5.	0.5
cis-1,2-Dichloroethene	2.	0.5
cis-1,3-Dichloropropene	2.	0.5
Dibromochloromethane	2.	0.5
Dichlorodifluoromethane	2.	0.5
Ethylbenzene	2.	0.5
Methylene Chloride	2.	0.5
Tetrachloroethene	2.	0.5
Toluene	2.	0.5
trans-1,2-Dichloroethene	2.	0.5
trans-1,3-Dichloropropene	2.	0.5
Trichloroethene	2.	0.5
Trichlorofluoromethane	2.	0.5
Vinyl Chloride	2.	0.5
Xylene (total)	3.	0.6

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-18

Petroleum Analysis by GC (8021B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Benzene	1.	0.2	0.005	0.002
Ethylbenzene	1.	0.2	0.005	0.002
Methyl *t*-butyl ether	1.	0.3	0.02	0.005
Naphthalene	5.	1.	0.02	0.01
Toluene	1.	0.2	0.005	0.002
Total Xylene	3.	0.6	0.015	0.005

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and my not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-19

TPH GRO/DRO by GC (8015B)

Compound Name	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
TPH-DRO	0.1	0.029	12	4.
TPH-GRO	0.05	0.02	1.	0.2

NOTE: MDLs listed are higher than determined MDLs. This is because the method sums the total detectable area under the chromatographic plot in region of interest, instead of actual fuel peak area as the respective fuel.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-20

Pesticide (8081A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4-DDD	0.02	0.004	1.7	0.33
4,4-DDE	0.02	0.005	1.7	0.33
4,4-DDT	0.02	0.006	1.7	0.33
Aldrin	0.02	0.004	0.83	0.19
alpha-BHC	0.01	0.0027	1.	0.33
beta-BHC	0.024	0.008	2.	0.61
Chlordane	0.5	0.07	17	4.
delta-BHC	0.024	0.008	0.83	0.17
Dieldrin	0.02	0.004	1.7	0.33
Endosulfan I	0.01	0.003	0.83	0.22
Endosulfan II	0.02	0.004	1.7	0.33
Endosulfan sulfate	0.04	0.012	1.7	0.33
Endrin	0.02	0.004	1.7	0.33
Endrin aldehyde	0.1	0.02	1.7	0.33
gamma-BHC (Lindane)	0.01	0.002	0.83	0.17
Heptachlor	0.01	0.003	0.83	0.17
Heptachlor epoxide	0.024	0.008	0.83	0.17
Methoxychlor	0.1	0.03	8.3	1.7
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-21

Appendix IX Organochlorine Pesticides (8081A)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4-DDD	0.02	0.004	1.7	0.33
4,4-DDE	0.02	0.005	1.7	0.33
4,4-DDT	0.02	0.006	1.7	0.33
Aldrin	0.02	0.004	0.83	0.19
alpha-BHC	0.01	0.0027	1.	0.33
beta-BHC	0.024	0.008	2.	0.61
Chlordane	0.5	0.07	17	4.
delta-BHC	0.024	0.008	0.83	0.17
Dieldrin	0.02	0.004	1.7	0.33
Endosulfan I	0.01	0.003	0.83	0.22
Endosulfan II	0.02	0.004	1.7	0.33
Endosulfan sulfate	0.04	0.012	1.7	0.33
Endrin	0.02	0.004	1.7	0.33
Endrin aldehyde	0.1	0.02	1.7	0.33
gamma-BHC (Lindane)	0.01	0.002	0.83	0.17
Heptachlor	0.01	0.003	0.83	0.17
Heptachlor epoxide	0.024	0.008	0.83	0.17
Kepone	0.2	0.07	7.	2.3
Methoxychlor	0.1	0.03	8.3	1.7
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-22

TCL Pesticides (8081A)
(OLM03.2 and OLM04.3 lists)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4'-DDD	0.02	0.004	1.7	0.33
4,4'-DDE	0.02	0.005	1.7	0.33
4,4'-DDT	0.02	0.006	1.7	0.33
Aldrin	0.02	0.004	0.83	0.19
alpha-BHC	0.01	0.0027	1.	0.33
alpha-Chlordane	0.01	0.003	0.83	0.17
beta-BHC	0.024	0.008	2.	0.61
delta-BHC	0.024	0.008	0.83	0.17
Dieldrin	0.02	0.004	1.7	0.33
Endosulfan I	0.01	0.003	0.83	0.22
Endosulfan II	0.02	0.004	1.7	0.33
Endosulfan sulfate	0.04	0.012	1.7	0.33
Endrin	0.02	0.004	1.7	0.33
Endrin aldehyde	0.1	0.02	1.7	0.33
Endrin ketone	0.04	0.013	1.7	0.33
gamma-BHC/Lindane	0.01	0.002	0.83	0.17
gamma-Chlordane	0.01	0.003	3	1
Heptachlor	0.01	0.003	0.83	0.17
Heptachlor epoxide	0.024	0.008	0.83	0.17
Methoxychlor	0.1	0.03	8.3	1.7
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-23

PCB Compound List by GC (8082)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
PCB-1016	0.5	0.1	17	3.3
PCB-1221	0.5	0.1	17	5.2
PCB-1232	0.5	0.2	17	3.3
PCB-1242	0.5	0.1	17	3.3
PCB-1248	0.5	0.1	17	3.3
PCB-1254	0.5	0.1	17	3.3
PCB-1260	0.5	0.1	17	3.3

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-24

Appendix IX Organphosphate Pesticides (8141A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Bolstar	2.	0.4	67	22
Coumaphos	3.	0.68	67	22
Demeton-O	2.	0.4	67	22
Demeton-S	3.	0.85	67	22
Diazinon	4.	1.4	67	22
Dichlorvos	3.	1.	67	22
Disulfoton	2.	0.45	75	25
Dursban (Chlorpyrifos)	2.	0.4	67	22
EPN	4.	0.4	67	22
Ethion	2.	0.4	67	22
Ethoprop	3.	1.	67	22
Ethyl parathion	2.	0.4	67	22
Famphur	3.	0.8	67	22
Fensulfothion	15.	5.	67	22
Fenthion	2.	0.4	67	22
Guthion (Azinphos-methyl)	4.	0.6	67	22
Malathion	3.	0.8	67	22
Merphos	6.	2.	67	22
Methyl parathion	2.	0.4	67	22
Mevinphos	4.	1.1	67	22
Naled	3.	0.4	67	22
Phorate	2.	0.4	67	22
Ronnel	2.	0.4	67	22
Stirophos	2.	0.65	67	22
Tokuthion	2.	0.4	67	22
Trichloronate	2.	0.4	67	22
Trithion	2.	0.4	67	22

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-25

Herbicides by GC (8151A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2,4,5-T	0.05	0.013	1.7	0.75
2,4,5-TP	0.05	0.01	1.7	0.75
2,4-D	0.5	0.16	17	5.
2,4-DB	1.	0.3	17	5.3
2,4-DP (Dichlorprop)	0.5	0.16	17	5.
Dalapon	1.3	0.25	60	23
Dicamba	0.3	0.06	5.	1.6
Dinoseb	0.5	0.1	8.3	1.7
MCPA	1000	300	6000	2000
MCPP	200	50	2500	750
Pentachlorophenol	0.05	0.027	1.7	0.33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-26

PAHs by HPLC (8310)

	Waters		Soils**	
Compound Name	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1-Methylnaphthalene	20	2.2	330	80
2-Methylnaphthalene	20	2.1	330	80
Acenaphthene	16	0.9	270	40
Acenapthylene	16	1.4	270	40
Anthracene	0.2	0.04	5.3	0.6
Benzo(a)anthracene	0.1	0.02	6.7	1.3
Benzo(a)pyrene	0.1	0.02	13	2.0
Benzo(b)fluoranthene	0.2	0.04	13	2.7
Benzo(g,h,i)perylene	0.6	0.1	13	2.7
Benzo(k)fluoranthene	0.1	0.02	6.7	1.3
Chrysene	0.4	0.08	13	2.0
Dibenzo(a,h)anthracene	0.2	0.04	5.3	2.0
Fluoranthene	0.2	0.04	5.3	1.3
Fluorene	0.8	0.5	27	4.0
Indeno(1,2,3-cd)pyrene	0.4	0.08	13	3.3
Naphthalene	12	1.3	330	47
Phenanthrene	0.4	0.08	13	2.0
Pyrene	0.8	0.18	27	4.7

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

B5. Quality Control

The particular types and frequencies of quality control checks analyzed with each sample are defined in *USEPA SW-846 3rd Edition, Update III, 1996*; *Standard Methods for the Examination of Water and Wastewater, 20th edition;* and *Methods for the Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020*. The quality control checks routinely performed during sample analysis include blanks, laboratory control samples, surrogates, duplicates, internal standards, and matrix spikes. In addition to these checks, some inorganic analyses employ serial dilutions and interference check samples.

Blanks (method, preparation) – Blanks are an analytical control consisting of a volume of deionized, distilled laboratory water for water samples, or a purified solid matrix for soil/sediment samples. (Metals use a digested reagent blank with soils.) They are treated with the same reagents, internal standards, and surrogate standards and carried through the entire analytical procedure. The blank is used to define the level of laboratory background contamination.

Laboratory Control Samples (LCS) or Reference materials – Aqueous and solid control samples of known composition are analyzed using the same sample preparation, reagents, and analytical methods employed for the sample. These materials may be purchased from NIST or commercial supply houses either as neat compounds or as solutions with certified concentrations, or prepared in the technical department. The accuracy and quality of the purchased standards are documented on certificates provided by the supply houses. Certificates are maintained on file in the laboratory. The accuracy information determined from reference materials and laboratory control samples is valuable because variables specific to sample matrix are eliminated. The acceptance criteria for this type of quality control is either dictated by the agency from whom the material is obtained or by statistical analysis of past information generated in the technical department. A LCS is analyzed with every sample preparation batch to demonstrate accuracy of the procedure and process control.

Surrogates (used for organic analysis only) – Each sample, matrix spike, matrix spike duplicate, and blank are spiked with surrogate compounds prior to purging and extraction in order to monitor preparation and analysis. Surrogates are used to evaluate analytical efficiency by measuring recovery. The recovery data is compared to method stipulated or statistically generated limits.

Duplicates (matrix or LCS spike duplicate – organics and inorganics; duplicate-inorganics) – A second aliquot of a matrix/sample is analyzed at the same time as the original sample in order to determine the precision of the method. The relative percent difference (RPD) between the two determinations is calculated and compared to values prescribed by the EPA or the laboratory's statistically generated limits.

Internal Standards (used for GC/MS and some GC analysis) – Internal standards are compounds added to every standard, blank, LCS, matrix spike, matrix spike duplicate, and sample at a known concentration, prior to analysis. The peak areas of the internal standards are used for internal standard quantitation as well as monitoring changes in the instrument response that may adversely affect quantification of target compounds.

Matrix Spikes – Matrix spikes are samples fortified with a target analyte and subjected to the entire analytical procedure. The recovery of the analyte(s) is calculated and indicates the appropriateness of the method for the matrix.
The matrix spike and its duplicate is a pair of fortified samples from the same source. Analysis of the matrix spike duplicates yields precision and accuracy information. The acceptance criteria for percent recovery of spiked samples is prescribed by the EPA or determined by statistical analysis of historical data generated in the technical department.

Serial Dilutions (used for inorganics ICP, and ICP/MS only) – If the analyte concentration is sufficiently high, an analysis of a five-fold dilution must agree within 10% of the original determination. If the dilution analysis is not within 10%, a chemical or physical interference effect should be suspected.

Interference Check Sample (ICP and ICP/MS) – To verify interelement and background correction factors a solution containing both interfering and analyte elements of known concentration is analyzed at the beginning and end of each analysis run or a minimum of twice per 8 hours.

Second Source Check – A second source check is analyzed using either the LCS or an ICV (Initial Calibration Verification). The second source is a standard that is made from a solution or neat purchased from a different vendor than that used for the calibration standards. For some organic custom mixes, the same vendor but a different lot and preparation is used. This ensures that potential problems with a vendor supply would be evident in the analysis. Some areas of the lab may use the continuing calibration verification standards as a second source from the initial calibration.

The results of all quality control samples are entered into the LIMS in the same way as the results of client samples. The computer is programmed to compare the individual values with the acceptance limits (statistically determined or method specified) and inform the analyst if the results of the quality control tests are in or out of specification. If the results are not within the acceptance criteria, corrective action suitable to the situation must be taken. This may include, but is not limited to, checking calculations, examining other quality control analyzed with the same batch of samples, qualifying results with a comment stating the observed deviation, and reanalysis of the samples in the batch. In addition, computerized reports on the results for all quality control analyses (including mean and standard deviation) are generated monthly. These are used by the Quality Assurance Department to check for trends that may indicate method bias. Control charts are plotted via computer and may be accessed at any time by all analysts.

The following tables list the specific QC used for each method and the applicable QC windows. These windows are generated statistically and are subject to change. Statistical limits are determined for recovery and relative percent difference (RPD) data using historical data (minimum of 20 data points) and applying a 99% confidence interval around the mean. The limits are generated every 6 months for SW-846 methods and annually for other methods, and updated as needed. The tables list the full list of analytes for a method. Sublists (TCL, PPL, etc.) may be reported based on the clients requirements. See Element B4 for the particular analytes associated with a regulatory list.

Table B5-1

Quality Control
Inorganics

Type	Acceptance Limits (%)	Frequency	Corrective Action
Matrix Spikes:	See Table B5-2 See Table B5-2A for ICP/MS	Each group of samples of similar matrix/level (≤20) each method	Analyze post-digestion spike sample
Matrix Spike Duplicate (RPD):	±20% RPD	Each group of samples of similar matrix/level (≤20) each method	Analyze post-digestion spike sample if not already run for MS, flag the data
Duplicates (RPD):	±20% RPD for sample values ≥5× LOQ	Each group of samples of similar matrix/level (≤20) each method	Flag the data
Blanks: Initial Calibration (ICB) Continuing Calibration (CCB)	**ICP and ICP/MS:** <3× IDL or blank <1/10 conc. of action level and samples not ±10% of action level **GFAA and CVAA:** <LOQ	Each element immediately after calibration verification at 10% frequency or every 2 hours (beginning and end of run min.)	Correct problem, recalibrate, and rerun
Preparation Blank (PB)	≤LOQ	Each SDG or batch (≤20 samples)	Redigest and reanalyze blank and associated samples if sample result <20× blank result
Serial Dilutions (excluding Hg):	Within ±10% of the original determination	Each group (≤20) of similar matrix/level	Flag the data
Interference Check Sample (ICP and ICP/MS only):	±20% of the true value for the analytes	Each element after Initial Calibration Verification at beginning and end of the run or min. of 2× per 8 hour	Recalibrate the instrument
Laboratory Control Sample:	See Table B5-2 See Table B5-2A for ICP/MS	Each SDG or batch (≤20 samples), each method	Redigest and reanalyze LCS and associated samples. Elements in the LCS that fail high and are ND in the samples can be reported.

Table B5-1 – Continued

Quality Control
Metals

Type	Acceptance Limits (%)	Frequency	Corrective Action
Post Digestion Spike:	**ICP and ICP/MS:** 75% to 125% **GFAA and CVAA:** 85% to 115%	When matrix spikes are outside 75% to 125% range, or the stastical wiwndow (whichever is tighter)	Flag the data

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for TAL, PPL, and Appendix IX metals.

Table B5-2

Statistical Acceptance Limits for Metals

Analyte	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Aluminum	90-112	75-125	85-115	75-125
Antimony	80-120	75-125	0-211	75-125
Arsenic	80-120	75-125	80-119	75-125
Barium	90-110	75-125	83-117	75-125
Beryllium	90-111	87-114	83-117	83-111
Boron	90-110	88-111	64-136	80-110
Cadmium	90-112	83-116	82-118	75-125
Calcium	90-112	75-125	81-119	75-125
Chromium	90-110	81-120	79-121	75-125
Cobalt	90-110	87-112	82-118	81-110
Copper	90-112	86-122	83-117	75-125
Iron	90-112	75-125	35-165	75-125
Lead[1]	90-113	75-125	82-118	80-120
Magnesium	89-110	75-125	78-122	75-125
Manganese	90-110	75-125	82-118	75-125
Mercury[2]	80-120	80-120	66-133	80-120
Molybdenum	90-110	89-112	80-120	77-10
Nickel	90-111	86-115	82-118	75-125
Potassium	88-119	75-125	73-127	75-125
Selenium	80-120	75-125	78-122	81-112
Silver	90-117	75-125	66-134	75-125
Sodium	80-120	75-125	64-136	75-125
Strontium	90-110	90-110	80-120	80-111
Thallium	80-120	75-125	77-123	78-109
Tin	90-110	86-118	70-130	80-110
Titanium	90-113	90-110	85-115	75-125
Vanadium	90-110	90-111	68-132	75-125
Zinc	90-111	75-125	79-121	75-125

[1] Analyzed by GFAA

[2] Analyzed by Cold Vapor

All other elements analyzed by ICP.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

The acceptance limits above pertain to the TAL, PPL and Appendix IX lists.

Table B5-2A

Acceptance Limits for ICP/MS

Analyte	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Antimony	80-120	75-125	0-264	75-125
Arsenic	80-120	75-125	79-121	75-125
Barium	80-120	75-125	81-119	75-125
Beryllium	80-120	75-125	80-120	75-125
Cadmium	80-120	75-125	81-119	75-125
Chromium	80-120	75-125	73-127	75-125
Copper	80-120	75-125	82-118	75-125
Lead	80-120	75-125	82-118	75-125
Nickel	80-120	75-125	82-118	75-125
Selenium	80-120	75-125	74-126	75-125
Silver	80-120	75-125	47-154	75-125
Thallium	80-120	75-125	78-122	75-125
Zinc	80-120	75-125	78-121	75-125

Acceptance limits are statistically derived or method-specified, whichever is more stringent.

Table B5-3

Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
Moisture:			
LCS/LCSD:	See Table B5-4	Each group (≤20) of samples	Batch is repeated
Duplicate:	≤15%	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Cyanide, total:			
Initial Calibration Blank (ICB):	≤LOQ	After every calibration	Recalibrate
Continuing Calibration Blank (CCB):	≤LOQ	After each CCV, which is every 10 samples	Reanalyze bracketed sample
Prep Blank (PB):	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested, or if there is not sufficient volume for Matrix QC)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and cyanide is ND in the sample, can be reported.
MS:	See Table B5-4	Every 10 samples	Post digestion spike is performed, MSA is performed for CN by SW-846 9012A
Duplicates:	≤20%	Every 10 samples	Ensure that LCS meets acceptance criteria
Phenolics, total:			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and phenolics are ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Every 10 samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤20%	Every 10 samples	Ensure that LCS meets acceptance criteria
Sulfide, total:			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and sulfide is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicate:	≤20% (statistically evaluated)	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria

Table B5-3 – Continued

Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
TPH (418.1):			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and TPH is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤34% wastewater ≤21% solid waste	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Hexane Extractable Materials (1664A):			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and HEM is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤18%	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
TOC:			
Initial Calibration Blank (ICB): Continuing Calibration Blank (CCB): Prep Blank (PB):	≤LOQ ≤LOQ ≤LOQ	After every calibration After every 10 injections Each group (≤20) of samples	Recalibrate Reanalyze bracketed sample Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and TOC is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Every 10 samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤4%	Every 10 samples	Ensure that LCS meets acceptance criteria

Table B5-3 – Continued

Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
Total Nitrite/Nitrate:			
Initial Calibration Blank (ICB):	≤LOQ	After initial calibration	Repeat calibration
Prep Blank (PBW):	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and total nitrite/nitrate is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤2%	Every 10 samples	Ensure that LCS meets acceptance criteria

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-4

Quality Control
Statistical Acceptance Limits for Miscellaneous Chemistry

Parameter	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Cyanide, total	90-110	83-111	90-110	59-124
HEM (1664A)	79-114	79-114	N/A	N/A
Moisture	N/A	N/A	99-101	N/A
Phenolics, total	80-109	73-115	82-113	38-175
Sulfide, total	80-120	86-113	N/A	N/A
TOC	80-120	62-148	40-148	51-115
Total Nitrite/Nitrate	90-110	90-110	N/A	N/A
TPH (418.1)	54-113	39-132	64-115	30-128

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-5

Quality Control
Volatiles by GC/MS (8260B)

	Acceptance Limits (%)			
Type	Waters	Soils	Frequency	Corrective Action
Surrogates: Toluene-d_8 Bromofluorobenzene 1,2-Dichloroethane-d_4 Dibromofluoromethane	 85-112 83-113 82-112 81-120	 70-130 70-128 70-121 70-129	Each sample, MS, MSD, LCS, and blank	Reanalyze sample if outside limits; if reanalysis confirms original, document on report and/or case narrative
Matrix Spikes: Spike all compounds of interest	See Table B5-6		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-6		Each group (≤20) of samples per matrix/level	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Spike all compounds of interest	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		Once for each 12-hour time period or ≤20 samples	Reanalyze blank and associated samples if blank outside limits
Internal Standards: Chlorobenzene-d_5 1,4-Dichlorobenzene-d_4	-50% to +100% of internal standard area of 12-hour STD RT Change ≤30 sec.		Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report or case narrative

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for PPL, Appendix IX, and TCL lists.

Table B5-6

Statistical Acceptance Limits for Volatiles by GC/MS (8260B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
1,1,1,2-Tetrachloroethane	83-114	83-119	78-115	58-115
1,1,1-Trichloroethane	83-127	81-142	74-127	64-118
1,1,2,2-Tetrachloroethane	72-119	73-121	64-121	37-142
1,1,2-Trichloroethane	86-113	77-125	81-112	64-118
1,1-Dichloroethane	83-127	85-135	82-116	65-115
1,1-Dichloroethene	76-122	87-145	74-115	56-113
1,1-Dichloropropene	84-116	86-134	75-121	57-114
1,2,3-Trichlorobenzene	67-114	65-127	63-120	10-122
1,2,3-Trichloropropane	78-117	73-125	69-119	44-140
1,2,4-Trichlorobenzene	65-114	60-121	60-116	11-121
1,2,4-Trimethylbenzene	78-117	80-125	74-117	47-122
1,2-Dibromo-3-chloropropane	62-128	52-137	49-127	39-128
1,2-Dibromoethane	81-114	78-120	77-114	66-108
1,2-Dichlorobenzene	81-112	82-117	81-109	50-111
1,2-Dichloroethane	77-132	70-143	76-126	62-130
1,2-Dichloropropane	80-117	83-129	78-119	64-112
1,3,5-Trimethylbenzene	78-116	77-124	74-112	52-117
1,3-Dichlorobenzene	81-114	79-123	76-112	47-109
1,3-Dichloropropane	84-119	82-121	80-115	66-110
1,4-Dichlorobenzene	84-116	81-122	78-108	47-109
2,2-Dichloropropane	74-130	79-146	72-123	64-115
2-Butanone	52-163	57-137	45-154	37-148
2-Chloroethyl Vinyl Ether	66-125	1-156	26-148	22-133
2-Chlorotoluene	78-115	78-121	73-114	53-113
2-Hexanone	61-140	60-135	38-154	33-146
4-Chlorotoluene	80-112	81-123	75-110	52-113
4-Methyl-2-pentanone	70-130	68-133	51-141	37-138
Acetone	32-200	48-143	26-198	26-184
Acrolein	26-151	19-154	52-128	10-135
Acrylonitrile	67-128	63-132	58-122	43-117
Benzene	78-119	83-128	84-115	59-120
Bromobenzene	82-110	83-121	77-113	52-118
Bromochloromethane	83-121	82-129	75-121	65-116
Bromodichloromethane	83-121	80-129	77-116	57-117
Bromoform	69-118	64-119	63-120	54-114

Table B5-6 – Continued

Statistical Acceptance Limits for
Volatiles by GC/MS (8260B)

	Waters		Soils	
Compound Name	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Bromomethane	47-129	54-141	61-118	50-114
Carbon Disulfide	69-119	74-135	69-109	45-107
Carbon Tetrachloride	77-130	82-149	76-122	56-120
Chlorobenzene	85-115	83-120	81-112	58-109
Chloroethane	57-125	56-140	63-120	52-114
Chloroform	86-124	83-139	81-117	69-117
Chloromethane	47-132	46-149	58-123	38-115
cis-1,2-Dichloroethene	84-117	83-126	84-113	67-110
cis-1,3-Dichloropropene	78-114	80-126	80-113	58-113
Dibromochloromethane	78-119	82-119	79-118	69-113
Dibromomethane	87-117	82-128	79-118	69-113
Dichlorodifluoromethane	26-157	31-185	28-134	15-127
Ethylbenzene	82-119	82-129	82-115	54-116
Hexachlorobutadiene	62-119	51-135	57-122	11-123
Isopropylbenzene	80-120	81-130	82-110	41-120
m+p-Xylene	83-113	82-130	82-117	44-127
Methylene Chloride	85-120	79-133	75-120	42-131
Naphthalene	61-116	50-124	52-121	10-123
n-Butylbenzene	75-120	73-134	68-116	17-131
n-Propylbenzene	78-119	74-138	76-122	46-121
o-Xylene	83-113	82-130	82-117	44-127
p-Isopropyltoluene	72-118	72-128	72-113	43-117
sec-Butylbenzene	72-120	73-137	72-112	38-124
Styrene	82-111	69-131	79-108	48-111
tert-Butylbenzene	74-114	76-128	72-113	44-118
Tetrachloroethene	74-125	78-133	70-117	40-140
Toluene	85-115	83-127	81-116	38-131
trans-1,2-Dichloroethene	83-117	82-133	77-113	60-110
trans-1,3-Dichloropropene	79-114	77-123	79-112	60-110
Trichloroethene	87-117	83-136	81-114	48-124
Trichlorofluoromethane	57-141	64-165	58-125	49-127
Vinyl Chloride	54-143	54-143	60-118	48-113
Xylene (Total)	83-113	82-130	82-117	44-127
Allyl Chloride	73-129	65-145	75-126	59-121
2-Chloro-1,3-butadiene	62-139	61-161	61-134	35-133

Table B5-6 – Continued

Statistical Acceptance Limits for
Volatiles by GC/MS (8260B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
trans-1,4-Dichloro-2-butene	49-135	37-141	57-125	45-124
1,2-Dichloroethene (Total)	84-117	83-126	79-113	61-111
1,4-Dioxane	54-139	44-148	52-124	42-126
Ethyl Methacrylate	77-118	74-120	67-114	32-125
Isobutyl Alcohol	48-144	48-151	42-143	25-134
Methacrylonitrile	80-125	68-131	70-131	50-128
Methyl Iodide	70-116	72-128	67-119	53-115
Methyl Methacrylate	72-121	68-126	61-121	47-122
Propionitrile	68-137	62-142	61-137	52-131
Vinyl Acetate	68-134	62-137	41-148	10-181

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-7

Quality Control
Semivolatiles by GC/MS (8270C)

	Acceptance Limits (%)			
Type	Waters	Soils	Frequency	Corrective Action
Surrogates:			Each sample, MS, MSD, LCS, and blank	Repeat extraction and analysis; if reanalysis confirms originals, document on report and/or case narrative
Nitrobenzene-d_5	54-124	47-128		
2-Fluorobiphenyl	64-112	55-123		
Terphenyl-d_{14}	43-116	49-133		
Phenol-d_6	10-80	45-120		
2-Fluorophenol	23-94	41-119		
2,4,6-Tribromophenol	40-136	46-136		
Matrix Spikes: Spike all compounds of interest	See Table B5-8 for acceptance limits		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Sample: Spike all compounds of interest	See Table B5-8 for acceptance limits		Each group (≤20) of samples per matrix/level	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Same as for matrix spikes	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		Once per extraction group (≤20) of samples, each matrix/level	Re-extract and reanalyze blank and associated samples
Internal Standards: 1,4-Dichlorobenzene-d_4 Naphthalene-d_8 Acenaphthene-d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene-d_{12}	-50% to +100% of internal standard area of 12-hour STD RT change ≤30 sec.		Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for PPL, Appendix IX, and TCL lists.

Table B5-8

Statistical Acceptance Limits for Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
1,1'-Biphenyl	73-106	72-113	69-108	39-146
1,2,4,5-Tetrachlorobenzene	74-109	72-102	67-117	60-119
1,2,4-Trichlorobenzene	61-113	65-105	68-105	54-118
1,2-Dichlorobenzene	58-100	59-106	59-108	40-117
1,2-Diphenylhydrazine	62-106	60-113	62-115	56-125
1,3,5-Trinitrobenzene	21-154	45-124	5-111*	5-126*
1,3-Dichlorobenzene	52-106	55-105	56-103	41-117
1,3-Dinitrobenzene	78-113	75-112	73-113	59-119
1,4-Dichlorobenzene	54-103	50-112	58-104	42-118
1,4-Dinitrobenzene	70 -130	70-130	80-110	65-110
1,4-Dioxane	37-79	29-76	19-65	15-67
1,4-Naphthoquinone	70-130	70-130	70-130	70-130
1,4-Phenylenediamine	70-130	70-130	70-130	70-130
1-Methylnaphthalene	65-107	60-126@	69-104	39-142
1-Naphthylamine	40-105	5-124*	5-73*	5-125*
2,2'-oxybis(1-Chloropropane)	70-143	71-140	70-134	50-146
2,3,4,6-Tetrachlorophenol	61-131	44-125	72-125	18-153
2,4,5-Trichlorophenol	70-115	37-128	73-104	23-143
2,4,6-Trichlorophenol	69-111	35-138	73-112	27-149
2,4-Dichlorophenol	66-110	33-135	74-105	35-138
2,4-Dimethylphenol	60-107	9-139	68-103	43-135
2,4-Dinitrophenol	52-124	20-154*	33-122	20-152*
2,4-Dinitrotoluene	75-122	52-130	73-115	44-138
2,6-Dichlorophenol	70-112	74-100	70-113	60-116
2,6-Dinitrotoluene	70-108	71-111	75-109	50-132
2-Acetylaminofluorene	49-127	74-114	64-117	55-119
2-Chloronaphthalene	56-100	53-96	60-101	42-110
2-Chlorophenol	63-112	20-144	73-105	48-125
2-Methylnaphthalene	64-105	58-110	67-101	39-127
2-Methylphenol	56-105	9-122	64-112	39-129
2-Naphthylamine	8-88	5-118*	5-47*	5-107*
2-Nitroaniline	73-115	63-125	76-117	45-139
2-Nitrophenol	82-121	43-148	74-113	36-146
2-Picoline	52-96	51-95	47-102	40-109
3- or 4-methylphenol	52-97	30-114	65-113	40-132
3,3'-Dichlorobenzidine	52-113	27-128	12-107	3-142*
3,3'-Dimethylbenzidine	10-103*	10-88*	22-111	10-122*
3-Methylcholanthrene	46-128	64-112	71-111	49-114
3-Nitroaniline	63-112	42-134	46-108	27-140
4,6-Dinitro-2-methylphenol	74-122	21-150	56-120	5-156*

Table B5-8 – Continued

Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
4-Aminobiphenyl	4-66	2-90*	5-55*	5-102*
4-Bromophenyl phenylether	67-110	76-112	70-111	52-136
4-Chloro-3-methylphenol	72-114	22-157	61-134	48-135
4-Chloroaniline	42-115	20-123	2-116*	2-130*
4-Chlorophenyl phenylether	65-110	62-113	69-110	50-128
4-Methylphenol	51-98	2-129	64-116	36-136
4-Nitroaniline	55-107	38-118	45-101	22-129
4-Nitrophenol	9-78	10-100*	57-123	5-165*
4-Nitroquinoline-1-oxide	20-115*	20-126*	10-80*	10-50*
5-Nitro-*o*-toluidine	37-92	20-96	28-62	1-106
7,12-Dimethylbenz(a)anthracene	50-101	32-134	67-125	24-148
a,a-Dimethylphenethylamine	70-130	70-130	70-130	70-130
Acenaphthene	68-111	68-117	74-110	48-129
Acenaphthylene	76-117	71-118	79-115	45-144
Acetophenone	65-114	78-99	73-105	24-146
Aniline	56-105	40-110	32-107	5-162*
Anthracene	68-108	68-115	69-109	17-161
Aramite	20-60	14-67	70-130	70-130
Atrazine	63-124	45-125	65-137	16-156
Benzaldehyde	1-67	1-63	2-46*	2-124*
Benzenethiol	5-75*	70-130	1-53	70-130
Benzidine	20-163*	10-148*	35-115*	35-134*
Benzo(a)anthracene	71-113	65-116	72-112	22-158
Benzo(a)pyrene	68-121	66-120	71-119	25-154
Benzo(b)fluoranthene	65-122	61-125	66-123	12-165
Benzo(g,h,i)perylene	67-126	64-124	66-120	28-148
Benzo(k)fluoranthene	67-120	64-120	67-121	21-154
Benzoic Acid	6-59*	6-81*	20-159	5-173*
Benzyl alcohol	51-99	72-89	64-116	57-117
bis (2-Chloroethoxy)methane	69-119	64-128	75-114	50-137
bis(2-Chloroethyl)ether	57-110	69-103	60-112	41-122
bis(2-Chloroisopropyl)ether	68-133	66-142	68-132	52-152
bis(2-Ethylhexyl)phthalate	62-126	61-118	63-131	33-148
Butylbenzylphthalate	63-120	60-117	69-117	46-138
Caprolactam	16-37	16-36	69-112	1-181
Carbazole	66-109	32-154	69-109	36-143
Chlorobenzilate	67-115	55-119	68-123	59-125
Chrysene	70-111	67-115	71-112	19-158
Diallate (cis/trans)	69-122	80-98	79-120	56-127
Dibenz(a,h)anthracene	68-129	70-131	70-130	36-151

Table B5-8 – Continued

Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Dibenzofuran	70-109	65-110	72-107	37-135
Diethylphthalate	61-110	43-127	75-109	49-128
Dimethoate	3-109*	3-75*	5-66*	5-138*
Dimethylphthalate	56-113	12-141	76-108	46-131
Diphenyl ether	67-102	69-108	82-102	64-113
Di-*n*-butylphthalate	63-113	62-111	68-112	49-128
Di-*n*-octylphthalate	58-118	55-119	61-117	38-147
Ethylmethanesulfonate	67-108	70-103	68-105	57-114
Fluoranthene	66-108	61-112	66-109	23-142
Fluorene	75-112	65-110	66-115	30-146
Hexachlorobenzene	68-113	62-117	69-114	45-138
Hexachlorobutadiene	40-127	48-125	66-112	45-129
Hexachlorocyclopentadiene	31-135	10-156	33-152	5-154*
Hexachloroethane	40-117	42-122	56-112	31-125
Hexachloropropene	51-124	50-132	61-123	3-168
Indeno(1,2,3-cd)pyrene	64-125	62-122	66-123	28-149
Isodrin	72-117	27-135	71-126	1-157
Isophorone	63-105	65-94	65-93	31-122
Isosafrole	65-97	69-96	69-96	61-106
Methapyrilene	70-130	70-130	27-171	70-130
Methylmethanesulfonate	29-83	45-80	38-87	22-98
Naphthalene	68-108	53-123	70-107	33-137
Nitrobenzene	61-111	55-126	68-105	38-136
n-Nitrosodiethylamine	66-110	67-104	66-103	58-110
n-Nitrosodimethylamine	39-84	37-87	52-108	43-113
n-Nitrosodi-*n*-butylamine	55-119	58-106	65-125	52-136
n-Nitrosodi-*n*-propylamine	56-109	27-137	61-109	35-133
n-Nitrosodiphenylamine	75-112	64-127	67-105	46-150
n-Nitrosomethylethylamine	61-111	57-108	63-106	57-107
n-Nitrosomorpholine	53-107	60-102	65-113	53-129
n-Nitrosopiperidine	70-110	76-99	73-106	61-118
n-Nitrosopyrrolidine	62-109	62-105	76-103	60-118
O,O,O-Triethylphosphorothioate	74-106	74-108	70-113	56-120
o-Toluidine	31-109	28-109	23-107	16-117
Pentachloroacetophenone	70-130	70-130	70-130	70-130
p-(Dimethylamino)azobenzene	2-158*	63-102	39-106	2-157
Pentachlorobenzene	79-108	73-104	67-110	24-145
Pentachloronitrobenzene	66-135	71-110	69-129	56-123
Pentachlorophenol	48-108	7-136	47-110	5-140
Phenacetin	66-126	66-112	70-117	63-121

Table B5-8 – Continued

Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Phenanthrene	68-111	68-116	70-107	4-176
Phenol	17-72	2-81	66-113	36-135
Pronamide	71-114	73-109	72-112	69-118
Pyrene	68-114	63-117	67-116	28-155
Pyridine	24-89	28-81	36-89	2-121*
Safrole	70-110	75-101	76-105	68-109
Tetraethyldithiopyrophosphate	59-120	68-117	63-114	58-123
Thionazin	67-115	70-104	64-125	42-143
a,a-Dimethylphenethylamine	1-77	4-65	70-130	70-130
N,N-dimethylformamide	70-130	70-130	70-130	70-130
N,N-diemthylacetamide	70-130	70-130	70-130	53-104
4,4'-Methylenebis(2-chloroaniline)	70-130	70-130	34-109	12-131
Indene	40-109	70-130	46-102	8-127
Quinoline	77-113	70-130	81-112	6-170
6-Methylchrysene	75-111	70-130	70-130	28-143
Dibenz(a,h)acridine	76-116	70-130	71-124	16-153
Phenothiazine	70-130	70-130	70-130	70-130
Dinoseb	70-130	70-130	70-130	70-130
Methyl Parathion	70-130	70-130	70-130	70-130
Octochlorostyrene	70-130	70-130	70-130	70-130
Parathion	70-130	70-130	70-130	70-130
Phorate	70-130	70-130	70-130	70-130
a-Methylstyrene	70-130	70-130	70-130	70-130
1,2,3,4-Tetrahydronaphthalene	70-130	70-130	70-130	70-130
1-Chloronaphthalene	70-130	70-130	70-130	70-130
Acylamide	70-130	70-130	70-130	70-130
Disulfoton	70-130	70-130	70-130	70-130
Famphur	70-130	70-130	70-130	70-130
(2-Bromoethyl)benzene	70-130	70-130	70-130	70-130
Dibenz(a,j)acridine	70-130	70-130	70-130	70-130

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

* = Lower limit adjusted for compound MDL.

@ = less than 20 data points.

All 70-130 windows are advisory due to insufficient data points except for 1,4-naphthoquinone,

1,4-phenylenediamine and methapyrilene. These windows are 70-130 are to the poor reproducibility of these compounds.

Table B5-9

Quality Control
Volatiles Halocarbons and Aromatics by GC (8021B)

Type	Waters Acceptance Limits (%)	Frequency	Corrective Action
Surrogates: Halocarbons; 1-Bromo-4-chlorobenzene (ELCD)	73-124	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix related problems are evident
Aromatics; 1-Bromo-4-chlorobenzene (PID)	72-122		
Halocarbons/Aromatics; 1-Bromo-4-chlorobenzene (ELCD/PID)	See above		
Non-halogenated; 2-hexanone (FID)	81-121		
Matrix Spikes: Spike all compounds of interest	See Table B5-10 for acceptance limits	Each group of samples of similar matrix/level (≤20) each method	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples/Check Standards: Spike all compounds of interest	See Table B5-10 for acceptance limits	Each group (≤20); LCSD is analyzed if sufficient volume is not available for MS/MSD	Reanalyze LCS and associated samples for compounds outside of acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Internal Standards: Fluorobenzene (ELCD/PID)	80-120	Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative; in cases where matrix is elevating the internal standard (ISTD) recovery, a dilution may be performed to bring the ISTD within specifications
Matrix Spike Duplicates (RPD): Same compounds as matrix spikes	≤30%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds	At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-10

Statistical Acceptance Limits for Volatiles Halocarbons and Aromatics by GC (8021B)

Compound Name	Waters	
	LCS/LCSD (%)	MS/MSD (%)
1,1,1-Trichloroethane	73-121	80-121
1,1,2,2-Tetrachloroethane	73-115	66-135
1,1,2-Trichloroethane	79-119	65-121
1,1-Dichloroethane	70-135	85-125
1,1-Dichloroethene	61-124	66-144
1,2-Dichlorobenzene	74-121	66-129
1,2-Dichloroethane	78-120	81-117
1,2-Dichloropropane	83-118	77-118
1,3-Dichlorobenzene	78-123	65-140
1,4-Dichlorobenzene	78-114	81-129
Benzene	75-114	77-131
Bromodichloromethane	81-115	80-118
Bromoform	72-126	64-143
Bromomethane	72-128	51-150
Carbon tetrachloride	67-116	81-128
Chlorobenzene	84-115	67-134
Chloroethane	65-130	67-146
Chloroform	75-121	81-119
Chloromethane	68-130	21-157
cis-1,2-Dichloroethene	67-120	71-136
cis-1,3-Dichloropropene	74-116	57-131
Dibromochloromethane	76-115	82-122
Dichlorodifluoromethane	58-150	51-181
Ethylbenzene	77-116	79-122
Methylene chloride	55-135	62-131
Tetrachloroethene	74-122	71-122
Toluene	76-116	88-122
trans-1,2-Dichloroethene	58-122	45-153
trans-1,3-Dichloropropene	72-119	55-123
Trichloroethene	71-117	62-136
Trichlorofluoromethane	67-128	47-154
Vinyl chloride	55-121	57-152
Xylene (total)	84-115	78-131

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-11

Quality Control
Petroleum Analysis by GC (8021B)

Type	Acceptance Limits (%)		Frequency	Corrective Action
	Waters	Soils		
Surrogates: α,α,α-Trifluorotoluene (PID)	66-136	72-122	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix-related problems are evident
Matrix Spikes: Spike all compounds of interest	See Table B5-12		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-12		Each group (≤20) of samples per matrix/level LCSD – analyzed if sufficient volume is not available for MS/MSD.	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD):	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by an analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits
Internal Standards: 1-Chloro-3-fluorobenzene (PID)	-50% to +150% if internal standard area		Each sample, MS, MSD, LCS, and blank analyzed on the PID	Reanalyze samples; if reanalysis confirms original, document on report or case narrative; in cases where matrix is elevating the ISTD recovery, a dilution may be performed to bring ISTD within specifications

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-12

Statistical Acceptance Limits for Petroleum Analysis by GC (8021B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Benzene	86-119	78-131	76-118	52-135
Ethylbenzene	81-119	75-133	77-115	56-132
MTBE	82-124	70-134	71-118	52-141
Naphthalene	52-136	50-146	61-117	53-122
Toluene	82-119	78-129	72-115	59-129
Total Xylenes	82-120	84-131	78-115	54-134

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-13

Quality Control
TPH-GRO by GC (8015B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: Trifluorotoluene (FID)	57-146	71-122	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix-related problems are evident
Matrix Spikes: Gasoline standard 8015B	63-154	39-118	Each group of samples of similar matrix/level (≤20) each method	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Gasoline standard	70-130	67-119	Each group (≤20) of samples. LCSD analyzed if sufficient volume is not available for MS/MSD.	Reanalyze LCS and associated samples. LCS that fails high, and GRO is ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Same compounds as matrix spikes	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ		At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-14

Quality Control
TPH-DRO by GC (8015B)

Type	Acceptance Limits (%) Waters	 Soils	Frequency	Corrective Action
Surrogates: *o*-Terphenyl	54-127	60-131	Added to each sample, MS/MSD, blank, and LCS/LCSD during the extraction phase	Repeat extraction and analysis; if reanalysis confirms original result, report results and comment in case narrative
Matrix Spikes: #2 Fuel Oil 8015B API California	41-145	37-153	Each group (≤20) of samples per matrix/level	Reinject if surrogates appear low. If still out of spec, evaluate for matrix effect. If matrix effect, accept based on LCS data. If no matrix effect, repeat batch.
Laboratory Control Samples: No. 2 Fuel	53-126	74-118	Each group ≤20	Reinject if surrogates appear low. If still out of spec, repeat batch. LCS that fails high, and DRO is ND in the sample, can be reported.
Laboratory Control Duplicates (RPD): #2 Fuel	≤20% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ		Once per case or extraction group (≤20) of samples, each matrix, level, instrument	Inject a solvent blank first to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected, if they, too, contain the analyte that was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-15

Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%)		Frequency	Corrective Action
	Waters	Soils		
Surrogates:			Added to each sample, MS/MSD, blank, LCS/LCSD during the extraction phase	Repeat extraction and analysis; if reanalysis confirms original result, report results and comment in case narrative
Organochlorine Pesticides:				
DCB	47-155	62-159		
TCX	45-125	58-149		
Herbicides:				
DCAA	31-137	31-137		
Organophosphate Pesticides:				
2NMX	46-117	69-118		
Matrix Spikes: Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	See Table B5-16 through B5-18 for acceptance limits		Each extraction group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.

Table B5-15 – Continued

Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%)		Frequency	Corrective Action
	Waters	Soils		
Laboratory Control Samples: Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	See Table B5-16 through B5-18 for acceptance limits		Each group (≤20) when MS/MSD falls outside established limits	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	≤30%	≤50%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results. Acceptable LCS would be indicative of matrix effects on the MS/MSD.

Table B5-15 – Continued

Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%) Waters	Acceptance Limits (%) Soils	Frequency	Corrective Action
Blanks:	≤LOQ		Once per extraction group (≤20) of samples, each matrix, level, instrument	Inject a hexane or solvent blank first to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected if they too, contain the analyte that was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.
Internal Standards(ISTD): Herbicides: 4,4'-dibromooctafluorobiphenyl (DBOB) OP Pesticides: 1-bromo-2-nitrobenzene	-50% to +100% of internal standard area of 12-hour STD RT change ≤30 sec.		Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-16

Statistical Acceptance Limits for Organochlorine Pesticides/PCBs (8081A/8082)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
4,4-DDD	65-125	81-119	60-153	52-181
4,4-DDE	65-123	48-138	52-159	48-175
4,4-DDT	59-133	40-128	57-124	62-166
Aldrin	47-122	41-131	58-138	21-141
alpha-BHC	71-123	46-131	60-127	25-146
alpha-Chlordane	77-127	45-140	66-127	3-157
beta-BHC	64-143	30-147	68-137	31-176
Chlordane	N/A	N/A	N/A	N/A
delta-BHC	64-128	50-129	66-118	68-158
Dieldrin	71-129	48-135	71-133	68-139
Endosulfan I	77-120	45-132	71-130	41-166
Endosulfan II	75-124	53-136	73-134	65-144
Endosulfan sulfate	69-130	58-141	58-133	65-154
Endrin	53-132	55-127	65-134	58-171
Endrin aldehyde	61-131	46-131	40-119	63-125
Endrin Ketone	61-139	61-142	70-143	33-173
gamma-BHC (Lindane)	71-124	48-143	74-133	43-154
gamma-Chlordane	52-153	28-170	63-145	30-157
Heptachlor	52-153	70-138	61-129	70-138
Heptachlor epoxide	73-141	50-131	72-132	69-133
Kepone	N/A	N/A	N/A	N/A
Methoxychlor	49-155	55-131	56-168	74-162
PCB-1016	52-123	66-115	45-125	72-120
PCB-1221	N/A	N/A	N/A	N/A
PCB-1232	N/A	N/A	N/A	N/A
PCB-1242	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A
PCB-1260	62-133	75-114	62-130	65-137
Toxaphene	N/A	N/A	N/A	N/A

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-17

Statistical Acceptance Limits for
Organophosphate Pesticides (8141A)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Bolstar	63-140	80-123	68-122	59-140
Coumaphos	54-140	71-125	44-167	18-210
Demeton-O	41-111	28-97	34-94	22-122
Demeton-S	20-151	85-191	63-170	41-214
Diazinon	52-130	82-160	68-146	60-148
Dichlorvos	66-162	83-165	25-154	48-181
Disulfoton	62-131	71-141	51-127	54-130
Dursban (Chlorpyrifos)	62-136	66-148	74-149	53-156
EPN	26-128	48-134	54-140	48-162
Ethion	61-140	74-121	57-153	57-157
Ethoprop	52-131	75-127	65-141	76-134
Ethyl parathion	64-129	58-157	58-145	34-181
Famphur	20-130	34-151	26-150	45-199
Fensulfothion	20-106	56-140	61-200	74-143
Fenthion	57-137	74-134	68-149	66-137
Guthion (Azinphos-methyl)	39-148	57-169	36-174	47-130
Malathion	62-120	46-150	75-116	39-176
Merphos	61-129	27-159	25-127	1-238
Methyl parathion	57-143	51-167	56-141	63-147
Mevinphos	20-111	63-140	42-130	25-231
Naled	52-145	24-183	19-175	19-170
Phorate	67-129	44-163	61-134	65-130
Ronnel	65-132	76-128	62-133	67-135
Stirophos	48-135	68-143	67-138	31-228
Tokuthion	69-138	86-124	66-142	51-168
Trichloronate	66-137	77-120	56-131	63-129
Trithion	58-135	69-138	71-120	55-173

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-18

Statistical Acceptance Limits for Herbicides (8151A)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
2,4,5-T	39-143	12-177	48-119	13-189
2,4,5-TP	52-140	44-161	44-137	30-151
2,4-D	50-144	38-176	40-140	41-158
2,4-DB	41-163	30-186	57-127	72-168
2,4-DP (Dichlorprop)	76-127	46-187	76-120	59-136
Dalapon	31-113	32-98	18-82	12-86
Dicamba	59-134	28-161	40-115	52-126
Dinoseb	19-96	13-132	1-36	1-48
MCPA	16-139	48-157	34-113	48-145
MCPP	42-126	43-159	37-114	33-123
Pentachlorophenol	61-121	29-151	55-108	20-117

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-19
Quality Control
PAHs by HPLC (8310)

Type	Acceptance Limits (%)		Frequency	Corrective Action
	Waters	Soils		
Surrogates: Nitrobenzene or Triphenylene	 63-154 59-131	 59-121 48-161	Added to each sample, MS/MSD, blank, LCS/LCSD during the extraction phase	Surrogate must be within the limits unless matrix related problems are evident. If matrix related problems are evident, comment on report and in case narrative.
Matrix Spikes: Spike all compounds of interest	See Table B5-20		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-20		Each group (≤20) of samples per matrix/level	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Spike all compounds of interest	≤30%	≤50%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relation to other QC results
Blanks:	≤LOQ		Once per extraction group (≤20) of samples, each matrix/level	Inject a hexane or solvent blank first, to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected, if they contain the analyte, which was present in the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-20

Statistical Acceptance Limits for PAHs by HPLC (8310)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Acenaphthene	60-116	59-114	76-103	66-113
Acenaphthylene	59-96	54-117	66-110	60-118
Anthracene	67-109	68-104	68-117	1-168
Benzo(a)anthracene	73-114	63-111	72-115	14-71
Benzo(a)pyrene	68-112	65-133	75-111	61-127
Benzo(b)fluoranthene	72-113	71-121	71-119	69-112
Benzo(g,h,i)perylene	28-138	68-116	73-116	58-125
Benzo(k)fluoranthene	72-119	70-109	71-119	69-112
Chrysene	70-111	69-107	71-108	48-132
Dibenz(a,h)anthracene	44-130	75-115	73-116	50-146
Fluoranthene	70-112	67-119	73-107	1-190
Fluorene	66-106	65-121	71-106	70-112
Indeno(1,2,3-cd)pyrene	60-111	72-119	68-129	53-127
Naphthalene	55-94	54-112	61-120	2-155
Phenanthrene	67-115	66-115	73-112	68-125
Pyrene	69-113	66-106	67-117	1-172

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

B6. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Conditions of the laboratory equipment and instrumentation can have a marked effect on the accuracy and precision of analysis. In order to ensure timely production of data and prevent/address potential malfunctions, Lancaster Laboratories schedules routine preventive maintenance of instruments based on manufacturer's recommendations. Maintenance of the laboratory instruments is the responsibility of the technical group using the equipment in conjunction with our in-house Equipment Maintenance Group. A schedule of routinely performed instrument maintenance tasks is attached as Table B6-1. All preventive maintenance, as well as maintenance performed as corrective action, is recorded in instrument logs. Equipment/Instrumentation is assigned unique designations to allow tracking of the piece of equipment within laboratory documentation. This allows the laboratory to substantiate the instrument condition during the time it was used for testing.

Critical spare parts are kept in supply at the laboratory by the Equipment Maintenance Group. Most items not kept in stock at the laboratory are available through overnight delivery from the manufacturer. In addition, Lancaster Labs maintains multiple numbers of most of the critical instruments used in our laboratory operations. A recent equipment inventory may be found in the *Environmental Quality Policy Manual*. Because we are a large laboratory with redundant capacity, the problems of instrument downtime are minimized.

Table B6-1

Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
GC/MS	Change septum	AN*: Min. weekly
	Clean/replace injection port seal and liner	AN
	Check fans	Monthly
	Check cool flow	Monthly
	Clean source	Bimonthly or AN
	Change oil in diffusion pump	Annually
	Change oil in rough pump	Annually
GC Volatiles	Check propanol level in ELCD resevoir	AN: Min. semiweekly
	Check all liquid and gas flows	Prior to calib. or AN
	Clean ELCD cell, change reaction tube	AN
	Change ELCD, Teflon line, and resin tube	AN
	Replace absorbant trap in concentrators	AN
	Column maintenance	AN
	Change PID lamp	AN
	Precalibration instrument settings check	Prior to each calibration
GC	Septum change	Each run
	Column/injection port maintenance	AN
	Clean detector	AN
	Vacuum filters	Semiannually
	Leak check ECDs	Semiannually
Cold Vapor AA	Replace pump tubing	AN: Min. weekly
	Lubricate pump head and autosampler	AN
	Inspect optical cell and windows	Monthly

Table B6-1 – Continued

Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
ICP	Replace pump winding	AN
	Lubricate autosampler	AN
	Vacuum instrument airfilters and air intakes	AN
	Change vacuum pump oil	Semiannually
	Clean optics and lenses	AN
	Clean Torch and injector tip	AN
	Clean nebulizer and spray chamber	AN
Infrared Spectrometer (FTIR)	Check on-demand diagnostics	Weekly
	Change dessicant	AN
HPLC	Pump lubrication	Annually
	Check pump seals	Annually
	Check valves cleaned or rebuilt	AN
	Replace and/or adjust detector bulb	AN
	Clean detector flow cell	AN
	Replace Teflon lines	AN
	Autosampler septa replacement	AN
	In-line filter sonication/cleaning	AN
	System passivation	AN
	PCRS pump lubrication	AN
	Empty waste liquid resevoir	Daily
ICP/MS	Change interface rough pump oil	Quarterly
	Change MS rough pump oil	Semiannually
	Clean cones and ion lenses	AN
	Clean torch, injector tip, nebulizer, and spray chamber	AN
	Change peristalic tubing	Weekly
	Vacuum instrument airfilters and air intakes	AN
	Empty waste liquid resevoir	Daily

Table B6-1 – Continued
Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
Total Organic Carbon Analyzer	Check IR zero and IR cell	AN
	Check for leaks	AN
	Check acid pump calibration	Bimonthly
	Check persulfate pump calibration	Bimonthly
	Inspect 6-port rotary valve	AN
	Inspect sample pump head	AN
	Wash molecular sieve	AN
	Check sample loop calibration	Monthly
	Clean gas permeation tube	AN
	Inspect digestion vessel O-rings	AN
	Check activated carbon scrubber	AN
	Dust back and clean circuit boards	AN
Total Organic Halogen Analyzer	Polish counter electrode	Daily
	Polish sensor electrode	Daily
	Clean loaders and pistons	Weekly
Autoanalyzer spectrophotometer	Clean sample probe	AN
	Clean proportioning pump	AN
	Inspect pump tubing, replace if worn	AN
	Clean wash receptacles	Monthly

* AN means as needed. Any of these items may be performed more frequently if response during operation indicates this is necessary.

B7. Instrument Calibration and Frequency

All measuring and testing equipment having an effect on the accuracy or validity of calibrations and tests will be calibrated and/or verified on an on-going and routine basis. Procedures for initial calibration and continuing calibration verification are in place for all instruments within the laboratory. The calibrations generally involve checking instrument response to standards (standardization) for each target compound to be analyzed. The source and accuracy of standards used for this purpose are integral to obtaining the best quality data. Standards used at Lancaster Laboratories are purchased from commercial supply houses either as neat compounds or as solutions with certified concentrations. The accuracy and quality of these purchased standards is verified through documentation provided by these commercial sources. Most solutions and all neat materials require subsequent dilution to an appropriate working range. All dilutions performed are documented and the resulting solution is checked by obtaining the instrument response of the new solution and comparing with the response to the solution currently in use. Any discrepancies between the responses are investigated and resolved before the new solution is used. Each standard is assigned a code that allows traceability to the original components. The standard container is marked with the code, name of solution, concentration, date prepared, expiration date, and the initials of the preparer. Shelf life and storage conditions for standards are included in the standard operating procedures and old standards are replaced before their expiration date.

Each instrument is calibrated with a given frequency using one or more concentrations of the standard solution. As analysis proceeds, the calibration is checked for any unacceptable change in instrument response. If the calibration check verifies the initial response, the analysis proceeds. If the calibration check indicates that a significant change in instrument response has occurred, then a new calibration is initiated. If necessary, maintenance may be performed before the recalibration.

Some instrumentation calibration involves the comparison of an instrument reading to a physical standard with a known certified value such as balance/weights or comparison against other instrumentation/apparatus such as NIST thermometer.

Calibration records are usually kept in the form of raw data with the other instrument printouts. In cases where no data system is used, calibration data is manually recorded in notebooks. Any maintenance or repair is also recorded in a notebook. The information that is recorded either in the notebooks or on the instrument printout includes the date, instrument ID, employee name and/or identification number, and concentration or code number of standard.

The frequency of calibration and calibration verification, number of concentrations analyzed, and acceptance criteria for each of the instruments to be used are listed in Table B7-1. In addition to checking the instrument response to target compounds, the GC/MS units are checked to ensure that standard mass spectral abundance criteria are met. Before each calibration, instruments used for volatile compound analysis are tuned using bromofluorobenzene (BFB) and instruments used for semivolatile analysis are tuned using decafluorotriphenylphosphine (DFTPP). The key ions and their abundance criteria are listed in Table B7-2.

Table B7-1

Instrument Calibration and Frequency

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc.	Acceptance Criteria	Frequency	# Std Conc.	Acceptance Criteria
GC/MS Volatiles*	After C-cal fails	6	RF for SPCCs >0.300 for chlorobenzene, and 1,1,2,2-tetrachloroethane, and >0.100 for 1,1-dichloroethene, bromoform, and chloromethane CCCs ≤30%	Every 12 hours	1	RF for SPCCs >0.300 for chlorobenzene, and 1,1,2,2-tetrachloroethane, and >0.100 for 1,1-dichloroethene, bromoform, and chloromethane %Drift for CCCs ≤20
GC/MS Semivolatiles*	After C-cal fails	6	RF for SPCCs ≥0.050 %RSD for CCCs ≤30%	Every 12 hours	1	RF for SPCCs ≥0.050 %Drift for CCCs ≤20
GC VOA Halocarbons and/or Aromatics	After C-cal fails	At least 5	%RSD of <20% for individual compounds or for average of all compounds	Every 12 hours, or every 10 samples	1	%Drift ±15% for individual compounds or average of all compounds
GC Pesticides and Herbicides (DDT/Endrin degradation applies to method 8081A only)	Each new run After C-cal fails	5	≤20% RSD of RFs of initial calibration to use avg. RF, otherwise use curve fit. Degradation for DDT, endrin 15%. Alternatively, if the average of the %RSDs of all compounds in the calibration standard is ≤20%, then the AVG RF can be used for all compounds.	Every 10 samples Every 20 samples or 12 hours for method 8081A, 8082	1	≤15% difference for individual analytes, from initial response for quantitation or A CCV is also compliant if the average RPD for all compounds in the CCV standard is ≤15%. DDT/Endrin degradation check every 12 hours or 20 injections
HPLC PAHs	Each new run or after C-cal fails	5	≤20% RSD of RFs of initial calibration to use average RF, otherwise use curve fit. Alternatively, if the average of the %RSDs of all compounds in the calibration standard is ≤20%, then the AVG RF can be used for all compounds.	Every 10 samples	1	≤15% difference for individual analytes, from initial response for quantitation or A CCV is also compliant if the average RPD for all compounds in the CCV standard is ≤15%.
GC TPH-GRO	After C-cal fails	At least 5	%RSD of <20% otherwise use calibration curve	Every 12 hours or every 10 samples	1	%Drift ±15%
GC TPH-DRO	After C-cal fails	5	% RSD of <20% for average RF otherwise use calibration curve	Every 10 samples	1	%Drift ±15%

Table B7-1 – Continued

Instrument Calibration and Frequency

	Initial Calibration			Continuing Calibration Verification		
ICP	Each new run	1	Independent calibration verification (ICV) within ±10%, standards <5%RSD	Every 10 samples	1	Same as initial
ICP-MS	Each new run	3	Independent calibration verification (ICV) within ±10% Corr. coeff. ≥0.995	Every 10 samples	1	±10% of true value
CVAA	Each new run	5	Independent calibration verification within ±10% Corr. coeff. >0.995	Every 10 samples	1	±20% of true value
TOC Analyzer	Weekly			Every 10 samples	1	±10% of true value
(w) Inst #1		1	±10% @ STD			
(w) Inst #2		5	Corr. coeff. >0.995			
(s) Inst #3		4	Corr. coeff. >0.995			
Autoanalyzer	Daily	6	Corr. coeff. >0.995	Every 10 samples	1	±10% of true value
Infrared Spectrophotometer (FTIR)	Monthly	7	Corr. coeff. >0.995	Every 10 samples	1	±10% of true value
Balance	Daily	4	Top-loading balance ±.5% Analytical balances ± .1% for weights >.1 g .05 g ± .5% .02 g ± 1.0% .01 g ± 2.0% .005 g ± 2.0%	N/A	N/A	N/A

*All compounds with %RSD >15 must use first or second order regression fit of the six calibration points. Alternatively, the AVG RF can be used for each compound.

<u>Abbreviations</u>

Std Conc. – The number of standard concentrations used

SPCCs – System performance check compounds

CCCs – Calibration check compounds

RF – Response factor

%RSD – Percent relative standard deviation

CCV – Continuing calibration verification

CVAA – Cold vapor atomic absorption spectrophotometer

HPLC – High Performance Liquid Chromatography

ICP – Inductively coupled plasma spectrophotometer; ICP run also includes interelement correction check standard (beginning and end of run)

Table B7-2

Mass and Ion Abundance Criteria

BFB Key Ions	Abundance Criteria
50	15% to 40% of mass 95
75	30% to 60% of mass 95
95	Base peak, 100% relative abundance
96	5% to 9% of mass 95
173	Less than 2% of mass 174
174	Greater than 50% of mass 95
175	5% to 9% of mass 174
176	Greater than 95% but less than 101% of mass 174
177	5% to 9% of mass 176
DFTPP Key Ions	Abundance Criteria
51	30% to 60% of mass 198
68	Less than 2% of mass 69
70	Less than 2% of mass 69
127	40% to 60% of mass 198
197	Less than 1% of mass 198
198	Base peak, 100% relative abundance
199	5% to 9% of mass 198
275	10% to 30% of mass 198
365	Greater than 1% of mass 198
441	Present but less than mass 443
442	Greater than 40% of mass 198
443	17% to 23% of mass 442

B8. Inspection/Acceptance Requirements for Supplies and Consumables

Analytical results can be affected by the type and quality of reagents, standards, and equipment. Time and effort could be lost if the reagents, standards, and equipment do not meet the specifications required for the method. Therefore, the specifications and/or requirements for reagents, standards, and equipment necessary to perform the testing methods are included in the analytical SOPs. Each technical department evaluates the reagents, standards and equipment they receive for acceptance and use in specific procedures. There are SOPs in place for procurement of supplies, and acceptance/evaluation of reagents and standards.

Sample bottles and vials provided to clients are purchased pre-cleaned to meet EPA specifications and guidelines for sample containers. Each lot of preservative purchased is analyzed for quality (signs of contamination) before being added to a sample container.

The deionized water system utilized by Lancaster Laboratories generates water for analytical purposes. Reagent water is defined as water that has been purified to remove contaminants and interferences to a level low enough to be acceptable for use in laboratory procedures. Analytes must not be present above LLI analytical detection levels or corrective action/data qualification may be needed. The routine test parameters for reagent water used by Lancaster Laboratories (LLI) are based on ASTM D1193, under Type II water and the USEPA Manual for the Certification of Laboratories Analyzing Drinking Water requirements. In addition, analytical methods employ the use of preparation and/or method blanks to demonstrate that the reagent water is appropriate for use.

B9. Data Acquisition Requirements (Non-Direct Measurements)

The data acquired from the analytical procedures will be assessed for precision, accuracy, representativeness, comparability, and completeness (PARCCs). These specifications will be met through precision and accuracy criteria as specified in Element B5 and MDLs as specified in Element B4.

Precision – Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions. The laboratory objective is to equal or exceed the precision demonstrated for the applied analytical method on comparable samples. The degree of agreement is expressed as the relative percent difference (RPD%). Evaluation of the RPD% is based on statistical evaluation of past lab data or guidelines within the methods for organic and inorganic analyses. External evaluation of precision is accomplished by analysis of standard reference material and interlaboratory performance data.

Accuracy – Accuracy is a measure of the closeness of an individual measurement to the true or expected value. Analyzing a reference material of known concentration or reanalyzing a sample which has been spiked with a known concentration/amount is a way to determine accuracy. Accuracy is expressed as a percent recovery (%R). Evaluation of the %R is based on statistical evaluation of past lab data or guidelines within the methods for organic and inorganic analyses.

Representativeness – Representativeness expresses the degree to which data accurately represents the media and conditions being measured. The representativeness of the data from the sampling site will depend on the sampling procedure. Sample collection is the responsibility of the client. Samples will be homogenized, if required, as part of the laboratory sample preparation. By comparing the quality control data for the samples against other data for similar samples analyzed at the same time, representativeness can be determined for this objective.

Comparability – Comparability conveys the confidence with which one set of data can be compared to another. The analytical results can be compared to other laboratories by using traceable standards, standard methodology, and consistent reporting units. The Laboratory Quality Assurance Program documents internal performance, and the interlaboratory studies document performance compared to other laboratories.

Completeness – Completeness is a measure of the quantity of valid data acquired from a measurement process compared to the amount that was expected to be acquired under the measurement conditions. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. Additional information will be stored in the laboratory's archives, both hard copy and magnetic tape. SOPs are in place to provide traceability of all reported results.

Uncertainty – (ISO 17025) "All uncertainty components which are of importance in a given situation shall be taken into account using appropriate methods of analysis." (5.4.6.3) This means the laboratory must determine the uncertainty contribution of all steps in the testing process such as equipment, calibration, standards, reagents, preparation, cleanups, etc. Since, in most methods, the laboratory control sample (LCS) goes through the entire process of preparation to analysis; all factors that would contribute to uncertainty will be evident through the LCS results. LCS are performed with every batch of samples where appropriate for the method.

B10. Data Management

At a minimum, data management is initiated when Lancaster Laboratories receives the samples from the client. In many instances, client-communicated requirements for bottleware and analyses are documented on an Incoming Sample Activity Report (ISAR) prior to sample receipt. This communication helps ensure that analysis and reporting meet the client needs. Sample information and requested analyses are entered into the Laboratory Information Management System (LIMS) where it can be accessed by all laboratory personnel. The entry is based on the ISAR and the client's COC. After entry, labels are printed for each container and an Acknowledgement is printed for the client. This will show exactly what was entered for the client's samples.

The flow of data from the time the samples enter the laboratory until the data is reported is summarized in Table B10-1. Raw analytical data generated in the laboratories is collected on printouts from the instruments and associated data system or manually in bound notebooks. All data is tracked by a unique seven-digit sample number assignment. Analysts review data as it is generated to determine that the instruments and methods are performing within specifications. This review includes calibration checks, surrogate recoveries, blank checks, retention time reproducibility, and other QC checks described in Elements B4, B5, and B7. If any problems are noted during the analytical run and/or at completion, corrective action is taken and documented.

Any data recorded manually is collected in bound notebooks and recorded in indelible ink, as described in Element A9. Procedures are in place for handling erroneous entries and all changes are dated, initialed, and explained. All data is uploaded automatically or manually entered into the LIMS. The LIMS is programmed to accept and track the results of quality control samples including blanks, surrogates, recoveries, duplicates, controls, and reference materials. The LIMS is programmed with the acceptance criteria for each QC type and if results are outside specifications, then a message is displayed to the analyst.

Data obtained from instrument printouts are dated and contain the signature and/or identification of the analyst responsible for the generation. The LIMS also produces control charts and statistics, which are reviewed by QA staff for trends that may indicate problems with the analytical data.

Computer technology is an integral part of laboratory operations including analytical instrumentation and central corporate functions. The laboratory makes extensive use of computers for business applications, technical operations, and the QA program. The Information Technology (IT) group support hardware and software applications at all levels as their primary function. Although some commercial software has been adapted to the laboratory operation, a larger portion is custom programmed by the IT group. The System Development Life Cycle (SDLC) approach is utilized and hardware and software are evaluated for appropriate functionality, accuracy, and security. Changes to systems and testing are documented. As part of QA's routine traceability audits, the electronic records are reviewed.

The principal criteria used to validate data will be the acceptance criteria described in Elements B4, B5, and B7 and protocols specified in laboratory SOPs. Following review, interpretation, and data reduction by the analyst, data is transferred to the LIMS by direct data upload from the analytical data system or manually. This system stores client information, sample results, and QC results. Element D1 describes the data deliverables validation performed by the laboratory.

Project files are created per client/project and contain chain-of-custody records, analysis requirements, and laboratory acknowledgments that document samples received, laboratory sample number assignment, and analyses requested. Raw data is filed per batch number assignment and laboratory sample number that correlates to the sample receipt documents. When the project is complete, all documentation is archived for 10 years in a locked storage area.

Table B10-1
Sample and Data Flow

Action	Personnel Involved
Sample received at Lancaster Labs • Unpacked and reconciled against the client paper work or Chain of Custody • SA Documentation log completed	Sample Administration
Sample is entered into sample management system • Lab ID number assigned • Analyses entered • Chain of custody started • Storage location assigned • Electronic record of sample number • Labels generated • Acknowledgement printed (record of samples received and analysis entered)	Sample Administration
Sample stored in assigned location (refrigerator, freezer, etc.) • Electronic record of sample #, bottle code, and location	Sample Support
Acknowledgment sent to client	Sample Administration
Sample removed from storage for analysis • Electronic requisition of sample number by bottle code • Necessary aliquot taken • Sample returned to storage	Technical Personnel
Analysis is performed according to selected analytical method • Raw data recorded • Reviewed • Transferred to computer by chemist or technician* (this is tracked by the unique sample number and batch number.)	Technical Personnel
Computer performs calculations as programmed according to methods	Data Processing
Second chemist or supervisor verifies raw data vs. LIMS entry	Technical Personnel
Analytical reports are printed and reviewed prior to sending to the client	Billing and Reporting staff and Technical Personnel
Data package deliverables are assembled	Data Package Group
Data packages are reviewed prior to sending to client	QA, Data Package Personnel, and Laboratory Management
Data packages are scanned, creating Adobe Acrobat PDF files, which can be e-mailed or stored on a CD-ROM and sent to the client Hard copy of batch raw data is archived Electronic files are backed up and archived	Data Package Personnel, Office Services, Technical Personnel

* Analyses requiring the chemist's interpretation may involve manual data reduction before entry into the computer.

Each analytical run is reviewed by a chemist for completeness and accuracy before interpretation and data reduction. The following calculations are used to reduce raw data to reportable results.

Semivolatiles and Volatiles by GC/MS Calculations:

GC/MS calculation used by the data system to determine concentration in extract for semivolatiles or in the sample itself for volatiles:

$$Q = \frac{(A_x)\ (I_s)}{(A_{is})\ (RRF)\ (V_i)}$$

Where:

Q = Concentration determined by the data system (mg/L)
A_x = Peak area
A_{is} = Internal standard peak area
I_s = Amount of internal standard injected (ng)
RRF = Relative response factor
V_i = Volume of extract injected (L) or volume sample purged (mL)

The extract concentration is further reduced by considering the initial sample weight or volume and the final extract volume:

$$Sample\ Concentration = \frac{(Q)\ (D)\ (F)\ (1000)}{IV\ (or\ IW)}$$

Where:

Q = Concentration determined by the data system (mg/L)
D = Dilution factor if needed
F = Final extract volume (mL)
IW = Initial sample weight (g)
IV = Initial sample volume (mL)

Results are reported in µg/L for water samples and µg/kg for solid samples. Soil samples are reported on a dry-weight basis. The results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Volatiles by GC and Petroleum Analysis Calculations:

For volatiles by GC and petroleum analysis, a calibration is performed with a minimum of five levels using either an internal standard calibration or external calibration.

A. Internal standard calibration

$$CF = \frac{(A_x)(C_{is})}{(A_{is})(C_x)} \text{ or } CF = \frac{(H_x)(C_{is})}{(H_{is})(C_x)}$$

Where:

A_x = Peak area of the compound to be measured in that level of the initial calibration

H_x = Height area of the compound to be measured in that level of the initial calibration

A_{is} = Peak area of the internal standard

H_{is} = Height are of the internal standard

C_{is} = Concentration of the internal standard

C_x = Concentration of the compound spiked into that level

$$\overline{CF} = \frac{\sum all\ CF\ in\ the\ initial\ calibration}{n}$$

Where:

n = Number of levels in the initial calibration

$$Concentration = \frac{(A_x)(C_{is})}{(A_{is})(\overline{\overline{CF}})} \times DF \text{ or } \frac{(H_x)(C_{is})}{(H_{is})(\overline{\overline{CF}})} \times DF$$

Where:

A_x = Peak area of the compound to be measured
H_x = Height area of the compound to be measured
A_{is} = Peak area of the internal standard
H_{is} = Height area of the internal standard
C_{is} = Concentration of the internal standard.
$\overline{\overline{CF}}$ = Average calibration factor
DF = Dilution factor or preparation factor

B. External calibration

$$Concentration = \frac{A_x}{\overline{\overline{CF}}} \times DF \text{ or } \frac{H_x}{\overline{\overline{CF}}} \times DF$$

Where all parameters are defined in A above.

Results are reported in µg/L for water samples and mg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Herbicides and Organophosphate Pesticides:

For herbicides and organophosphate pesticides, an internal standard calibration is used. The results are calculated from the average response factor when the individual analyte %RSD is ≤20% or when the <u>average</u> of all analyte %RSDs is ≤20%. Otherwise, the results are calculated using the curve.

A. Curve

$$Sample\ Concentration,\ \mu g/kg\ or\ \mu g/L = Extract\ Concentration \times \frac{DF \times FV \times AF}{IW\ (or\ IV)}$$

Where:

Extract Concentration = (peak ht. – y-intercept)/slope
FV = Final volume
IW = Initial weight (g)
IV = Initial volume (mL)
DF = Dilution Factor
AF = Additional preparation factors

B. Average response factor

$$Extract\ Conc.,\ mg/L = \frac{Pk\ Ht\ in\ sample}{ARF} \times \frac{Int\ std\ ht\ in\ L3\ std}{Int\ std\ ht\ in\ sample}$$

Where:

ARF = Average Response Factor [(RF Calib1 + ... + RF Calib 5)/5]
RF = Peak height/conc. in standard

Results are reported as µg/L for water samples and µg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

PAHs by HPLC and Pesticide/PCB Calculations:

The results for the PAHs by HPLC and pesticide/PCBs analyses are calculated using external standard. The pesticides/PCBs results are calculated from the average response factor when the individual analyte %RSD is ≤20% or when the average of all analyte %RSDs is ≤20%. Otherwise, the results are calculated using the curve.

$$\frac{Pk\ Ht \times FV \times DF \times AF}{ARF \times IV\ (or\ IW)} = Concentration\ (mg/L\ or\ \mu g/kg)$$

Where:
Pk Ht = Peak height found in sample
ARF = Average response factor [(RFCalib1 + ...+ RFCalib5)/5]
FV = Final volume of sample extract (mL)
DF = Dilution factor (where applicable)
IV = Initial volume of sample extracted (mL)
IW = Initial weight of the sample extracted (g)
AF = Additional factor

If a curve is used, then $\frac{\text{Pk Ht}}{\text{ARF}}$ is replaced by the following in the preceding equation:

$$\frac{Pk\ Ht - y\ intercept}{slope}$$

Results are reported as µg/L for water samples and µg/kg for solid samples. Soil samples are reported on dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

TPH-GRO and TPH-DRO Calculations:

For TPH-GRO and TPH-DRO, an external calibration procedure of at least five levels of standards is used. The resulting point-to-point calibration curve is used by the data system to calculate analyte concentrations. The equations that the data system uses for calculating analyte concentrations are shown below:

$$Concentration = \left(\frac{Ax}{ARF}\right) \times (DF)$$

Where:

Ax = Total peak area in region defined as analyte
DF = Dilution factor
ARF = Average response factor from the calibration curve, calculated as shown below:

$$ARF = \frac{[(As1/Qs1) + (As2/Qs2) + (As3/Qs3) + (As4/Qs4) + (As5/Qs5) + \ldots(Asn/Qsn)]}{n}$$

Where:

As# = Analyte peak sum area for all components of calibration level #
Qs# = Analyte concentration sum for all components of calibration level #
n = Number of calibration levels

For DRO, the concentration determined is then multiplied by F/IV (or IW) to account for the sample preparation.

Where:

F = Final extract volume (mL)
IV = Initial sample volume (mL)
IW = Initial sample weight (g)

Results are reported in mg/L for water samples and in mg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Inorganic Calculations:

The results for inorganic analyses are calculated using the following equation:

$$Concentration = \frac{(A)\ (D)\ (E)}{IV\ (or\ IW)}$$

Where:

A = The concentration determined using calibration data programmed into the instrument (mg/L)
D = Dilution factor if needed
E = Final extract volume (mL)
IW = Initial sample weight (g)
IV = Initial sample volume (mL)

Results are usually reported in mg/L for water samples and in mg/kg for solid samples. Alternate units are available upon request. Soil samples are reported on a dry-weight basis. The results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

GROUP C

ASSESSMENT AND OVERSIGHT

C1. Assessments and Response Actions

Whenever any of the data generated falls outside of the established acceptance criteria outlined for instrument tune and calibration (Element B7) and internal QC (Element B5), the cause of this irregularity must be investigated, corrected, and documented. The documentation will be used to prevent a recurrence of the problem and to inform management of the situation.

If the results are not within acceptance criteria, the appropriate corrective action will be initiated. This may include, but is not limited to, checking calculations and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with a comment stating the observed deviation.

A standard operating procedure is in place, which outlines the procedures to be followed when quality control data for an analysis falls outside of previously established acceptance limits. All batch QC data is entered into the computerized QC system promptly after its generation and evaluated for compliance. When the QC (blanks, check standards, continuing calibration verification, LCS/LCSD, etc) is noncompliant then corrective action is needed.

The Quality Assurance Department reviews monthly summaries of the quality control data entered onto the computerized sample management system by analysts. Control charts and statistics are reviewed for trends that may indicate problems with the analytical data. In this way, small problems are identified before they have any significant impact on laboratory results.

System audits are conducted on each department at Lancaster Laboratories by members of the Quality Assurance Department to ensure compliance with laboratory procedures and assist in identifying and correcting deficiencies. The audits include checks on methodology, reagent preparation, equipment calibration and maintenance, quality control results, and training of personnel. These audits may entail observation of procedures in process or a review of records to demonstrate traceability and compliance with all documented record keeping procedures. The QA Department will then issue a written report to management and the department that summarizes the audit. The department must respond in writing to the audit report within 30 days of report receipt. The response must address the corrective action that needs to be taken along with an expected completion date and identify the employee responsible for completing the action. Audit results and the corresponding response are communicated to laboratory personnel and management. Follow-up audits verify that proper corrective action has been implemented.

Audits by outside organizations including clients, regulatory personnel, and the USEPA are permitted by arrangement with the Quality Assurance Department.

Performance audits consist of both intralaboratory and interlaboratory check samples. QC samples from commercial suppliers are analyzed quarterly to assess laboratory accuracy including a double blind program. The Laboratory also participates in a number of interlaboratory performance evaluation studies, which involve analysis of samples with concentrations of analytes that are known to the sponsoring organization, but unknown to the laboratory. Inorganics, pesticide/herbicides, trihalomethanes, volatile organic compounds, semivolatile organic compounds, and traditional wet chemistry analyses are analyzed by Lancaster Labs for studies conducted by various state agencies and private vendors (WS, WP, solid and hazardous waste). Representative results from some of these studies are in Figure C1-2.

When performance evaluation studies are identified as out of specification or when a nonconformance is due to a repetitive laboratory error, system failures, or observable trend, an Investigation and Corrective Action Report (ICAR) is issued. An example of an ICAR form is in Figure C1-1. The QA Department will circulate all completed Investigation and Corrective Action forms to the appropriate management.

Annually the QA Department itself is audited for compliance with corporate and departmental procedures, and meeting regulatory requirements. In a separate event, the laboratory Executive Group reviews the previous year's activities and documentation to evaluate the effectiveness of the quality system and its implementation/adequacy for the operation.

Figure C1-1

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

No. ____________________

Investigation and Corrective Action Report (ICAR)

Part I – Description of the Problem (Attach additional pages, if needed, in addition to supporting documentation.)

1. Date of issue:
2. Department(s) involved:
3. LL sample number(s) involved:
4. Nature of the problem (describe in detail):

Initiated by: ______________________

Part II - The Investigation (Attach additional pages, if needed, in addition to supporting documentation.)

1. Steps taken to investigate the problem:

2. Explanation of probable cause(s) (Refer to LOM-SOP-ES-230 Procedure section for a list of the six areas of real/root cause):

3. Steps taken to prevent future occurrence (describe in detail and use corrective action check boxes below):

Corrective action(s): Check the appropriate box and attach supporting documentation

- ☐ Employee(s) retrained. (Attach proof of training)
- ☐ Employee(s) reread SOP, OMC, EQV, etc. (Attach copy of updated training record form)
- ☐ Other measures taken (Attach memo or equivalent proof)
- ☐ Further investigation needed from additional areas. (Include proof of the transfer of information)

4. Must investigation be complete before reporting further data to clients? Yes No

5. In addition to the samples listed above, would any additional data already reported to clients be affected by this problem? Yes No If yes, please explain:

Investigator(s): .... Date: ________________

Departmental Review*: .... Date: ________________
(*Manager or above, must be someone other than the investigator)
Quality Assurance: .... Date: ________________

Return to QA by: .... Date: ________________

2064.04

Figure C1-2

Final Report Results For Laboratory
Lancaster Laboratories

Figure C1-2 – Continued

Study: **WP-144**
ERA Laboratory Code: **L272101**
Laboratory Name: **Lancaster Laboratories**

Inorganic Results

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Demand							
0037	TOC	mg/L	20.3	18.6	15.4 - 21.8	Acceptable	EPA 415.1
Simple Nutrients							
1820	Nitrate + Nitrite as N	mg/L	0.749	0.853	0.688 - 1.01	Acceptable	EPA 353.2
Total Cyanide							
0071	Cyanide, total	mg/L	0.293	0.329	0.171 - 0.493	Acceptable	EPA 335.4
Total Phenolics (4-AAP)							
0097	Phenolics, total	mg/L	0.105	0.140	0.0694 - 0.211	Acceptable	EPA 420.2
Oil & Grease							
0104	Oil & Grease (Gravimetric)	mg/L	61.1	67.5	45.8 - 80.3	Acceptable	EPA 1664A
Trace Metals							
0001	Aluminum	µg/L		618	485 - 749	Not Reported	
0016	Antimony	µg/L	322.	307	209 - 372	Acceptable	EPA 6020
0002	Arsenic	µg/L	438.	401	335 - 470	Acceptable	EPA 6020
1015	Barium	µg/L	2080.	2080	1810 - 2350	Acceptable	EPA 6020
0003	Beryllium	µg/L	79.9	80.8	67.5 - 91.4	Acceptable	EPA 6020
1025	Boron	µg/L		1890	1540 - 2200	Not Reported	
0004	Cadmium	µg/L	634.	673	574 - 764	Acceptable	EPA 6020
0005	Chromium	µg/L	579.	568	495 - 642	Acceptable	EPA 6020
0006	Cobalt	µg/L		585	514 - 656	Not Reported	
0007	Copper	µg/L	696.	660	594 - 726	Acceptable	EPA 6020
0008	Iron	µg/L		604	532 - 685	Not Reported	
0012	Lead	µg/L	655.	647	565 - 726	Acceptable	EPA 6020
0010	Manganese	µg/L		227	202 - 252	Not Reported	
0074	Molybdenum	µg/L		104	83.2 - 124	Not Reported	
0011	Nickel	µg/L	181.	175	152 - 199	Acceptable	EPA 6020
0013	Selenium	µg/L	1040.	991	788 - 1150	Acceptable	EPA 6020
0017	Silver	µg/L		181	155 - 208	Not Reported	
0075	Strontium	µg/L		91.1	76.9 - 105	Not Reported	
0018	Thallium	µg/L	572.	552	446 - 662	Acceptable	EPA 6020
0014	Vanadium	µg/L		1530	1340 - 1710	Not Reported	
0015	Zinc	µg/L		169	143 - 200	Not Reported	

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Trace Metals							
0001	Aluminum	µg/L	627.	618	485 - 749	Acceptable	EPA 6010B
0016	Antimony	µg/L	303.	307	209 - 372	Acceptable	EPA 6010B
0002	Arsenic	µg/L	388.	401	335 - 470	Acceptable	EPA 6010B
1015	Barium	µg/L	2070.	2080	1810 - 2350	Acceptable	EPA 6010B
0003	Beryllium	µg/L	81.4	80.8	67.5 - 91.4	Acceptable	EPA 6010B
1025	Boron	µg/L	1840.	1890	1540 - 2200	Acceptable	EPA 6010B
0004	Cadmium	µg/L	658.	673	574 - 764	Acceptable	EPA 6010B
0006	Chromium	µg/L	557.	568	495 - 642	Acceptable	EPA 6010B
0005	Cobalt	µg/L	606.	585	514 - 656	Acceptable	EPA 6010B
0007	Copper	µg/L	672.	660	594 - 726	Acceptable	EPA 6010B
0008	Iron	µg/L	593.	604	532 - 685	Acceptable	EPA 6010B
0012	Lead	µg/L	655.	647	565 - 726	Acceptable	EPA 6010B
0010	Manganese	µg/L	234.	227	202 - 252	Acceptable	EPA 6010B
0074	Molybdenum	µg/L	104.	104	83.2 - 124	Acceptable	EPA 6010B
0011	Nickel	µg/L	177.	175	152 - 199	Acceptable	EPA 6010B
0013	Selenium	µg/L	926.	991	788 - 1150	Acceptable	EPA 6010B
0017	Silver	µg/L	179.	181	155 - 208	Acceptable	EPA 6010B
0075	Strontium	µg/L	92.3	91.1	76.9 - 105	Acceptable	EPA 6010B
0018	Thallium	µg/L	534.	552	446 - 662	Acceptable	EPA 6010B
0014	Vanadium	µg/L	1510.	1530	1340 - 1710	Acceptable	EPA 6010B
0015	Zinc	µg/L	175.	169	143 - 200	Acceptable	EPA 6010B
Mercury							
0009	Mercury	µg/L	14.9	16.4	10.1 - 22.2	Acceptable	EPA 7470A
Tin & Titanium							
1175	Tin	µg/L	1620.	1700	1340 - 2060	Acceptable	EPA 6010
0076	Titanium	µg/L	183.	190	163 - 214	Acceptable	EPA 6010
Sulfide							
2005	Sulfide	mg/L	6.99	8.18	3.97 - 11.6	Acceptable	EPA 376.1

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

Study: **WP-144**
ERA Laboratory Code: **L272101**
Laboratory Name: **Lancaster Laboratories**

Organic Results

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
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2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Volatiles							
4315	Acetone	µg/L		118	23.5 - 192	Not Reported	
4320	Acetonitrile	µg/L		0.00		Not Reported	
4325	Acrolein	µg/L		0.00		Not Reported	
4340	Acrylonitrile	µg/L		0.00		Not Reported	
0065	Benzene	µg/L	44.2	43.5	31.1 - 55.6	Acceptable	EPA 8021B
0060	Bromodichloromethane	µg/L	35.3	33.4	23.3 - 45.0	Acceptable	EPA 8021B
0062	Bromoform	µg/L	38.3	31.8	19.6 - 43.4	Acceptable	EPA 8021B
4950	Bromomethane	µg/L		0.00		Not Reported	
4410	2-Butanone (MEK)	µg/L		0.00		Not Reported	
5000	tert-Butyl methyl ether (MTBE)	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4450	Carbon disulfide	µg/L		48.8	25.9 - 76.6	Not Reported	
0058	Carbon tetrachloride	µg/L	20.9	20.5	11.7 - 28.4	Acceptable	EPA 8021B
0064	Chlorobenzene	µg/L	53.6	47.7	34.4 - 59.9	Acceptable	EPA 8021B
0061	Chlorodibromomethane	µg/L	45.9	42.6	29.0 - 56.5	Acceptable	EPA 8021B
4485	Chloroethane	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4500	2-Chloroethylvinylether	µg/L		0.00		Not Reported	
0055	Chloroform	µg/L	20.0	20.7	14.2 - 27.7	Acceptable	EPA 8021B
4960	Chloromethane	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4585	1,2-Dibromoethane (EDB)	µg/L		0.00		Not Reported	
4595	Dibromomethane	µg/L		0.00		Not Reported	
0094	1,2-Dichlorobenzene	µg/L	35.1	39.8	27.3 - 51.9	Acceptable	EPA 8021B
0096	1,3-Dichlorobenzene	µg/L	12.9	10.9	6.56 - 14.5	Acceptable	EPA 8021B
0095	1,4-Dichlorobenzene	µg/L	47.4	42.6	28.6 - 54.0	Acceptable	EPA 8021B
4625	Dichlorodifluoromethane	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4630	1,1-Dichloroethane	µg/L	28.6	28.5	19.2 - 38.9	Acceptable	EPA 8021B
0054	1,2-Dichloroethane	µg/L	23.9	24.2	16.7 - 32.7	Acceptable	EPA 8021B
4640	1,1-Dichloroethylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4645	cis-1,2-Dichloroethylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4700	trans-1,2-Dichloroethylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4655	1,2-Dichloropropane	µg/L	41.9	47.2	30.7 - 62.6	Acceptable	EPA 8021B
4680	cis-1,3-Dichloropropylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

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Study Dates: 01/15/07 - 03/01/07
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Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Volatiles (Continued)							
4685	trans-1,3-Dichloropropylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
0066	Ethylbenzene	µg/L	46.8	43.6	29.9 - 55.7	Acceptable	EPA 8021B
4835	Hexachlorobutadiene	µg/L	67.5	63.2	6.32 - 78.8	Acceptable	EPA 8021B
4860	2-Hexanone	µg/L		0.00		Not Reported	
0063	Methylene chloride	µg/L	65.8	63.0	38.6 - 87.7	Acceptable	EPA 8021B
4995	4-Methyl-2-pentanone (MIBK)	µg/L		82.0	38.2 - 123	Not Reported	
5005	Naphthalene	µg/L	43.6	42.5	13.4 - 53.7	Acceptable	EPA 8021B
5100	Styrene	µg/L	37.6	33.3	21.9 - 45.0	Acceptable	EPA 8021B
5105	1,1,1,2-Tetrachloroethane	µg/L		0.00		Not Reported	
5110	1,1,2,2-Tetrachloroethane	µg/L	30.7	32.3	17.5 - 49.3	Acceptable	EPA 8021B
0059	Tetrachloroethylene	µg/L	15.0	14.6	7.00 - 19.5	Acceptable	EPA 8021B
0067	Toluene	µg/L	46.7	44.8	31.1 - 56.4	Acceptable	EPA 8021B
5155	1,2,4-Trichlorobenzene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
0056	1,1,1-Trichloroethane	µg/L	36.7	42.5	26.6 - 56.2	Acceptable	EPA 8021B
5165	1,1,2-Trichloroethane	µg/L	96.8	93.9	65.0 - 121	Acceptable	EPA 8021B
0057	Trichloroethylene	µg/L	38.6	37.8	23.9 - 49.8	Acceptable	EPA 8021B
5175	Trichlorofluoromethane	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
5180	1,2,3-Trichloropropane (TCP)	µg/L		0.00		Not Reported	
5225	Vinyl acetate	µg/L		0.00		Not Reported	
5235	Vinyl chloride	µg/L	21.4	21.4	8.56 - 34.2	Acceptable	EPA 8021B
5260	Xylenes, total	µg/L	142.	132	75.6 - 178	Acceptable	EPA 8021B

Figure C1-2 – Continued

WP-144 Final Complete Report

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Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Volatiles							
4315	Acetone	µg/L	123.	118	23.5 - 192	Acceptable	EPA 8260
4320	Acetonitrile	µg/L	< 25.	0.00		Acceptable	EPA 8260
4325	Acrolein	µg/L	< 40.	0.00		Acceptable	EPA 8260
4340	Acrylonitrile	µg/L	< 4.	0.00		Acceptable	EPA 8260
0065	Benzene	µg/L	46.4	43.5	31.1 - 55.6	Acceptable	EPA 8260
0060	Bromodichloromethane	µg/L	35.1	33.4	23.3 - 45.0	Acceptable	EPA 8260
0062	Bromoform	µg/L	32.0	31.8	19.6 - 43.4	Acceptable	EPA 8260
4950	Bromomethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
4410	2-Butanone (MEK)	µg/L	< 3.0	0.00		Acceptable	EPA 8260
5000	tert-Butyl methyl ether (MTBE)	µg/L	< 0.5	0.00		Acceptable	EPA 8260
4450	Carbon disulfide	µg/L	58.1	48.8	25.9 - 76.6	Acceptable	EPA 8260
0058	Carbon tetrachloride	µg/L	22.8	20.5	11.7 - 28.4	Acceptable	EPA 8260
0064	Chlorobenzene	µg/L	50.2	47.7	34.4 - 59.9	Acceptable	EPA 8260
0051	Chlorodibromomethane	µg/L	43.8	42.6	29.0 - 56.5	Acceptable	EPA 8260
4485	Chloroethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
4500	2-Chloroethylvinylether	µg/L	< 2.0	0.00		Acceptable	EPA 8260
0055	Chloroform	µg/L	22.1	20.7	14.2 - 27.7	Acceptable	EPA 8260
4960	Chloromethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	< 2.0	0.00		Acceptable	EPA 8260
4585	1,2-Dibromoethane (EDB)	µg/L	< 1.0	0.00		Acceptable	EPA 8260
4595	Dibromomethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
0094	1,2-Dichlorobenzene	µg/L	41.2	39.8	27.3 - 51.9	Acceptable	EPA 8260
0096	1,3-Dichlorobenzene	µg/L	11.3	10.9	6.56 - 14.5	Acceptable	EPA 8260
0095	1,4-Dichlorobenzene	µg/L	44.6	42.6	28.6 - 54.0	Acceptable	EPA 8260
4625	Dichlorodifluoromethane	µg/L	< 2.0	0.00		Acceptable	EPA 8260
4630	1,1-Dichloroethane	µg/L	31.1	28.5	19.2 - 38.9	Acceptable	EPA 8260
0054	1,2-Dichloroethane	µg/L	26.8	24.2	16.7 - 32.7	Acceptable	EPA 8260
4640	1,1-Dichloroethylene	µg/L	< 0.8	0.00		Acceptable	EPA 8260
4645	cis-1,2-Dichloroethylene	µg/L	< 0.8	0.00		Acceptable	EPA 8260
4700	trans-1,2-Dichloroethylene	µg/L	< 0.8	0.00		Acceptable	EPA 8260
4655	1,2-Dichloropropane	µg/L	49.5	47.2	30.7 - 62.6	Acceptable	EPA 8260
4680	cis-1,3-Dichloropropylene	µg/L	< 1.0	0.00		Acceptable	EPA 8260

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID:	**PA00009**
ERA Laboratory Code:	**L272101**
Report Issued:	**03/22/07**
Study Dates:	**01/15/07 - 03/01/07**
Agency ID:	

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Volatiles (Continued)							
4685	trans-1,3-Dichloropropylene	µg/L	< 1.0	0.00		Acceptable	EPA 8260
0066	Ethylbenzene	µg/L	46.0	43.6	29.9 - 55.7	Acceptable	EPA 8260
4835	Hexachlorobutadiene	µg/L	68.3	63.2	6.32 - 78.8	Acceptable	EPA 8260
4860	2-Hexanone	µg/L	< 3.0	0.00		Acceptable	EPA 8260
0063	Methylene chloride	µg/L	70.7	63.0	38.6 - 87.7	Acceptable	EPA 8260
4995	4-Methyl-2-pentanone (MIBK)	µg/L	83.2	82.0	38.2 - 123	Acceptable	EPA 8260
5005	Naphthalene	µg/L	43.1	42.5	13.4 - 53.7	Acceptable	EPA 8260
5100	Styrene	µg/L	35.1	33.3	21.9 - 45.0	Acceptable	EPA 8260
5105	1,1,1,2-Tetrachloroethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
5110	1,1,2,2-Tetrachloroethane	µg/L	34.4	32.3	17.5 - 49.3	Acceptable	EPA 8260
0059	Tetrachloroethylene	µg/L	15.1	14.6	7.00 - 19.5	Acceptable	EPA 8260
0067	Toluene	µg/L	47.7	44.8	31.1 - 56.4	Acceptable	EPA 8260
5155	1,2,4-Trichlorobenzene	µg/L	< 1.0	0.00		Acceptable	EPA 8260
0056	1,1,1-Trichloroethane	µg/L	46.4	42.5	26.6 - 56.2	Acceptable	EPA 8260
5165	1,1,2-Trichloroethane	µg/L	103.	93.9	65.0 - 121	Acceptable	EPA 8260
0057	Trichloroethylene	µg/L	40.0	37.8	23.9 - 49.8	Acceptable	EPA 8260
5175	Trichlorofluoromethane	µg/L	< 2.0	0.00		Acceptable	EPA 8260
5180	1,2,3-Trichloropropane (TCP)	µg/L	< 1.0	0.00		Acceptable	EPA 8260
5225	Vinyl acetate	µg/L	< 2.0	0.00		Acceptable	EPA 8260
5235	Vinyl chloride	µg/L	23.3	21.4	8.56 - 34.2	Acceptable	EPA 8260
5260	Xylenes, total	µg/L	138.	132	75.6 - 178	Acceptable	EPA 8260
PCBs in Water							
0040	Aroclor 1016	µg/L	< 0.1	0.00		Acceptable	EPA 8082
8885	Aroclor 1221	µg/L	< 0.1	0.00		Acceptable	EPA 8082
0042	Aroclor 1232	µg/L	< 0.1	0.00		Acceptable	EPA 8082
0040	Aroclor 1242	µg/L	< 0.1	0.00		Acceptable	EPA 8082
0044	Aroclor 1248	µg/L	< 0.1	0.00		Acceptable	EPA 8082
0045	Aroclor 1254	µg/L	4.72	4.50	2.10 - 5.88	Acceptable	EPA 8082
0046	Aroclor 1260	µg/L	< 0.1	0.00		Acceptable	EPA 8082
PCBs in Oil							
0099	Aroclor 1016/1242	mg/kg	28.0	43.6	8.20 - 58.0	Acceptable	EPA 8082
0100	Aroclor 1254	mg/kg	< 0.60	0.00		Acceptable	EPA 8082
0101	Aroclor 1260	mg/kg	< 0.60	0.00		Acceptable	EPA 8082

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
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Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Organochlorine Pesticides

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
0047	Aldrin	µg/L	2.78	3.26	0.934 - 4.51	Acceptable	EPA 8081A
7110	alpha-BHC	µg/L	8.87	8.85	3.92 - 12.0	Acceptable	EPA 8081A
7115	beta-BHC	µg/L	4.59	4.65	1.90 - 6.43	Acceptable	EPA 8081A
7105	delta-BHC	µg/L	2.85	2.74	0.874 - 3.65	Acceptable	EPA 8081A
7120	gamma-BHC(Lindane)	µg/L	2.14	2.19	0.828 - 3.15	Acceptable	EPA 8081A
7240	alpha-Chlordane	µg/L	3.53	3.42	1.53 - 4.71	Acceptable	EPA 8081A
7245	gamma-Chlordane	µg/L	2.04	2.14	0.932 - 3.02	Acceptable	EPA 8081A
0049	4,4'-DDD	µg/L	8.80	8.92	3.25 - 12.7	Acceptable	EPA 8081A
0050	4,4'-DDE	µg/L	8.68	9.42	4.21 - 12.1	Acceptable	EPA 8081A
0051	4,4'-DDT	µg/L	5.70	7.74	2.89 - 10.9	Acceptable	EPA 8081A
0048	Dieldrin	µg/L	11.8	11.5	5.66 - 15.6	Acceptable	EPA 8081A
7540	Endrin	µg/L	4.51	4.77	1.78 - 7.20	Acceptable	EPA 8081A
7530	Endrin aldehyde	µg/L	7.56	7.29	2.03 - 11.2	Acceptable	EPA 8081A
7535	Endrin ketone	µg/L	6.02	6.01	3.30 - 8.71	Acceptable	EPA 8081A
7510	Endosulfan I	µg/L	11.0	13.7	4.19 - 20.0	Acceptable	EPA 8081A
7515	Endosulfan II	µg/L	15.6	16.6	5.02 - 21.9	Acceptable	EPA 8081A
7520	Endosulfan sulfate	µg/L	9.66	9.12	3.43 - 13.3	Acceptable	EPA 8081A
0052	Heptachlor	µg/L	2.85	3.35	1.09 - 4.63	Acceptable	EPA 8081A
0078	Heptachlor epoxide (beta)	µg/L	2.92	2.85	1.37 - 4.05	Acceptable	EPA 8081A
7810	Methoxychlor	µg/L	10.8	13.7	3.72 - 21.5	Acceptable	EPA 8081A

Chlordane

0053	Chlordane, technical	µg/L	14.3	14.0	5.25 - 20.2	Acceptable	EPA 8081A

Toxaphene

8250	Toxaphene	µg/L	8.31	21.7	2.17 - 39.3	Acceptable	EPA 8081A

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
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Report Issued: 03/22/07
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Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Chlorinated Acid Herbicides							
8505	Acifluorfen	µg/L		0.00		Not Reported	
8530	Bentazon	µg/L		9.69	0.969 - 18.9	Not Reported	
8540	Chloramben	µg/L		0.00		Not Reported	
8545	2,4-D	µg/L	4.55	6.95	0.696 - 11.2	Acceptable	EPA 8151
8560	2,4-DB	µg/L	5.82	8.18	0.818 - 15.7	Acceptable	EPA 8151
8550	Dacthal diacid (DCPA)	µg/L		2.82	0.419 - 4.89	Not Reported	
8555	Dalapon	µg/L	< 0.25	0.00		Acceptable	EPA 8151
8595	Dicamba	µg/L	21.7	2.65	0.265 - 4.06	Not Acceptable	EPA 8151
8600	3,5-Dichlorobenzoic acid	µg/L		9.48	2.82 - 14.0	Not Reported	
8605	Dichlorprop	µg/L	< 0.16	0.00		Acceptable	EPA 8151
8620	Dinoseb	µg/L	1.99	3.80	0.380 - 5.96	Acceptable	EPA 8151
7775	MCPA	µg/L	< 300.	0.00		Acceptable	EPA 8151
7780	MCPP	µg/L	< 50.0	12.8	0.00 - 34.7	Not Acceptable	EPA 8151
6500	4-Nitrophenol	µg/L		0.00		Not Reported	
6605	Pentachlorophenol	µg/L	< 0.027	0.00		Acceptable	EPA 8151
8645	Picloram	µg/L		0.00		Not Reported	
8655	2,4,5-T	µg/L	36.2	4.72	0.472 - 7.08	Not Acceptable	EPA 8151
8650	2,4,5-TP (Silvex)	µg/L	35.0	4.47	0.541 - 6.62	Not Acceptable	EPA 8151

Figure C1-2 – Continued

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EPA ID: PA00009
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Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals							
5500	Acenaphthene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5505	Acenaphthylene	µg/L	17.9	20.1	7.09 - 26.4	Acceptable	EPA 8270C
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L	106.	128	25.3 - 172	Acceptable	EPA 8270C
5545	Aniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5555	Anthracene	µg/L	26.7	28.2	12.4 - 37.0	Acceptable	EPA 8270C
5595	Benzidine	µg/L	< 20.	0.00		Acceptable	EPA 8270C
5575	Benzo(a)anthracene	µg/L	15.6	15.9	6.67 - 21.0	Acceptable	EPA 8270C
5585	Benzo(b)fluoranthene	µg/L	20.4	23.9	7.43 - 34.0	Acceptable	EPA 8270C
5600	Benzo(k)fluoranthene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5590	Benzo(g,h,i)perylene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5580	Benzo(a)pyrene	µg/L	21.9	23.9	7.56 - 33.0	Acceptable	EPA 8270C
5630	Benzyl alcohol	µg/L	< 5.	0.00		Acceptable	EPA 8270C
5660	4-Bromophenyl-phenylether	µg/L	37.6	38.5	13.8 - 53.2	Acceptable	EPA 8270C
5670	Butylbenzylphthalate	µg/L	136.	149	30.5 - 210	Acceptable	EPA 8270C
5680	Carbazole	µg/L	58.4	55.5	32.0 - 80.2	Acceptable	EPA 8270C
5745	4-Chloroaniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5760	bis(2-Chloroethoxy)methane	µg/L	63.7	64.0	25.1 - 76.9	Acceptable	EPA 8270C
5765	bis(2-Chloroethyl)ether	µg/L	15.0	18.5	6.90 - 26.9	Acceptable	EPA 8270C
5780	bis(2-Chloroisopropyl)ether	µg/L	86.8	80.2	20.6 - 99.2	Acceptable	EPA 8270C
5790	1-Chloronaphthalene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5795	2-Chloronaphthalene	µg/L	< 2.	0.00		Acceptable	EPA 8270C
5825	4-Chlorophenyl-phenylether	µg/L	84.4	92.2	34.7 - 115	Acceptable	EPA 8270C
5855	Chrysene	µg/L	16.3	17.3	7.98 - 25.9	Acceptable	EPA 8270C
5895	Dibenz(a,h)anthracene	µg/L	29.1	28.5	7.42 - 42.3	Acceptable	EPA 8270C
5905	Dibenzofuran	µg/L	110.	121	42.0 - 149	Acceptable	EPA 8270C
5925	Di-n-butylphthalate	µg/L	95.	97.6	32.0 - 128	Acceptable	EPA 8270C
4610	1,2-Dichlorobenzene	µg/L	50.3	54.1	6.87 - 79.0	Acceptable	EPA 8270C
4615	1,3-Dichlorobenzene	µg/L	37.2	48.6	6.58 - 58.6	Acceptable	EPA 8270C
4620	1,4-Dichlorobenzene	µg/L	103.	128	12.8 - 151	Acceptable	EPA 8270C
5945	3,3'-Dichlorobenzidine	µg/L	< 2.	0.00		Acceptable	EPA 8270C
6070	Diethylphthalate	µg/L	< 2.	0.00		Acceptable	EPA 8270C
6135	Dimethylphthalate	µg/L	< 2.	0.00		Acceptable	EPA 8270C

Figure C1-2 – Continued

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Agency ID:

Base/Neutrals (Continued)

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
6185	2,4-Dinitrotoluene	µg/L	44.8	49.4	17.0 - 64.1	Acceptable	EPA 8270C
6190	2,6-Dinitrotoluene	µg/L	80.5	90.6	37.3 - 114	Acceptable	EPA 8270C
6200	Di-n-octylphthalate	µg/L	96.3	103	22.5 - 152	Acceptable	EPA 8270C
6255	bis(2-Ethylhexyl)phthalate	µg/L	62.6	68.6	20.6 - 96.5	Acceptable	EPA 8270C
6265	Fluoranthene	µg/L	39.3	40.3	18.9 - 52.4	Acceptable	EPA 8270C
6270	Fluorene	µg/L	120.	131	57.8 - 154	Acceptable	EPA 8270C
6275	Hexachlorobenzene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
4835	Hexachlorobutadiene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6285	Hexachlorocyclopentadiene	µg/L	< 5.	0.00		Acceptable	EPA 8270C
4840	Hexachloroethane	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6315	Indeno(1,2,3-cd)pyrene	µg/L	30.9	30.5	4.47 - 44.4	Acceptable	EPA 8270C
6320	Isophorone	µg/L	45.6	53.1	21.5 - 69.4	Acceptable	EPA 8270C
6385	2-Methylnaphthalene	µg/L	35.7	40.2	5.86 - 54.1	Acceptable	EPA 8270C
5005	Naphthalene	µg/L	37.7	43.6	13.6 - 54.9	Acceptable	EPA 8270C
6460	2-Nitroaniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6465	3-Nitroaniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6470	4-Nitroaniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5015	Nitrobenzene	µg/L	56.5	63.5	20.3 - 78.7	Acceptable	EPA 8270C
6525	N-Nitrosodiethylamine	µg/L	85.1	97.3	19.8 - 107	Acceptable	EPA 8270C
6530	N-Nitrosodimethylamine	µg/L	60.2	109	10.9 - 129	Acceptable	EPA 8270C
6535	N-Nitrosodiphenylamine	µg/L	< 2.	0.00		Acceptable	EPA 8270C
6545	N-Nitroso-di-n-propylamine	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6590	Pentachlorobenzene	µg/L	49.7	58.8	11.6 - 78.8	Acceptable	EPA 8270C
6615	Phenanthrene	µg/L	113.	116	53.2 - 139	Acceptable	EPA 8270C
6665	Pyrene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5095	Pyridine	µg/L	< 2.	0.00		Acceptable	EPA 8270C
6715	1,2,4,5-Tetrachlorobenzene	µg/L	< 2.	0.00		Acceptable	EPA 8270C
5155	1,2,4-Trichlorobenzene	µg/L	< 1.	0.00		Acceptable	EPA 8270C

Figure C1-2 – Continued

WP-144 Final Complete Report

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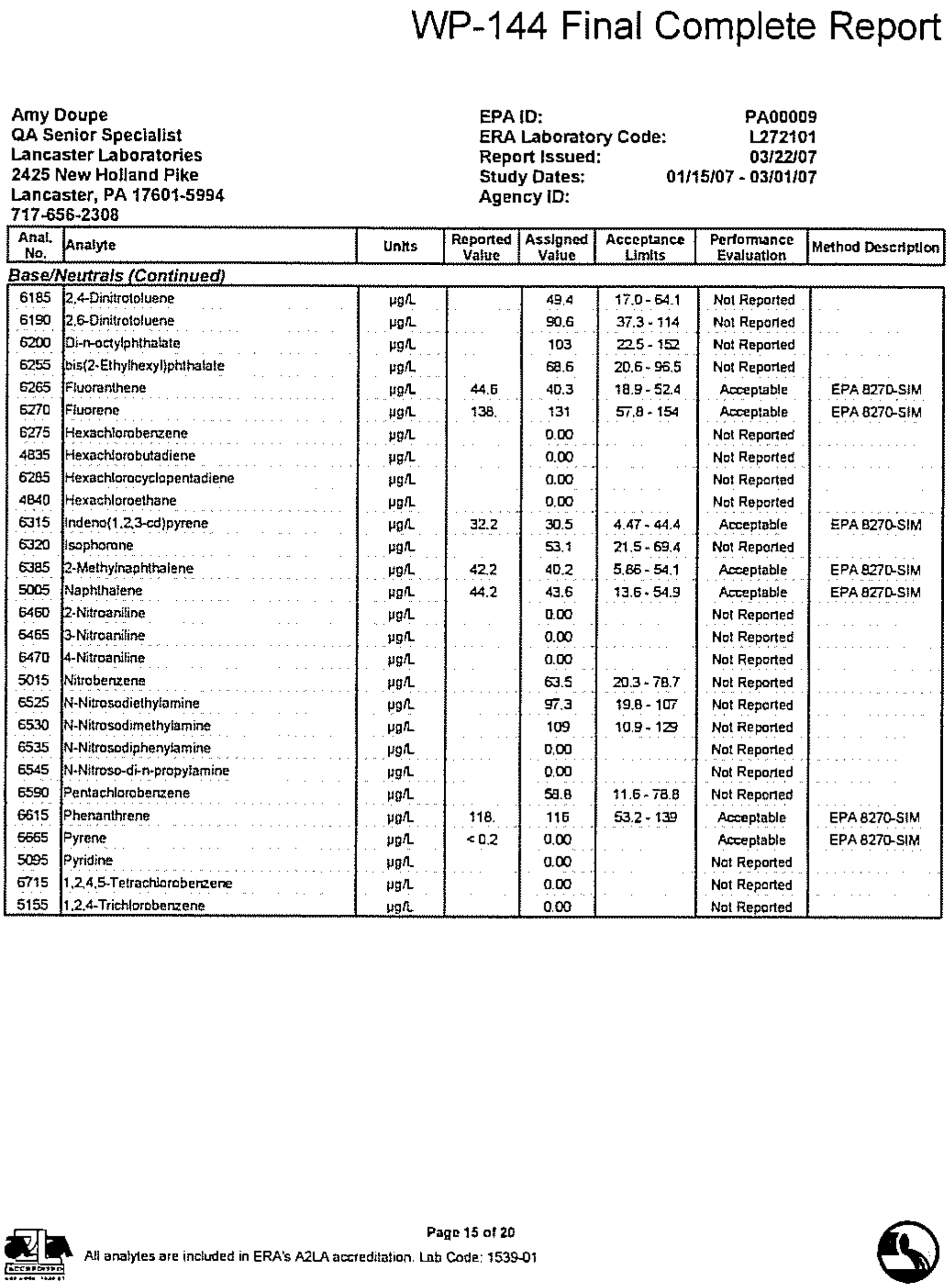
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
	Base/Neutrals						
5500	Acenaphthene	µg/L	< 0.05	0.00		Acceptable	EPA 8270-SIM
5505	Acenaphthylene	µg/L	19.0	20.1	7.09 - 26.4	Acceptable	EPA 8270-SIM
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L		128	25.3 - 172	Not Reported	
5545	Aniline	µg/L		0.00		Not Reported	
5555	Anthracene	µg/L	28.5	28.2	12.4 - 37.0	Acceptable	EPA 8270-SIM
5595	Benzidine	µg/L		0.00		Not Reported	
5575	Benzo(a)anthracene	µg/L	16.9	15.9	6.67 - 21.0	Acceptable	EPA 8270-SIM
5585	Benzo(b)fluoranthene	µg/L	22.4	23.9	7.43 - 34.0	Acceptable	EPA 8270-SIM
5600	Benzo(k)fluoranthene	µg/L	< 0.01	0.00		Acceptable	EPA 8270-SIM
5590	Benzo(g,h,i)perylene	µg/L	< 0.02	0.00		Acceptable	EPA 8270-SIM
5580	Benzo(a)pyrene	µg/L	21.4	23.9	7.56 - 33.0	Acceptable	EPA 8270-SIM
5630	Benzyl alcohol	µg/L		0.00		Not Reported	
5660	4-Bromophenyl-phenylether	µg/L		38.5	13.8 - 53.2	Not Reported	
5670	Butylbenzylphthalate	µg/L		149	30.5 - 210	Not Reported	
5680	Carbazole	µg/L		55.5	32.0 - 80.2	Not Reported	
5745	4-Chloroaniline	µg/L		0.00		Not Reported	
5760	bis(2-Chloroethoxy)methane	µg/L		64.0	25.1 - 76.9	Not Reported	
5765	bis(2-Chloroethyl)ether	µg/L		18.5	6.90 - 26.9	Not Reported	
5780	bis(2-Chloroisopropyl)ether	µg/L		80.2	20.6 - 99.2	Not Reported	
5790	1-Chloronaphthalene	µg/L		0.00		Not Reported	
5795	2-Chloronaphthalene	µg/L		0.00		Not Reported	
5825	4-Chlorophenyl-phenylether	µg/L		92.2	34.7 - 115	Not Reported	
5855	Chrysene	µg/L	17.7	17.3	7.98 - 25.9	Acceptable	EPA 8270-SIM
5895	Dibenz(a,h)anthracene	µg/L	28.8	28.5	7.42 - 42.3	Acceptable	EPA 8270-SIM
5905	Dibenzofuran	µg/L		121	42.0 - 149	Not Reported	
5925	Di-n-butylphthalate	µg/L		97.6	32.0 - 128	Not Reported	
4610	1,2-Dichlorobenzene	µg/L		64.1	6.87 - 79.0	Not Reported	
4615	1,3-Dichlorobenzene	µg/L		46.6	6.58 - 58.6	Not Reported	
4620	1,4-Dichlorobenzene	µg/L		128	12.8 - 151	Not Reported	
5945	3,3'-Dichlorobenzidine	µg/L		0.00		Not Reported	
6070	Diethylphthalate	µg/L		0.00		Not Reported	
6135	Dimethylphthalate	µg/L		0.00		Not Reported	

Figure C1-2 – Continued



WP-144 Final Complete Report

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2425 New Holland Pike
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EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals (Continued)							
6185	2,4-Dinitrotoluene	µg/L		49.4	17.0 - 64.1	Not Reported	
6190	2,6-Dinitrotoluene	µg/L		90.6	37.3 - 114	Not Reported	
6200	Di-n-octylphthalate	µg/L		103	22.5 - 152	Not Reported	
6255	bis(2-Ethylhexyl)phthalate	µg/L		68.6	20.6 - 96.5	Not Reported	
6265	Fluoranthene	µg/L	44.6	40.3	18.9 - 52.4	Acceptable	EPA 8270-SIM
6270	Fluorene	µg/L	138.	131	57.8 - 154	Acceptable	EPA 8270-SIM
6275	Hexachlorobenzene	µg/L		0.00		Not Reported	
4835	Hexachlorobutadiene	µg/L		0.00		Not Reported	
6285	Hexachlorocyclopentadiene	µg/L		0.00		Not Reported	
4840	Hexachloroethane	µg/L		0.00		Not Reported	
6315	Indeno(1,2,3-cd)pyrene	µg/L	32.2	30.5	4.47 - 44.4	Acceptable	EPA 8270-SIM
6320	Isophorone	µg/L		53.1	21.5 - 69.4	Not Reported	
6385	2-Methylnaphthalene	µg/L	42.2	40.2	5.86 - 54.1	Acceptable	EPA 8270-SIM
5005	Naphthalene	µg/L	44.2	43.6	13.6 - 54.9	Acceptable	EPA 8270-SIM
6460	2-Nitroaniline	µg/L		0.00		Not Reported	
6465	3-Nitroaniline	µg/L		0.00		Not Reported	
6470	4-Nitroaniline	µg/L		0.00		Not Reported	
5015	Nitrobenzene	µg/L		63.5	20.3 - 78.7	Not Reported	
6525	N-Nitrosodiethylamine	µg/L		97.3	19.8 - 107	Not Reported	
6530	N-Nitrosodimethylamine	µg/L		109	10.9 - 129	Not Reported	
6535	N-Nitrosodiphenylamine	µg/L		0.00		Not Reported	
6545	N-Nitroso-di-n-propylamine	µg/L		0.00		Not Reported	
6590	Pentachlorobenzene	µg/L		58.8	11.6 - 78.8	Not Reported	
6615	Phenanthrene	µg/L	118.	116	53.2 - 139	Acceptable	EPA 8270-SIM
6665	Pyrene	µg/L	< 0.2	0.00		Acceptable	EPA 8270-SIM
5095	Pyridine	µg/L		0.00		Not Reported	
6715	1,2,4,5-Tetrachlorobenzene	µg/L		0.00		Not Reported	
5155	1,2,4-Trichlorobenzene	µg/L		0.00		Not Reported	

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals							
5500	Acenaphthene	µg/L	< 0.9	0.00		Acceptable	EPA 8310
5505	Acenaphthylene	µg/L	18.0	20.1	7.09 - 26.4	Acceptable	EPA 8310
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L		128	25.3 - 172	Not Reported	
5545	Aniline	µg/L		0.00		Not Reported	
5555	Anthracene	µg/L	23.1	28.2	12.4 - 37.0	Acceptable	EPA 8310
5595	Benzidine	µg/L		0.00		Not Reported	
5575	Benzo(a)anthracene	µg/L	14.5	15.9	6.67 - 21.0	Acceptable	EPA 8310
5585	Benzo(b)fluoranthene	µg/L	20.1	23.9	7.43 - 34.0	Acceptable	EPA 8310
5600	Benzo(k)fluoranthene	µg/L	< 0.05	0.00		Acceptable	EPA 8310
5590	Benzo(g,h,i)perylene	µg/L	< 0.1	0.00		Acceptable	EPA 8310
5580	Benzo(a)pyrene	µg/L	20.4	23.9	7.56 - 33.0	Acceptable	EPA 8310
5630	Benzyl alcohol	µg/L		0.00		Not Reported	
5660	4-Bromophenyl-phenylether	µg/L		38.5	13.8 - 53.2	Not Reported	
5670	Butylbenzylphthalate	µg/L		149	30.5 - 210	Not Reported	
5680	Carbazole	µg/L		55.5	32.0 - 80.2	Not Reported	
5745	4-Chloroaniline	µg/L		0.00		Not Reported	
5760	bis(2-Chloroethoxy)methane	µg/L		64.0	25.1 - 76.9	Not Reported	
5765	bis(2-Chloroethyl)ether	µg/L		18.5	6.90 - 26.9	Not Reported	
5780	bis(2-Chloroisopropyl)ether	µg/L		80.2	20.6 - 99.2	Not Reported	
5790	1-Chloronaphthalene	µg/L		0.00		Not Reported	
5795	2-Chloronaphthalene	µg/L		0.00		Not Reported	
5825	4-Chlorophenyl-phenylether	µg/L		92.2	34.7 - 115	Not Reported	
5855	Chrysene	µg/L	16.6	17.3	7.98 - 25.9	Acceptable	EPA 8310
5895	Dibenz(a,h)anthracene	µg/L	24.3	28.5	7.42 - 42.3	Acceptable	EPA 8310
5905	Dibenzofuran	µg/L		121	42.0 - 149	Not Reported	
5925	Di-n-butylphthalate	µg/L		97.6	32.0 - 128	Not Reported	
4610	1,2-Dichlorobenzene	µg/L		64.1	6.87 - 79.0	Not Reported	
4615	1,3-Dichlorobenzene	µg/L		48.6	6.58 - 58.6	Not Reported	
4620	1,4-Dichlorobenzene	µg/L		128	12.8 - 151	Not Reported	
5945	3,3'-Dichlorobenzidine	µg/L		0.00		Not Reported	
6070	Diethylphthalate	µg/L		0.00		Not Reported	
6135	Dimethylphthalate	µg/L		0.00		Not Reported	

Figure C1-2 – Continued

WP-144 Final Complete Report

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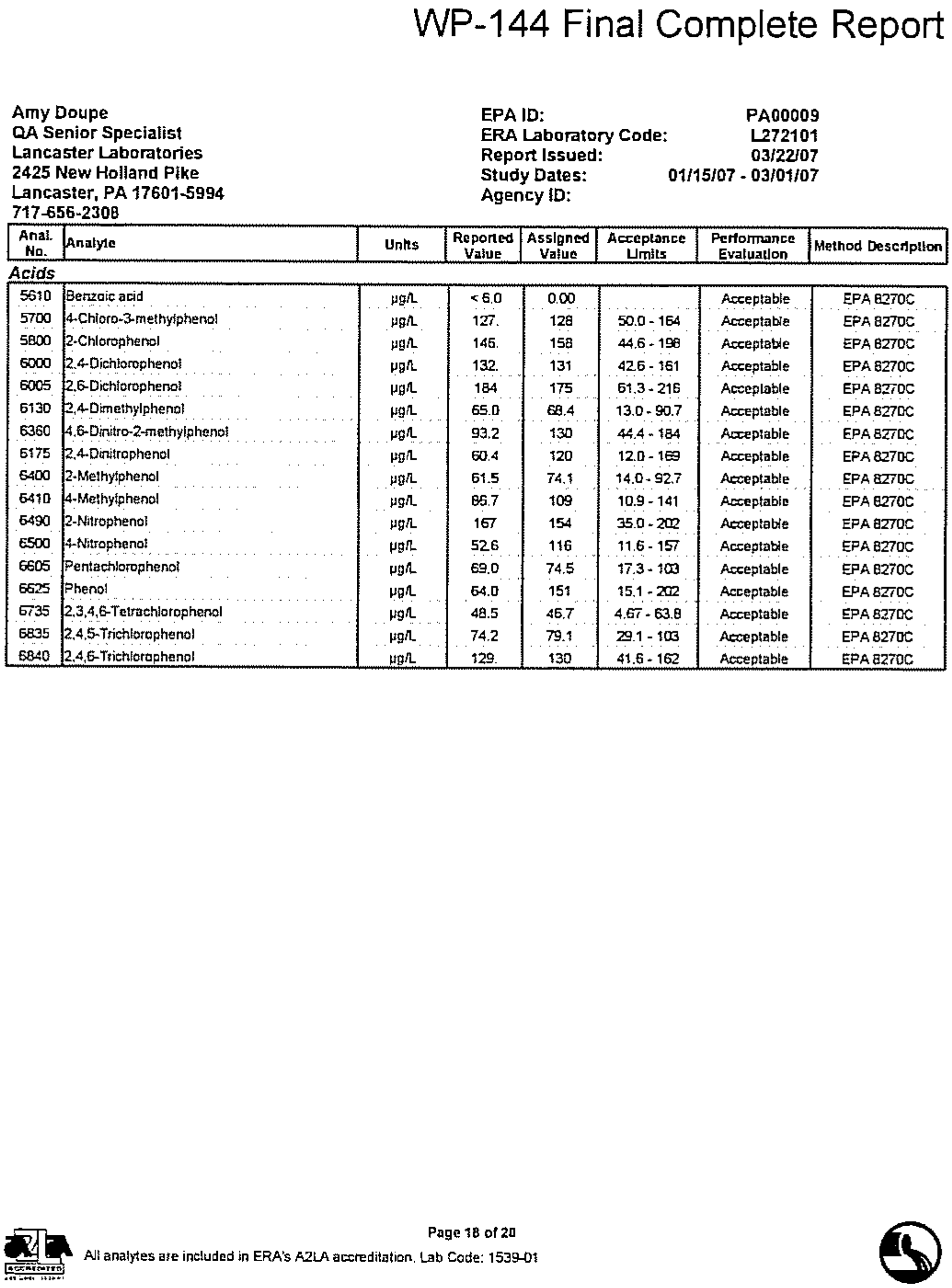
EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals (Continued)							
6185	2,4-Dinitrotoluene	µg/L		49.4	17.0 - 64.1	Not Reported	
6190	2,6-Dinitrotoluene	µg/L		90.6	37.3 - 114	Not Reported	
6200	Di-n-octylphthalate	µg/L		103	22.5 - 152	Not Reported	
6255	bis(2-Ethylhexyl)phthalate	µg/L		68.6	20.6 - 96.5	Not Reported	
6265	Fluoranthene	µg/L	34.0	40.3	18.9 - 52.4	Acceptable	EPA 8310
6270	Fluorene	µg/L	111.	131	57.8 - 154	Acceptable	EPA 8310
6275	Hexachlorobenzene	µg/L		0.00		Not Reported	
4835	Hexachlorobutadiene	µg/L		0.00		Not Reported	
6285	Hexachlorocyclopentadiene	µg/L		0.00		Not Reported	
4840	Hexachloroethane	µg/L		0.00		Not Reported	
6315	Indeno(1,2,3-cd)pyrene	µg/L	26.2	30.5	4.47 - 44.4	Acceptable	EPA 8310
6320	Isophorone	µg/L		53.1	21.5 - 69.4	Not Reported	
6385	2-Methylnaphthalene	µg/L	324.	40.2	5.86 - 54.1	Not Acceptable	EPA 8310
5005	Naphthalene	µg/L	38.7	43.6	13.6 - 54.9	Acceptable	EPA 8310
6460	2-Nitroaniline	µg/L		0.00		Not Reported	
6465	3-Nitroaniline	µg/L		0.00		Not Reported	
6470	4-Nitroaniline	µg/L		0.00		Not Reported	
5015	Nitrobenzene	µg/L		63.5	20.3 - 78.7	Not Reported	
6525	N-Nitrosodiethylamine	µg/L		97.3	19.8 - 107	Not Reported	
6530	N-Nitrosodimethylamine	µg/L		109	10.9 - 129	Not Reported	
6535	N-Nitrosodiphenylamine	µg/L		0.00		Not Reported	
6545	N-Nitroso-di-n-propylamine	µg/L		0.00		Not Reported	
6590	Pentachlorobenzene	µg/L		58.8	11.6 - 78.8	Not Reported	
6615	Phenanthrene	µg/L	100.	116	53.2 - 139	Acceptable	EPA 8310
6665	Pyrene	µg/L	< 0.2	0.00		Acceptable	EPA 8310
5095	Pyridine	µg/L		0.00		Not Reported	
6715	1,2,4,5-Tetrachlorobenzene	µg/L		0.00		Not Reported	
5155	1,2,4-Trichlorobenzene	µg/L		0.00		Not Reported	

Figure C1-2 – Continued



WP-144 Final Complete Report

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EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Acids							
5610	Benzoic acid	µg/L	< 6.0	0.00		Acceptable	EPA 8270C
5700	4-Chloro-3-methylphenol	µg/L	127.	128	50.0 - 164	Acceptable	EPA 8270C
5800	2-Chlorophenol	µg/L	146.	158	44.6 - 198	Acceptable	EPA 8270C
6000	2,4-Dichlorophenol	µg/L	132.	131	42.6 - 161	Acceptable	EPA 8270C
6005	2,6-Dichlorophenol	µg/L	184	175	61.3 - 216	Acceptable	EPA 8270C
6130	2,4-Dimethylphenol	µg/L	65.0	68.4	13.0 - 90.7	Acceptable	EPA 8270C
6360	4,6-Dinitro-2-methylphenol	µg/L	93.2	130	44.4 - 184	Acceptable	EPA 8270C
6175	2,4-Dinitrophenol	µg/L	60.4	120	12.0 - 169	Acceptable	EPA 8270C
6400	2-Methylphenol	µg/L	61.5	74.1	14.0 - 92.7	Acceptable	EPA 8270C
6410	4-Methylphenol	µg/L	86.7	109	10.9 - 141	Acceptable	EPA 8270C
6490	2-Nitrophenol	µg/L	167	154	35.0 - 202	Acceptable	EPA 8270C
6500	4-Nitrophenol	µg/L	52.6	116	11.6 - 157	Acceptable	EPA 8270C
6605	Pentachlorophenol	µg/L	69.0	74.5	17.3 - 103	Acceptable	EPA 8270C
6625	Phenol	µg/L	64.0	151	15.1 - 202	Acceptable	EPA 8270C
6735	2,3,4,6-Tetrachlorophenol	µg/L	48.5	46.7	4.67 - 63.8	Acceptable	EPA 8270C
6835	2,4,5-Trichlorophenol	µg/L	74.2	79.1	29.1 - 103	Acceptable	EPA 8270C
6840	2,4,6-Trichlorophenol	µg/L	129.	130	41.6 - 162	Acceptable	EPA 8270C

Page 18 of 20

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Nitrogen Pesticides							
7005	Alachlor	µg/L	7.59	7.32	4.83 - 9.66	Acceptable	EPA 8141
7035	Ametryn	µg/L		0.00		Not Reported	
7045	Anilazine	µg/L		0.00		Not Reported	
7060	Atraton	µg/L		0.00		Not Reported	
7065	Atrazine	µg/L	18.0	15.9	9.64 - 21.4	Acceptable	EPA 8141
7130	Bromacil	µg/L		0.00		Not Reported	
7160	Butachlor	µg/L		0.00		Not Reported	
7175	Butylate	µg/L		0.00		Not Reported	
7340	Cyanazine	µg/L	10.1	9.44	1.26 - 15.9	Acceptable	EPA 8141
7066	Deethyl atrazine	µg/L		0.00		Not Reported	
7067	Deisopropyl atrazine	µg/L		0.00		Not Reported	
7068	Diaminoatrazine	µg/L		0.00		Not Reported	
7555	EPTC (Eptam)	µg/L		19.1	6.38 - 24.5	Not Reported	
7705	Hexazinone	µg/L		0.00		Not Reported	
7835	Metolachlor	µg/L	18.4	17.2	6.78 - 26.3	Acceptable	EPA 8141
7845	Metribuzin	µg/L		11.3	1.93 - 16.9	Not Reported	
6440	Napropamide	µg/L		10.5	3.68 - 15.5	Not Reported	
8035	Prometon	µg/L		6.74	1.68 - 10.6	Not Reported	
8040	Prometryn	µg/L		0.00		Not Reported	
6650	Pronamide	µg/L		0.00		Not Reported	
8045	Propachlor	µg/L		12.7	8.31 - 15.8	Not Reported	
8060	Propazine	µg/L		0.00		Not Reported	
8125	Simazine	µg/L	13.5	11.5	4.35 - 16.4	Acceptable	EPA 8141
8180	Terbacil	µg/L		0.00		Not Reported	
8295	Trifluralin	µg/L		4.04	0.456 - 6.54	Not Reported	

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
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Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Organophosphorous Pesticides (OPP)							
7075	Azinphos-methyl (Guthion)	µg/L	8.20	11.4	1.48 - 19.5	Acceptable	EPA 8141
7220	Carbophenothion	µg/L	13.0	14.8	2.46 - 25.1	Acceptable	EPA 8141
7300	Chlorpyrifos	µg/L	< 0.4	11.6	5.66 - 15.8	Not Acceptable	EPA 8141
7395	Demeton-O	µg/L	< 0.4	0.00		Acceptable	EPA 8141
7385	Demeton-S	µg/L	< 0.85	0.00		Acceptable	EPA 8141
7410	Diazinon	µg/L	7.18	9.45	3.51 - 14.0	Acceptable	EPA 8141
8610	Dichlorvos (DDVP)	µg/L	< 1.0	0.00		Acceptable	EPA 8141
7475	Dimethoate	µg/L		0.00		Not Reported	
7495	Dioxathion	µg/L		0.00		Not Reported	
8625	Disulfoton	µg/L	5.35	5.76	0.952 - 9.40	Acceptable	EPA 8141
7565	Ethion	µg/L	7.07	7.44	1.24 - 12.6	Acceptable	EPA 8141
7570	Ethoprop	µg/L	< 1.0	0.00		Acceptable	EPA 8141
7955	Ethyl Parathion	µg/L	4.63	5.02	2.76 - 7.28	Acceptable	EPA 8141
7580	Famphur	µg/L	< 0.8	0.00		Acceptable	EPA 8141
7640	Fonofos	µg/L		0.00		Not Reported	
7770	Malathion	µg/L	10.6	12.3	2.75 - 19.4	Acceptable	EPA 8141
7825	Methyl Parathion	µg/L	5.97	6.65	0.950 - 10.5	Acceptable	EPA 8141
7985	Phorate	µg/L	< 0.4	0.00		Acceptable	EPA 8141
8000	Phosmet	µg/L		0.00		Not Reported	
8110	Ronnel	µg/L	13.9	16.0	2.66 - 27.2	Acceptable	EPA 8141
8200	Stirophos	µg/L	< 0.65	0.00		Acceptable	EPA 8141
8185	Terbufos	µg/L		3.83	0.932 - 5.78	Not Reported	
Gasoline Range Organics (GRO) in Water							
9408	Gasoline Range Organics (GRO)	µg/L	3090.	2480	963 - 4380	Acceptable	EPA 8015B
4375	Benzene in GRO	µg/L		15.6	6.73 - 26.2	Not Reported	
4765	Ethylbenzene in GRO	µg/L		68.7	39.2 - 96.0	Not Reported	
5140	Toluene in GRO	µg/L		194	103 - 259	Not Reported	
5260	Xylenes, total in GRO	µg/L		276	157 - 373	Not Reported	
Diesel Range Organics (DRO) in Water							
9369	Diesel Range Organics (DRO)	µg/L	2910.	3200	781 - 4130	Acceptable	EPA 8015B
Total Petroleum Hydrocarbons (TPH) in Water							
1935	TPH (Gravimetric)	mg/L		60.0	27.3 - 86.6	Not Reported	
1935	TPH (IR)	mg/L	74.4	73.8	34.1 - 106	Acceptable	EPA 418.1

C2. Reports To Management

Reports of quality status from the Quality Assurance Department to management are made frequently and in various forms. All results from internal or external performance evaluation samples are circulated to management along with corrective action responses. A report of each audit performed is prepared and copied to management. Monthly summaries of data obtained from analysis of quality control check samples are generated via the computerized sample management system. These summaries include mean and standard deviation to aid in assessment of data accuracy and precision. These are reviewed by QA personnel to evaluate trends. Any issues are communicated to the technical department management. Documentation summarizing problems that require investigation and corrective action are completed by group leaders and circulated to management. Through these channels, laboratory management is kept apprised of QA/QC activities.

Any problems or unusual observations that occur during the analysis of samples for a specific project will be listed on the laboratory report and/or in the case narrative delivered with the data package. The items often discussed in this manner include samples with surrogate recovery outside of the acceptance criteria and samples with matrix problems requiring dilution and causing increased detection limits. Where applicable, any corrective action attempted or performed to address the problem will also be presented.

Monthly and quarterly reports are sent to management, which provide them with the quality status on each technical department. The reports detail areas of improvement, observable trends, ICAR summaries, MDL/statistical window status, and a summary of client/agency issues. Reports are also generated for support groups closely tied to technical operations (i.e., Sample Administration, Bottles, and Sample Support).

The laboratory will contact the client for direction regarding major problems. Such as, but not limited to samples listed on the chain of custody but missing from the shipping container, samples which arrive broken or are accidentally broken in the laboratory, and samples with severe matrix problems. The client will be contacted if it is necessary to change any item in the original approved project plan.

GROUP D

DATA VALIDATION AND USABILITY

D1. Data Review, Verification, and Validation

As stated in Element B10, following review, interpretation, and data reduction by the analyst, the data is transferred into the Laboratory Information Management System (LIMS) by manual entry or direct upload from the analytical data system. This system stores the client information, sample results, and QC results. A security system is in place to control access of laboratory personnel and to provide an audit trail for information changes.

The data is again reviewed by the group leader or another analyst whose function is to provide an independent review before data is verified on the LIMS. The person performing the verification step reviews all data including quality control information before verifying the data. Any errors identified and corrected during the review process are documented and addressed with appropriate personnel to ensure generation of quality data.

If data package deliverables have been requested, the data deliverables department will complete the appropriate forms (see Appendix A) summarizing the quality control information, and include copies of all raw data (instrument printouts, spectra, chromatograms, laboratory notebooks, etc.). This group will combine the information from the various analytical tests and the analytical reports from the LIMS into one package in the client requested format. This package is reviewed for quality, compliance, and conformance to SOPs and QC requirements. Any analytical problems are discussed in the case narrative, which is also included with the data package deliverables.

The validation of the data for quality and compliance includes spot checking raw data versus the final report, checking that all pertinent raw data is included and does refer to the samples analyzed, review of all QC results for conformance with the method, and review of the case narrative for description of any unusual occurrences during analysis. This validation is performed using techniques similar to those used by the Sample Management Office for the USEPA's Contract Laboratory Program.

The validation performed by the laboratory does not address usability of the data, which usually requires some knowledge of the site. The laboratory will make every attempt to meet requirements of the project, thus reducing the need to assess usability of the data.

D2. Verification and Validation Methods

Lancaster Laboratories has procedures in place to verify that instrumental computers and the LIMS perform at the required accuracy, traceability, and security for reporting verified data. Element B10 describes this process in more detail.

Knowledge of the site and sampling methods are necessary to assess data usability. Therefore, overall data validation and assessment of data usability is the responsibility of the client. Lancaster Laboratories will evaluate the analytical data to verify that method and/or project requirements have been met.

D3. Reconciliation with User Requirements

Data quality requirements are based on the measurement process and the intended use of the data. Lancaster Laboratories evaluates the QC data generated by the following data quality objectives.

Precision – Precision refers to the reproducibility of a method when it is repeated on a second aliquot of the same sample. The degree of agreement is expressed as the relative percent difference (RPD). The RPD will be calculated according to the following equation:

$$RPD = \frac{|D_2 - D_1|}{\frac{(D_1 D_2)}{2}} \times 100$$

Where:

D_1 = First sample value
D_2 = Second sample value (Duplicate)

Duplicates will be run on at least 5% of the samples for inorganics analyses and matrix spike duplicates are used for organics analyses. Acceptance criteria are detailed in Element B5. All quality control sample results are entered into the LIMS and compared with acceptance limits. In addition, there is a monthly review of values on the computer QC system. Data obtained from quality control samples is entered onto our LIMS that charts the data and calculates a mean and standard deviation on a monthly basis. The Quality Assurance Department then reviews this data for trends, which may indicate analytical problems. The control charts are graphical methods for monitoring precision and bias over time.

Accuracy – Accuracy refers to the agreement between the amount of a compound measured by the test method and the amount present. Accuracy is usually expressed as a percent recovery (R). Recoveries will be calculated according to the following equations:

$$Surrogate\ \%\ Recovery = \frac{Qd}{Qa} \times 100$$

Where:

Qd = Quantity determined by analysis
Qa = Quantity added to sample

$$Matrix\ Spike\ \%\ Recovery = \frac{(SSR - SR)}{SA} \times 100$$

Where:

SSR = Spiked sample results
SR = Sample results
SA = Spike added

$$Laboratory\ Control\ Sample\ \%\ Recovery = \frac{LCS\ found}{LCS\ true} \times 100$$

As directed by the methods, surrogate standards are added to each sample analyzed for organics. Spikes and laboratory control samples will be run on at least 5% of the samples (each batch or Sample Delivery Group [SDG], ≤20 samples). Refer to Element B5 for acceptance criteria for accuracy. The LIMS is programmed to compare the individual values with the acceptance limits and inform the analyst if the results meet specifications. If the results are not within the acceptance criteria, corrective action suitable to the situation will be taken. This may include, but is not limited to, checking calculations and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with documentation of any QC problems in the case narrative.

Commercial quality control materials are run at least quarterly to ensure accuracy of the analytical procedure. Repetitive analysis of a reference material will also yield precision data. Accuracy information determined from reference materials is valuable because variables specific to sample matrix are eliminated.
The QC program is capable of charting data for surrogates, spikes, control materials, and reference materials. The Quality Assurance Department reviews these charts in association with the monthly trend report for any indication of possible problems (i.e., shift in the mean and standard deviation).

Completeness – Completeness is the percentage of valid data acquired from a measurement system compared to the amount of valid measurements that were planned to be collected. The objective is analysis of all samples submitted intact, and to ensure that sufficient sample weight/volume is available should the initial analysis not meet acceptance criteria. The laboratory's LIMS will assign a unique identification number to the sample which tracks and controls movement of samples from the time of receipt until disposal. All data generated will be recorded referencing the corresponding sample identification number. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. This information will include, but is not limited to, summaries of QC data and sample results, chromatograms, spectra, and instrument tune and calibration data. Additional information will be stored in the laboratory's archives, both hard copy and electronic.

$$Completeness = \frac{Number\ of\ valid\ measurements}{Total\ measurements\ needed} \times 100$$

Method Detection Limit – It is important to ascertain the limit of quantitation that can be achieved by a given method, particularly when the method is commonly used to determine trace levels of analyte. The Environmental Protection Agency has set forth one method for determining method detection limits (MDLs) from which limits of quantitation (LOQs) can be extrapolated. MDLs are evaluated on an annual basis. MDL is defined as follows for all measurements:

$$MDL = t_{(n-1,1-a=0.99)} \times s$$

Where:

MDL = Method detection limit

s = Standard deviation of the replicate analyses

$t_{(n-1,1-a=0.99)}$ = Students' t-value for a one-sided 99% confidence level and a standard deviation estimate with n-1 degrees of freedom

Definitions:

Calculated Method Detection Limit – The calculated method detection limit is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. It is determined from analysis, on a given instrument, of a sample in a given matrix containing the analyte.

Reported Method Detection Limit (MDL) – The reported MDL is defined as the highest of all calculated MDLs obtained from all instruments used for a particular method/matrix. This can be the actual value or a default value set above the calculated values.

Limit of Quantitation (LOQ) – The limit of quantitation is defined as the level above which quantitative results may be obtained with a specified degree of confidence. The Lancaster Laboratories' policy is to set quantitation limits at a value at least 3× the MDL. Regulatory limits may require setting a lower LOQ. The judgement of the technical department management may be used to assess the feasibility of a lower LOQ.

APPENDIX A

EXAMPLE REPORTING FORMS

Analysis Report

Lancaster
Laboratories

ANALYTICAL RESULTS

Prepared for:

Example Client
2425 New Holland Pike
Lancaster, PA 17601

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 1029138. Samples arrived at the laboratory on Tuesday, March 13, 2007. The PO# for this group is 4000010170 and the release number is 6-066.

Client Description	Lancaster Labs Number
Sludge-Mix_No._3 Waste Sludge Sample	5003785
Sludge-Mix_No._4 Waste Sludge Sample	5003788

METHODOLOGY

The specific methodologies used in obtaining the enclosed analytical results are indicated on the laboratory chronicles.

1 COPY TO	Example Client	Attn: Ms. Joanne Smith
1 COPY TO	Data Package Group	

Questions? Contact your Client Services Representative
Katherine A Klinefelter at (717) 656-2300

Respectfully Submitted,

Barbara F. Reedy

Barbara F. Reedy
Senior Specialist

Lancaster Laboratories
2425 New Holland Pike ○ Lancaster, PA 17601

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	BMQL	Below Minimum Quantitation Level
N.D.	none detected	MPN	Most Probable Number
TNTC	Too Numerous To Count	CP Units	cobalt-chloroplatinate units
IU	International Units	NTU	nephelometric turbidity units
umhos/cm	micromhos/cm		
C	degrees Celsius	F	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
ug	microgram(s)	**mg**	milligram(s)
ml	milliliter(s)	**l**	liter(s)
m3	cubic meter(s)	**ul**	microliter(s)

<	less than - The number following the sign is the <u>limit of quantitation</u>, the smallest amount of analyte which can be reliably determined using this specific test.
>	greater than
J	estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

U.S. EPA CLP Data Qualifiers:

	Organic Qualifiers		Inorganic Qualifiers
A	TIC is a possible aldol-condensation product	B	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	E	Estimated due to interference
C	Pesticide result confirmed by GC/MS	M	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	N	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	S	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	U	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	W	Post digestion spike out of control limits
		*	Duplicate analysis not within control limits
U	Compound was not detected	+	Correlation coefficient for MSA <0.995
X,Y,Z	Defined in case narrative		

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been perfomed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL LANCASTER LABORATORIES BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF LANCASTER LABORATORIES AND (B) WHETHER LANCASTER LABORATORIES HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Lancaster Laboratories which includes any conditions that vary from the Standard Terms and Conditions of Lancaster Laboratories and we hereby object to any conflicting terms contained in any acceptance or order submitted by client.

Lancaster Laboratories Sample No. SW 5003785

Sludge-Mix_No._3 Waste Sludge Sample
SITE ID: 6-066 SAMPLE ID: Sludge-Mix_No._3
6-066
Collected:03/12/2007 08:00 by DG

Account Number: 06195

Submitted: 03/13/2007 09:20
Reported: 04/02/2007 at 14:03
Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Units	Dilution Factor
00159	9.38 Mercury	7439-97-6	0.0258 J	0.0115	mg/kg	1
01643	Aluminum	7429-90-5	9,170.	3.78	mg/kg	1
01650	Calcium	7440-70-2	217,000.	143.	mg/kg	10
01654	Iron	7439-89-6	5,110.	5.32	mg/kg	1
01657	Magnesium	7439-95-4	2,000.	2.87	mg/kg	1
01662	Potassium	7440-09-7	2,000.	3.74	mg/kg	1
01667	Sodium	7440-23-5	3,970.	39.3	mg/kg	1
06925	Thallium	7440-28-0	N.D.	1.50	mg/kg	1
06935	Arsenic	7440-38-2	3.58	1.03	mg/kg	1
06936	Selenium	7782-49-2	N.D.	1.10	mg/kg	1
06944	Antimony	7440-36-0	N.D.	1.02	mg/kg	1
06946	Barium	7440-39-3	307.	0.0260	mg/kg	1
06947	Beryllium	7440-41-7	0.673	0.0767	mg/kg	1
06949	Cadmium	7440-43-9	0.470 J	0.0734	mg/kg	1
06951	Chromium	7440-47-3	16.4	0.658	mg/kg	1
06952	Cobalt	7440-48-4	4.88	0.147	mg/kg	1
06953	Copper	7440-50-8	21.4	0.203	mg/kg	1
06955	Lead	7439-92-1	62.2	0.498	mg/kg	1
06958	Manganese	7439-96-5	190.	0.0632	mg/kg	1
06961	Nickel	7440-02-0	33.6	0.684	mg/kg	1
06966	Silver	7440-22-4	N.D.	0.192	mg/kg	1
06971	Vanadium	7440-62-2	142.	0.181	mg/kg	1
06972	Zinc	7440-66-6	40.5	0.739	mg/kg	1
04173	20.90 Formaldehyde in Soil	50-00-0	N.D.	1,100.	ug/kg	1
00111	18.60 Moisture	n.a.	11.4	0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.					
07400	18.50 Total Residue	n.a.	88.6	0.50	%	1
	The total residue is calculated by subtracting the moisture value from 100%.					
04688	8.44 TCL Semivolatiles/Soil					
00176	1,4-Dioxane	123-91-1	N.D.	1,100.	ug/kg	1
01185	Phenol	108-95-2	15,000.	380.	ug/kg	1
01186	2-Chlorophenol	95-57-8	N.D.	380.	ug/kg	1
01187	1,4-Dichlorobenzene	106-46-7	N.D.	380.	ug/kg	1
01188	N-Nitroso-di-n-propylamine	621-64-7	N.D.	380.	ug/kg	1
01189	1,2,4-Trichlorobenzene	120-82-1	N.D.	380.	ug/kg	1
01190	4-Chloro-3-methylphenol	59-50-7	N.D.	750.	ug/kg	1
01191	Acenaphthene	83-32-9	N.D.	380.	ug/kg	1

Lancaster Laboratories Sample No. SW 5003785

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Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
01192	4-Nitrophenol	100-02-7	N.D.		1,900.	ug/kg	1
01193	2,4-Dinitrotoluene	121-14-2	N.D.		750.	ug/kg	1
01194	Pentachlorophenol	87-86-5	N.D.		1,900.	ug/kg	1
01195	Pyrene	129-00-0	N.D.		380.	ug/kg	1
03746	2-Nitrophenol	88-75-5	N.D.		380.	ug/kg	1
03747	2,4-Dimethylphenol	105-67-9	N.D.		750.	ug/kg	1
03748	2,4-Dichlorophenol	120-83-2	560.	J	380.	ug/kg	1
03749	2,4,6-Trichlorophenol	88-06-2	N.D.		380.	ug/kg	1
03750	2,4-Dinitrophenol	51-28-5	N.D.		7,500.	ug/kg	1
03751	4,6-Dinitro-2-methylphenol	534-52-1	N.D.		1,900.	ug/kg	1
03753	bis(2-Chloroethyl)ether	111-44-4	N.D.		380.	ug/kg	1
03754	1,3-Dichlorobenzene	541-73-1	N.D.		380.	ug/kg	1
03755	1,2-Dichlorobenzene	95-50-1	N.D.		380.	ug/kg	1
03757	Hexachloroethane	67-72-1	N.D.		380.	ug/kg	1
03758	Nitrobenzene	98-95-3	N.D.		380.	ug/kg	1
03759	Isophorone	78-59-1	N.D.		380.	ug/kg	1
03760	bis(2-Chloroethoxy)methane	111-91-1	N.D.		380.	ug/kg	1
03761	Naphthalene	91-20-3	3,600.		380.	ug/kg	1
03762	Hexachlorobutadiene	87-68-3	N.D.		750.	ug/kg	1
03763	Hexachlorocyclopentadiene	77-47-4	N.D.		1,900.	ug/kg	1
03764	2-Chloronaphthalene	91-58-7	N.D.		380.	ug/kg	1
03765	Acenaphthylene	208-96-8	N.D.		380.	ug/kg	1
03766	Dimethylphthalate	131-11-3	N.D.		750.	ug/kg	1
03767	2,6-Dinitrotoluene	606-20-2	N.D.		380.	ug/kg	1
03768	Fluorene	86-73-7	480.	J	380.	ug/kg	1
03769	4-Chlorophenyl-phenylether	7005-72-3	N.D.		380.	ug/kg	1
03770	Diethylphthalate	84-66-2	N.D.		750.	ug/kg	1
03772	N-Nitrosodiphenylamine	86-30-6	N.D.		380.	ug/kg	1
	N-nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for N-nitrosodiphenylamine represents the combined total of both compounds.						
03773	4-Bromophenyl-phenylether	101-55-3	N.D.		380.	ug/kg	1
03774	Hexachlorobenzene	118-74-1	N.D.		380.	ug/kg	1
03775	Phenanthrene	85-01-8	4,200.		380.	ug/kg	1
03776	Anthracene	120-12-7	N.D.		380.	ug/kg	1
03777	Di-n-butylphthalate	84-74-2	N.D.		750.	ug/kg	1
03778	Fluoranthene	206-44-0	N.D.		380.	ug/kg	1
03780	Butylbenzylphthalate	85-68-7	N.D.		750.	ug/kg	1
03781	Benzo(a)anthracene	56-55-3	N.D.		380.	ug/kg	1
03782	Chrysene	218-01-9	1,500.	J	380.	ug/kg	1
03783	3,3'-Dichlorobenzidine	91-94-1	N.D.		1,100.	ug/kg	1
03784	bis(2-Ethylhexyl)phthalate	117-81-7	N.D.		750.	ug/kg	1

Lancaster Laboratories Sample No. SW 5003785

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Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
03785	Di-n-octylphthalate	117-84-0	N.D.		750.	ug/kg	1
03786	Benzo(b)fluoranthene	205-99-2	N.D.		380.	ug/kg	1
03787	Benzo(k)fluoranthene	207-08-9	N.D.		380.	ug/kg	1
03788	Benzo(a)pyrene	50-32-8	N.D.		380.	ug/kg	1
03789	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.		380.	ug/kg	1
03790	Dibenz(a,h)anthracene	53-70-3	N.D.		380.	ug/kg	1
03791	Benzo(g,h,i)perylene	191-24-2	N.D.		380.	ug/kg	1
04690	2-Methylphenol	95-48-7	N.D.		750.	ug/kg	1
04691	2,2'-oxybis(1-Chloropropane)	108-60-1	N.D.		380.	ug/kg	1
04692	4-Methylphenol	106-44-5	1,300.	J	750.	ug/kg	1
	3-Methylphenol and 4-methylphenol cannot be resolved under the chromatographic conditions used for sample analysis. The result reported for 4-methylphenol represents the combined total of both compounds.						
04693	4-Chloroaniline	106-47-8	N.D.		750.	ug/kg	1
04694	2-Methylnaphthalene	91-57-6	4,000.		380.	ug/kg	1
04695	2,4,5-Trichlorophenol	95-95-4	N.D.		750.	ug/kg	1
04696	2-Nitroaniline	88-74-4	N.D.		380.	ug/kg	1
04697	3-Nitroaniline	99-09-2	N.D.		750.	ug/kg	1
04698	Dibenzofuran	132-64-9	N.D.		380.	ug/kg	1
04700	4-Nitroaniline	100-01-6	N.D.		750.	ug/kg	1
04702	Carbazole	86-74-8	N.D.		380.	ug/kg	1
	Due to sample matrix interferences observed during the extraction, the normal reporting limits were not attained. Surrogate recoveries were outside of QC limits for the GC/MS semivolatile compounds due to the increased final volume from the sample extraction.						
06292	8.32 TCL VOAs by 8260 (soil)						
02016	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.6	ug/kg	1
05444	Chloromethane	74-87-3	N.D.		2.	ug/kg	1
05445	Vinyl Chloride	75-01-4	N.D.		1.	ug/kg	1
05446	Bromomethane	74-83-9	N.D.		2.	ug/kg	1
05447	Chloroethane	75-00-3	N.D.		2.	ug/kg	1
05449	1,1-Dichloroethene	75-35-4	N.D.		1.	ug/kg	1
05450	Methylene Chloride	75-09-2	4.	J	2.	ug/kg	1
05451	trans-1,2-Dichloroethene	156-60-5	N.D.		1.	ug/kg	1
05452	1,1-Dichloroethane	75-34-3	N.D.		1.	ug/kg	1
05454	cis-1,2-Dichloroethene	156-59-2	N.D.		1.	ug/kg	1
05455	Chloroform	67-66-3	N.D.		1.	ug/kg	1
05457	1,1,1-Trichloroethane	71-55-6	N.D.		1.	ug/kg	1
05458	Carbon Tetrachloride	56-23-5	N.D.		1.	ug/kg	1

Lancaster Laboratories Sample No. SW 5003785

Sludge-Mix_No._3 Waste Sludge Sample
SITE ID: 6-066 SAMPLE ID: Sludge-Mix_No._3
6-066
Collected:03/12/2007 08:00 by DG

Account Number: 06195

Submitted: 03/13/2007 09:20
Reported: 04/02/2007 at 14:03
Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
05460	Benzene	71-43-2	2.	J	0.6	ug/kg	1
05461	1,2-Dichloroethane	107-06-2	N.D.		1.	ug/kg	1
05462	Trichloroethene	79-01-6	N.D.		1.	ug/kg	1
05463	1,2-Dichloropropane	78-87-5	N.D.		1.	ug/kg	1
05465	Bromodichloromethane	75-27-4	N.D.		1.	ug/kg	1
05466	Toluene	108-88-3	2.	J	1.	ug/kg	1
05467	1,1,2-Trichloroethane	79-00-5	N.D.		1.	ug/kg	1
05468	Tetrachloroethene	127-18-4	N.D.		1.	ug/kg	1
05470	Dibromochloromethane	124-48-1	N.D.		1.	ug/kg	1
05472	Chlorobenzene	108-90-7	N.D.		1.	ug/kg	1
05474	Ethylbenzene	100-41-4	N.D.		1.	ug/kg	1
05477	Styrene	100-42-5	N.D.		1.	ug/kg	1
05478	Bromoform	75-25-2	N.D.		1.	ug/kg	1
05480	1,1,2,2-Tetrachloroethane	79-34-5	N.D.		1.	ug/kg	1
06293	Acetone	67-64-1	120.		8.	ug/kg	1
06294	Carbon Disulfide	75-15-0	2.	J	1.	ug/kg	1
06296	2-Butanone	78-93-3	12.		5.	ug/kg	1
06297	trans-1,3-Dichloropropene	10061-02-6	N.D.		1.	ug/kg	1
06298	cis-1,3-Dichloropropene	10061-01-5	N.D.		1.	ug/kg	1
06299	4-Methyl-2-pentanone	108-10-1	N.D.		3.	ug/kg	1
06300	2-Hexanone	591-78-6	N.D.		3.	ug/kg	1
06301	Xylene (Total)	1330-20-7	11.		1.	ug/kg	1

Surrogate recoveries were outside of QC limits for the GC/MS volatile fraction. The analysis was repeated and out of specification surrogate recoveries were again observed indicating a matrix effect. A GC/MS volatile internal standard peak area was also outside the QC limits for the re-analysis.

Commonwealth of Pennsylvania Lab Certification No. 36-037

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00159	9.38 Mercury	SW-846 7471A	1	03/16/2007 09:54	Damary Valentin	1
01643	Aluminum	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 5003785

Sludge-Mix_No._3 Waste Sludge Sample
SITE ID: 6-066 SAMPLE ID: Sludge-Mix_No._3
6-066
Collected:03/12/2007 08:00 by DG

Account Number: 06195

Submitted: 03/13/2007 09:20
Reported: 04/02/2007 at 14:03
Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

01650	Calcium	SW-846 6010B	1	03/19/2007 22:23	Choon Y Tian	10
01654	Iron	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
01657	Magnesium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
01662	Potassium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
01667	Sodium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06925	Thallium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06935	Arsenic	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06936	Selenium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06944	Antimony	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06946	Barium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06947	Beryllium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06949	Cadmium	SW-846 6010B	1	03/20/2007 19:48	Choon Y Tian	1
06951	Chromium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06952	Cobalt	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06953	Copper	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06955	Lead	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06958	Manganese	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06961	Nickel	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06966	Silver	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06971	Vanadium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06972	Zinc	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
04173	20.90 Formaldehyde in Soil	SW-846 8315A	1	03/21/2007 21:05	James H Place	1
00111	18.60 Moisture	EPA 160.3 modified	1	03/15/2007 17:23	Scott W Freisher	1
07400	18.50 Total Residue	EPA 160.3 modified	1	03/15/2007 17:23	Scott W Freisher	1
04688	8.44 TCL Semivolatiles/Soil	SW-846 8270C	1	03/17/2007 08:25	William T Parker	1
06292	8.32 TCL VOAs by 8260 (soil)	SW-846 8260B	1	03/20/2007 17:26	Emiley A King	1
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	03/20/2007 14:34	Emiley A King	n.a.
00381	BNA Soil Extraction	SW-846 3550B	1	03/15/2007 18:30	Sally L Appleyard	1
05708	SW SW846 ICP Digest	SW-846 3050B	1	03/15/2007 20:10	Annamaria Stipkovits	1
05711	SW SW846 Hg Digest	SW-846 7471A modified	1	03/15/2007 23:20	Annamaria Stipkovits	1
05876	Formaldehyde Solid Extraction	SW-846 8315A	1	03/21/2007 08:15	Deborah M Zimmerman	1

APPENDIX A

GC/MS VOLATILES
DATA DELIVERABLES FORMS

2A
WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Lancaster Laboratories Contract:

Lab Code: LANCAS Case No.: SAS No.: SDG No.: LS433

	EPA SAMPLE NO.	SMC1 (DCA) #	SMC2 (TOL) #	SMC3 (BFB) #	TOT OUT
01	VBLKR32	106	102	98	0
02	TB322	107	102	100	0
03	IN322DL	109	103	101	0
04	IN322	109	102	106	0
05	VIBLKR00	107	103	98	0
06	IN322MS	110	101	103	0
07	VIBLKR01	110	102	98	0
08	IN322MSD	105	104	106	0

	QC LIMITS
SMC1 (DCA) = 1,2-Dichloroethane-d4	(76-114)
SMC2 (TOL) = Toluene-d8	(88-110)
SMC3 (BFB) = 4-Bromofluorobenzene	(86-115)

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

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKR32

Lab Name: Lancaster Laboratories Contract:______

Lab Code: LANCAS Case No.:_______ SAS No.:________ SDG No.:________

Matrix: (soil/water) WATER Lab Sample ID: VBLKR32

Sample wt/vol: 5.00 (g/mL) mL Lab File ID: HP07566.i/07apr02a.b/ra02b01.d

Level: (low/med) LOW Date Received:

Moisture: not dec. _____ Date Analyzed: 04/02/07

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

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

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKR32

ıb Name: Lancaster Laboratories Contract:______

ıb Code: LANCAS Case No.:______ SAS No.:______ SDG No.:______

ıtrix: (soil/water) WATER Lab Sample ID: VBLKR32

ımple wt/vol: 5.00 (g/mL) mL Lab File ID: HP07566.i/07apr02a.b/ra02b01.d

ɜvel: (low/med) LOW Date Received:

ɔisture: not dec. _____ Date Analyzed: 04/02/07

ℶ Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-25-2	---------Bromoform	10	U
79-34-5	---------1,1,2,2-Tetrachloroethane	10	U
540-59-0	--------1,2-Dichloroethene (Total)	10	U

4A
VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKR32

Lab Name: Lancaster Laboratories Contract:

Lab Code: LANCAS Case No.: SAS No.: SDG No.:

Lab File ID: ra02b01.d Lab Sample ID: VBLKR32

Date Analyzed: 04/02/07 Time Analyzed: 19:23

GC Column: DB-624 ID: 0.25 (mm) Heated Purge: (Y/N) N

Instrument ID: HP07566

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	246TB	5012043	ra02s01.d	20:09
02	TB322	5013066	ra02s02.d	20:34
03	IN322DL	5013065	ra02s03.d	20:59
04	IN322	5013065	ra02s04.d	21:24
05	VIBLKR00	VIBLKR00	ra02s05.d	21:49
06	IN322MS	5013065	ra02s06.d	22:13
07	VIBLKR01	VIBLKR01	ra02s07.d	22:38
08	IN322MSD	5013065	ra02s08.d	23:03

COMMENTS: R070921AA

5A

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: Lancaster Laboratories Contract:______________

Lab Code: LANCAS Case No.:________ SAS No.:_________ SDG No.:__________

Lab File ID: ra02t02.d BFB Injection Date: 04/02/07

Instrument ID: HP07566 BFB Injection Time: 18:03

GC Column: DB-624 ID: .25 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	8.0 - 40.0% of mass 95	22.5
75	30.0 - 66.0% of mass 95	50.7
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.6
173	Less than 2.0% of mass 174	0.2 (0.3)1
174	50.0 - 120.0% of mass 95	73.7
175	4.0 - 9.0% of mass 174	6.2 (8.4)1
176	93.0 - 101.0% of mass 174	71.7 (97.3)1
177	5.0 - 9.0% of mass 176	5.6 (7.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE ~~FOLLOWING~~ SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD050	VSTD050	ra02c01.d	04/02/07	18:27
02	VBLKR32	VBLKR32	ra02b01.d	04/02/07	19:23
03	246TB	5012043	ra02s01.d	04/02/07	20:09
04	TB322	5013066	ra02s02.d	04/02/07	20:34
05	IN322DL	5013065	ra02s03.d	04/02/07	20:59
06	IN322	5013065	ra02s04.d	04/02/07	21:24
07	VIBLKR00	VIBLKR00	ra02s05.d	04/02/07	21:49
08	IN322MS	5013065	ra02s06.d	04/02/07	22:13
09	VIBLKR01	VIBLKR01	ra02s07.d	04/02/07	22:38
10	IN322MSD	5013065	ra02s08.d	04/02/07	23:03

8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Lancaster Laboratories Contract:_____________

Lab Code: LANCAS Case No.:_______ SAS No.:________ SDG No.:_________

Lab File ID (Standard): ra02c01.d Date Analyzed: 04/02/07

Instrument ID: HP07566 Time Analyzed: 18:27

GC Column: DB-624 ID: 0.25 (mm) Heated Purge: (Y/N) N

		IS1(BCM)		IS2(DFB)		IS3(CBZ)	
		AREA #	RT #	AREA #	RT #	AREA #	RT #
	12 HOUR STD	120834	6.378	754713	7.777	709348	11.111
	UPPER LIMIT	241668	6.878	1509426	8.277	1418696	11.611
	LOWER LIMIT	60417	5.878	377356	7.277	354674	10.611
	EPA SAMPLE NO.						
01	VBLKR32	109279	6.385	672355	7.780	608086	11.114
02	246TB	105039	6.381	643582	7.783	578415	11.114
03	TB322	104435	6.384	623680	7.783	576801	11.114
04	IN322DL	101733	6.380	627469	7.779	569573	11.113
05	IN322	101651	6.380	624145	7.780	574489	11.113
06	VIBLKR00	100325	6.381	622238	7.777	563361	11.111
07	IN322MS	100923	6.374	630675	7.777	578000	11.111
08	VIBLKR01	98881	6.381	616494	7.777	565944	11.111
09	IN322MSD	103311	6.380	627595	7.776	560061	11.113

IS1 (BCM)=Bromochloromethane
IS2 (DFB)=1,4-Difluorobenzene
IS3 (CBZ)=Chlorobenzene-d5

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk
* Values outside of QC limits.

6A
VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:____________

Lab Code: LANCAS Case No.:_______ SAS No.:________ SDG No.:_________

Instrument ID: HP07566 Calibration Date(s): 12/15/06 12/15/06

Heated Purge: (Y/N) N Calibration Time(s): 05:20 06:58

GC Column: DB-624 ID: .25 (mm)

LAB FILE ID: RRF 10= rd15i01.d RRF 20= rd15i02.d
RRF 50= rd15i03.d RRF100= rd15i04.d RRF200= rd15i05.d

COMPOUND	RRF 10	RRF 20	RRF 50	RRF100	RRF200	$\overline{RRF}$	% RSD	
Chloromethane	3.9749	3.9407	4.0779	4.0905	3.9305	4.0029	1.9	
Vinyl Chloride	*3.6054	3.5574	3.7034	3.6741	3.5777	3.6236	1.7	*
Bromomethane	*2.1743	2.1242	2.1992	2.2350	2.1571	2.1780	1.9	*
Chloroethane	2.0194	1.9854	2.0762	2.0850	2.0054	2.0343	2.2	
1,1-Dichloroethene	*2.2039	1.9780	2.2831	2.2121	2.2574	2.1869	5.5	*
Acetone	1.0936	0.9849	1.0068	0.9447	1.0051	1.0070	5.4	
Carbon Disulfide	8.1512	7.4062	8.7166	8.6572	8.9575	8.3778	7.4	
Methylene Chloride	2.6892	2.4867	2.7683	2.6998	2.7219	2.6732	4.1	
trans-1,2-Dichloroethene	2.4392	2.1940	2.5645	2.5167	2.5470	2.4523	6.2	
1,1-Dichloroethane	*4.8474	4.4664	5.1890	5.1001	5.1059	4.9418	6.0	*
cis-1,2-Dichloroethene	2.6066	2.3984	2.7578	2.7156	2.7374	2.6432	5.6	
2-Butanone	1.6435	1.5925	1.7687	1.6506	1.7735	1.6858	4.8	
Chloroform	*3.9900	3.7728	4.3056	4.2425	4.2710	4.1164	5.6	*
1,1,1-Trichloroethane	*0.5157	0.4569	0.5450	0.5297	0.5344	0.5164	6.7	*
Carbon Tetrachloride	*0.4072	0.3568	0.4311	0.4216	0.4292	0.4092	7.5	*
1,2-Dichloroethene (Total)	2.5229	2.2962	2.6612	2.6161	2.6422	2.5477	5.9	
Benzene	*1.6955	1.5335	1.7797	1.7409	1.7284	1.6956	5.6	*
1,2-Dichloroethane	*3.3042	3.2259	3.6694	3.5919	3.6164	3.4816	5.8	*
Trichloroethene	*0.3606	0.3145	0.3701	0.3696	0.3723	0.3574	6.8	*
1,2-Dichloropropane	0.4657	0.4344	0.5045	0.4875	0.4882	0.4761	5.7	
Bromodichloromethane	*0.4580	0.4424	0.5109	0.5096	0.5120	0.4866	6.9	*
cis-1,3-Dichloropropene	*0.6652	0.6230	0.7356	0.7209	0.7253	0.6940	7.0	*
4-Methyl-2-Pentanone	0.5815	0.5791	0.6463	0.6011	0.6420	0.6100	5.3	
Toluene	*1.9551	1.7110	1.9720	1.9392	1.9273	1.9009	5.6	*
trans-1,3-Dichloropropene	*0.6019	0.5840	0.6753	0.6659	0.6719	0.6398	6.8	*
1,1,2-Trichloroethane	*0.3445	0.3277	0.3696	0.3599	0.3593	0.3522	4.6	*
Tetrachloroethene	*0.2921	0.2566	0.2968	0.2936	0.3028	0.2884	6.3	*
2-Hexanone	0.3949	0.3980	0.4498	0.4227	0.4536	0.4238	6.5	
Dibromochloromethane	*0.2991	0.2912	0.3449	0.3438	0.3543	0.3266	8.9	*
1,2-Dibromoethane	0.3891	0.3731	0.4207	0.4122	0.4153	0.4021	5.0	
Chlorobenzene	*1.1491	1.0231	1.1676	1.1534	1.1655	1.1317	5.4	*
Ethylbenzene	*0.6484	0.5608	0.6552	0.6501	0.6583	0.6346	6.5	*
m+p-Xylene	0.7936	0.7014	0.8125	0.8059	0.8144	0.7856	6.1	
Xylene (Total)	*0.7703	0.6854	0.7937	0.7847	0.7966	0.7662	6.0	*
o-Xylene	0.7703	0.6854	0.7937	0.7847	0.7966	0.7662	6.0	
Styrene	*1.2449	1.1336	1.3134	1.3094	1.3251	1.2653	6.3	*
Bromoform	*0.1929	0.1947	0.2329	0.2357	0.2484	0.2209	11.5	*
1,1,2,2-Tetrachloroethane	*0.5682	0.5511	0.6053	0.5796	0.5856	0.5780	3.5	*
1,2-Dibromo-3-Chloropropane	0.1098	0.1010	0.1133	0.1096	0.1167	0.1101	5.3	
1,2-Dichloroethane-d4(mz102)	0.5482	0.5415	0.5493	0.5752	0.5754	0.5580	2.9	
1,2-Dichloroethane-d4	2.5831	2.7168	2.7019	2.8216	2.8199	2.7287	3.6	
Toluene-d8(mz100)	0.9620	0.9759	0.9548	1.0084	0.9949	0.9792	2.3	
4-Bromofluorobenzene(mz174)	0.3782	0.3884	0.3768	0.4010	0.4097	0.3908	3.7	
Toluene-d8	1.4696	1.4990	1.4451	1.5310	1.5165	1.4922	2.3	
4-Bromofluorobenzene	*0.5519	0.5658	0.5465	0.5781	0.5780	0.5641	2.6	*

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:______________

Lab Code: LANCAS Case No.:________ SAS No.:_________ SDG No.:__________

Instrument ID: HP07566 Calibration Date: 12/15/06 Time: 09:39

Lab File ID: rd15cv2.d Init. Calib. Date(s): 12/15/06 12/15/06

Heated Purge: (Y/N) N Init. Calib. Time(s): 05:20 09:39

GC Column: DB-624 ID: .25 (mm)

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Chloromethane	4.0029	4.2255		5.6	
* Vinyl Chloride	3.6236	3.7482	0.10	3.4	25.0*
* Bromomethane	2.1780	2.2935	0.10	5.3	25.0*
Chloroethane	2.0343	2.1530		5.8	
* 1,1-Dichloroethene	2.1869	1.7370	0.10	-20.6	25.0*
Acetone	1.0070	0.9905		-1.6	
Carbon Disulfide	8.3778	6.4144		-23.4	
Methylene Chloride	2.6732	2.3588		-11.8	
trans-1,2-Dichloroethene	2.4523	2.1474		-12.4	
* 1,1-Dichloroethane	4.9418	4.5086	0.20	-8.8	25.0*
cis-1,2-Dichloroethene	2.6432	2.4221		-8.4	
2-Butanone	1.6858	1.7776		5.4	
* Chloroform	4.1164	3.9069	0.20	-5.1	25.0*
* 1,1,1-Trichloroethane	0.5164	0.4754	0.10	-7.9	25.0*
* Carbon Tetrachloride	0.4092	0.3708	0.10	-9.4	25.0*
1,2-Dichloroethene (Total)	2.5477	2.2848		-10.3	
* Benzene	1.6956	1.5612	0.50	-7.9	25.0*
* 1,2-Dichloroethane	3.4816	3.3732	0.10	-3.1	25.0*
* Trichloroethene	0.3574	0.3311	0.30	-7.4	25.0*
1,2-Dichloropropane	0.4761	0.4579		-3.8	
* Bromodichloromethane	0.4866	0.4892	0.20	0.5	25.0*
* cis-1,3-Dichloropropene	0.6940	0.6834	0.20	-1.5	25.0*
4-Methyl-2-Pentanone	0.6100	0.6758		10.8	
* Toluene	1.9009	1.8018	0.40	-5.2	25.0*
* trans-1,3-Dichloropropene	0.6398	0.6336	0.10	-1.0	25.0*
* 1,1,2-Trichloroethane	0.3522	0.3448	0.10	-2.1	25.0*
* Tetrachloroethene	0.2884	0.2659	0.20	-7.8	25.0*
2-Hexanone	0.4238	0.4612		8.8	
* Dibromochloromethane	0.3266	0.3392	0.10	3.8	25.0*
1,2-Dibromoethane	0.4021	0.3976		-1.1	
* Chlorobenzene	1.1317	1.1027	0.50	-2.6	25.0*
* Ethylbenzene	0.6346	0.6031	0.10	-5.0	25.0*
m+p-Xylene	0.7856	0.7533		-4.1	
* Xylene (Total)	0.7662	0.7353	0.30	-4.0	25.0*
o-Xylene	0.7662	0.7353		-4.0	
* Styrene	1.2653	1.2993	0.30	2.7	25.0*

All other compounds must meet a minimum RRF of 0.010.

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:____________

Lab Code: LANCAS Case No.:_______ SAS No.:_______ SDG No.:________

Instrument ID: HP07566 Calibration Date: 12/15/06 Time: 09:39

Lab File ID: rd15cv2.d Init. Calib. Date(s): 12/15/06 12/15/06

Heated Purge: (Y/N) N Init. Calib. Time(s): 05:20 09:39

GC Column: DB-624 ID: .25 (mm)

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
* Bromoform	0.2209	0.2260	0.10	2.3	25.0*
* 1,1,2,2-Tetrachloroethane	0.5780	0.5912	0.30	2.3	25.0*
1,2-Dibromo-3-Chloropropane	0.1101	0.1112		1.0	
1,2-Dichloroethane-d4	2.7287	2.7448		0.6	
Toluene-d8	1.4922	1.4694		-1.5	
* 4-Bromofluorobenzene	0.5641	0.5616	0.20	-0.4	25.0*

All other compounds must meet a minimum RRF of 0.010.

APPENDIX A

GC/MS SEMIVOLATILES DATA DELIVERABLES FORMS

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: Lancaster Laboratories Contract: ____________

Lab Code: ____________ Case No.: ________ SAS No.: ________ SDG No.: LS433

	LL #'s	EPA SAMPLE NO.	S1 (TBP) #	S2 (PHL) #	S3 (DCB) #	S4 (2FP) #	S5 (2CP) #	S6 (TPH) #	S7 (NBZ) #	S8 (FBP) #	TOT OUT
1	5013065	IN322	121	91	70	73	84	86	97	85	0
2	5013065DL	IN322DL	105	102	74	83	94	78	100	90	0
3	SBLKWB085	SBLKWB0858	110	89	69	76	83	101	93	81	0
4	085WBLCS	085WBLCS8	118	90	72	76	82	96	91	81	0
5	085WBLCSD	085WBLCSD8	116	91	72	75	82	95	91	82	0

	QC LIMITS	
S1 (TBP) = 2,4,6-Tribromophenol	(10-123)	
S2 (PHL) = Phenol-d5	(10-110)	
S3 (DCB) = 1,2-Dichlorobenzene-d4	(16-110)	(advisory)
S4 (2FP) = 2-Fluorophenol	(21-110)	
S5 (2CP) = 2-Chlorophenol-d4	(33-110)	(advisory)
S6 (TPH) = Terphenyl-d14	(33-141)	
S7 (NBZ) = Nitrobenzene-d5	(35-114)	
S8 (FBP) = 2-Fluorobiphenyl	(43-116)	

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

page 1 of 1

Lancaster Laboratories, Inc.
GC/MS Volatiles Matrix Spike/Spike Duplicate Recoveries

Unspiked: cy23s24.d
LECS3 4773655
Method: SOW OLM 10/92
Instrument: HP10193

Matrix Spike: cy23s25.d
LECS3MS 4773656
Matrix/Level: WL
Dilution Factor: 1.00

Spike Duplicate: cy23s27.d
LECS3MSD 4773657
Batch: C061431AB

COMPOUND NAME	MS SPIKE	MSD SPIKE	US CONC ng	MS CONC ng	MSD CONC ng	MS REC %	MSD REC %	Range LOWER-UPPER	INSPEC	RPD %	RPD MAX
Vinyl Chloride	125.0	125.0	ND	152	153	122	123	60-140	YES	0.6	30
Carbon Tetrachloride	125.0	125.0	ND	140	140	112	112	60-140	YES	0	30
Benzene	125.0	125.0	ND	133	131	107	105	60-140	YES	1.8	30
1,2-Dichloroethane	125.0	125.0	ND	146	144	116	115	60-140	YES	1.1	30
Trichloroethene	125.0	125.0	2.50	138	137	108	108	60-140	YES	0	30
1,2-Dichloropropane	125.0	125.0	ND	129	127	103	102	60-140	YES	1.2	30
cis-1,3-Dichloropropene	125.0	125.0	ND	123	117	98	94	60-140	YES	4.7	30
1,1,2-Trichloroethane	125.0	125.0	ND	130	130	104	104	60-140	YES	0	30
Tetrachloroethene	125.0	125.0	ND	130	127	104	102	60-140	YES	2.4	30
1,2-Dibromoethane	125.0	125.0	ND	124	120	99	96	60-140	YES	3.3	30
Bromoform	125.0	125.0	ND	138	136	110	109	60-140	YES	1.4	30
1,4-Dichlorobenzene	125.0	125.0	ND	148	143	119	114	60-140	YES	3.6	30

N/C = Could not calculate

Lab Chronicle: ______________________________ Ent. by ____

______________________________ Ver. by ____

3B
SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Lancaster Laboratories Contract: ____________

Lab Code: LANCAS Case No.: ________ SAS No.: __________ SDG No.: ________

Matrix Spike - EPA Sample No.: 00115 Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene	60.47	0.00	63.29	105	59-172
Benzene	60.47	2.09	62.21	99	66-142
Trichloroethene	60.47	0.00	53.96	89	62-137
Toluene	60.47	2.16	71.54	115	59-139
Chlorobenzene	60.47	0.00	58.56	97	60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene	57.11	46.90	82	24*	22	59-172
Benzene	57.11	46.26	77	25*	21	66-142
Trichloroethene	57.11	42.41	74	18	24	62-137
Toluene	57.11	48.76	82	34*	21	59-139
Chlorobenzene	57.11	42.09	74	27*	21	60-133

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

* Values outside of QC limits

RPD: 4 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

COMMENTS: ____

FORM III VOA-1 OLM03.0

Lancaster Laboratories, Inc.
Volatiles Laboratory Control Sample Recoveries

LCS: cu18l01.d
Client ID: LCSC07
Method: SW-846 8260B (25ML)
Instrument: HP10193

LCS Duplicate: cu18l02.d
Client ID: LCDC07
Matrix/Level: WL
Dilution Factor: 1.0

Batch: C071691AA

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	LCSD CONC UG/L	LCS REC %	LCSD REC %	Range LOWER-UPPER	RPD %	RPD MAX	INSPEC
Dichlorodifluoromethane	5.00	4.58	4.32	92	86	44-146	6	30	YES
Chloromethane	5.00	5.03	4.82	101	96	51-135	4	30	YES
Vinyl Chloride	5.00	5.11	4.90	102	98	65-120	4	30	YES
Bromomethane	5.00	5.11	4.89	102	98	74-113	4	30	YES
Chloroethane	5.00	5.29	5.00	106	100	64-121	6	30	YES
Acrolein	37.50	35.43	34.87	94	93	10-138	2	30	YES
1,1-Dichloroethene	5.00	4.94	4.75	99	95	84-117	4	30	YES
Freon 113	5.00	4.84	4.62	97	92	78-114	5	30	YES
Acetone	37.50	40.68	39.68	108	106	64-129	2	30	YES
Carbon Disulfide	5.00	4.44	4.15	89	83	77-123	7	30	YES
Allyl Chloride	5.00	5.19	4.97	104	99	67-128	4	30	YES
Methyl Acetate	5.00	5.39	5.00	108	100	34-178	7	30	YES
Methylene Chloride	5.00	4.95	4.81	99	96	83-111	3	30	YES
t-Butyl Alcohol	50.00	48.49	44.69	97	89	68-132	8	30	YES
Acrylonitrile	25.00	30.20	27.98	121	112	71-128	8	30	YES
trans-1,2-Dichloroethene	5.00	4.95	4.73	99	95	86-111	5	30	YES
Methyl Tertiary Butyl Ether	5.00	4.80	4.78	96	96	83-110	1	30	YES
n-Hexane	5.00	5.29	5.07	106	101	73-121	4	30	YES
1,1-Dichloroethane	5.00	5.51	5.33	110	107	84-116	3	30	YES
2-Chloro-1,3-Butadiene	5.00	5.50	5.18	110	104	62-158	6	30	YES
Ethyl t-Butyl Ether	5.00	4.89	4.83	98	97	83-115	1	30	YES
2,2-Dichloropropane	5.00	5.00	4.76	100	95	78-121	5	30	YES
cis-1,2-Dichloroethene	5.00	4.82	4.66	96	93	86-113	3	30	YES
2-Butanone	37.50	46.37	44.52	124	119	71-132	4	30	YES
Propionitrile	37.50	44.37	41.69	118	111	69-135	6	30	YES
Methacrylonitrile	37.50	43.60	41.68	116	111	87-115	5	30	NO
Bromochloromethane	5.00	4.44	4.38	89	88	83-115	1	30	YES
Tetrahydrofuran	25.00	27.33	26.26	109	105	81-115	4	30	YES
Chloroform	5.00	5.49	5.33	110	107	83-121	3	30	YES
1,1,1-Trichloroethane	5.00	5.53	5.28	111	106	83-123	5	30	YES
Cyclohexane	5.00	5.22	4.95	104	99	78-121	5	30	YES
1,1-Dichloropropene	5.00	5.36	5.04	107	101	87-114	6	30	YES
Carbon Tetrachloride	5.00	5.42	5.17	108	103	76-134	5	30	YES
Isobutyl Alcohol	125.00	136.40	129.43	109	104	56-138	5	30	YES
Benzene	5.00	5.11	4.90	102	98	87-111	4	30	YES
1,2-Dichloroethane	5.00	5.93	5.81	119	116	83-130	2	30	YES
t-Amyl Methyl Ether	5.00	4.56	4.52	91	90	84-112	1	30	YES
n-Heptane	5.00	5.89	5.53	118	111	79-115	6	30	NO
n-Butanol	250.00	225.14	216.68	90	87	53-127	4	30	YES
Trichloroethene	5.00	5.09	4.88	102	98	87-116	4	30	YES
Methylcyclohexane	5.00	4.91	4.62	98	92	86-116	6	30	YES
1,2-Dichloropropane	5.00	5.40	5.24	108	105	85-115	3	30	YES
Dibromomethane	5.00	5.14	5.08	103	102	90-116	1	30	YES
Methyl Methacrylate	5.00	5.37	5.09	107	102	76-116	5	30	YES
Bromodichloromethane	5.00	5.56	5.48	111	110	85-123	1	30	YES
cis-1,3-Dichloropropene	5.00	4.83	4.72	97	94	79-114	2	30	YES
4-Methyl-2-Pentanone	25.00	26.99	27.01	108	108	71-130	0	30	YES
Toluene	5.00	5.12	4.90	102	98	89-113	4	30	YES
trans-1,3-Dichloropropene	5.00	5.26	5.18	105	104	77-122	2	30	YES
Ethyl Methacrylate	5.00	4.95	4.99	99	100	71-121	1	30	YES
1,1,2-Trichloroethane	5.00	5.11	5.05	102	101	87-115	1	30	YES
Tetrachloroethene	5.00	4.52	4.27	90	85	81-116	5	30	YES
1,3-Dichloropropane	5.00	5.53	5.42	111	108	88-114	2	30	YES
2-Hexanone	25.00	28.77	28.94	115	116	69-135	1	30	YES
Dibromochloromethane	5.00	5.36	5.18	107	104	85-117	3	30	YES
1,2-Dibromoethane	5.00	5.08	5.01	102	100	86-116	2	30	YES
Chlorobenzene	5.00	5.03	4.86	101	97	88-112	3	30	YES
1,1,1,2-Tetrachloroethane	5.00	5.17	4.98	103	100	86-119	4	30	YES

N/C = Could not calculate

Lab Chronicle: ____________________ Ent. by

____________________ Ver. by ______

Lancaster Laboratories, Inc.

Volatiles Laboratory Control Sample Recoveries

LCS: cu18l01.d
Client ID: LCSC07
Method: SW-846 8260B (25ML)
Instrument: HP10193

LCS Duplicate: cu18l02.d
Client ID: LCDC07
Matrix/Level: WL
Dilution Factor: 1.0

Batch: C071691AA

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	LCSD CONC UG/L	LCS REC %	LCSD REC %	Range LOWER-UPPER	RPD %	RPD MAX	INSPEC
Ethylbenzene	5.00	5.40	5.17	108	103	88-114	4	30	YES
m+p-Xylene	10.00	10.12	9.70	101	97	88-115	4	30	YES
o-Xylene	5.00	5.06	4.89	101	98	88-115	3	30	YES
Styrene	5.00	4.77	4.63	95	93	85-118	3	30	YES
Bromoform	5.00	4.40	4.30	88	86	79-126	2	30	YES
Isopropylbenzene	5.00	5.11	4.89	102	98	87-115	4	30	YES
1,1,2,2-Tetrachloroethane	5.00	5.59	5.61	112	112	83-119	0	30	YES
Bromobenzene	5.00	4.96	4.80	99	96	84-112	3	30	YES
trans-1,4-Dichloro-2-Butene	25.00	27.73	26.23	111	105	15-165	6	30	YES
n-Propylbenzene	5.00	6.10	5.86	122	117	88-116	4	30	NO
2-Chlorotoluene	5.00	5.35	5.16	107	103	90-112	4	30	YES
4-Chlorotoluene	5.00	5.46	5.26	109	105	90-113	4	30	YES
1,3,5-Trimethylbenzene	5.00	5.65	5.45	113	109	86-113	4	30	YES
Pentachloroethane	5.00	4.98	4.94	100	99	86-122	1	30	YES
tert-Butylbenzene	5.00	5.15	4.96	103	99	90-114	4	30	YES
1,2,4-Trimethylbenzene	5.00	5.66	5.51	113	110	86-114	3	30	YES
sec-Butylbenzene	5.00	5.57	5.40	111	108	83-115	3	30	YES
1,3-Dichlorobenzene	5.00	5.07	5.00	101	100	85-109	1	30	YES
p-Isopropyltoluene	5.00	5.39	5.18	108	104	85-115	4	30	YES
1,4-Dichlorobenzene	5.00	5.08	4.98	102	100	85-112	2	30	YES
Benzyl Chloride	5.00	4.47	4.42	89	88	70-130	1	30	YES
n-Butylbenzene	5.00	5.80	5.64	116	113	82-115	3	30	NO
1,2-Dichlorobenzene	5.00	5.00	4.95	100	99	89-114	1	30	YES
1,2-Dibromo-3-Chloropropane	5.00	4.56	4.39	91	88	76-120	4	30	YES
1,2,4-Trichlorobenzene	5.00	4.39	4.48	88	90	78-117	2	30	YES
Hexachlorobutadiene	5.00	4.37	4.38	87	88	75-120	0	30	YES
Naphthalene	5.00	4.81	4.77	96	95	75-123	1	30	YES
1,2,3-Trichlorobenzene	5.00	4.35	4.39	87	88	84-116	1	30	YES

N/C = Could not calculate

Lab Chronicle: ______ Ent. by ______

______ Ver. by 8261

SOIL GC/MS SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: LANCASTER LABS
Lab Code: LANCAS

UNSPIKED:ed1383.d
S2030 5034293
AMT USED:30.0 g
FINAL VOL:1 ml

MATRIX SPIKE:ed1384.d
S2030MS 5034293
AMT USED: 30.0 g
FINAL VOL: 1 ml

SPIKE DUPLICATE:ed1385.d
S2030MSD 5034293
AMT USED: 30.0 g
FINAL VOL: 1 ml

INSTRUMENT: HP09572
DILUTION FACTOR: 1
BATCH: 07114SLA026

%MOISTURE: 24
EXTRACT SPIKE LEVEL: 2192.98

COMPOUND NAME	MS SPIKE	MSD SPIKE	US CONC UG/KG	MS CONC UG/KG	MSD CONC UG/KG	MS REC %	MSD REC %	Range LOWER-UPPER	INSPEC	RPD %	RPD MAX	INSPEC
Benzaldehyde	2192.98	2192.98	ND	829.89	638.12	38	29	2-124	YES	27	30	YES
Phenol	2192.98	2192.98	ND	1904.56	1877.08	87	86	36-135	YES	1	30	YES
bis(2-Chloroethyl)ether	2192.98	2192.98	ND	2026.15	1969.25	92	90	41-122	YES	2	30	YES
2-Chlorophenol	2192.98	2192.98	ND	2133.83	2040.64	97	93	48-125	YES	4	30	YES
2-Methylphenol	2192.98	2192.98	ND	1917.05	1953.95	87	89	39-129	YES	2	30	YES
2,2'-oxybis(1-Chloropropane	2192.98	2192.98	ND	1621.93	1560.80	74	71	45-146	YES	4	30	YES
Acetophenone	2192.98	2192.98	ND	2020.57	1981.13	92	90	24-146	YES	2	30	YES
N-Nitroso-di-n-propylamine	2192.98	2192.98	ND	2001.40	1991.62	91	91	35-133	YES	0	30	YES
4-Methylphenol	2192.98	2192.98	ND	2207.80	2201.07	101	100	36-136	YES	1	30	YES
Hexachloroethane	2192.98	2192.98	ND	1931.00	1778.20	88	81	31-125	YES	8	30	YES
Nitrobenzene	2192.98	2192.98	ND	1941.99	1956.81	89	89	38-136	YES	0	30	YES
Isophorone	2192.98	2192.98	ND	1818.09	1790.53	83	82	31-122	YES	1	30	YES
2-Nitrophenol	2192.98	2192.98	ND	2172.62	2206.92	99	101	36-146	YES	2	30	YES
2,4-Dimethylphenol	2192.98	2192.98	ND	2000.93	1986.08	91	91	43-135	YES	0	30	YES
bis(2-Chloroethoxy)methane	2192.98	2192.98	ND	2057.26	2026.71	94	92	50-137	YES	2	30	YES
2,4-Dichlorophenol	2192.98	2192.98	ND	2076.84	2066.72	95	94	35-138	YES	1	30	YES
Naphthalene	2192.98	2192.98	ND	1978.62	1975.19	90	90	33-137	YES	0	30	YES
4-Chloroaniline	2192.98	2192.98	ND	1891.15	1951.82	86	89	2-130	YES	3	30	YES
Hexachlorobutadiene	2192.98	2192.98	ND	1989.23	1985.40	91	91	45-129	YES	0	30	YES
Caprolactam	2192.98	2192.98	ND	1969.53	2041.10	90	93	1-181	YES	3	30	YES
4-Chloro-3-methylphenol	2192.98	2192.98	ND	2089.96	2047.56	95	93	48-135	YES	2	30	YES
2-Methylnaphthalene	2192.98	2192.98	ND	1981.88	2018.92	90	92	39-127	YES	2	30	YES
Hexachlorocyclopentadiene	4385.96	4385.96	ND	3673.96	3401.11	84	78	5-154	YES	7	30	YES
2,4,6-Trichlorophenol	2192.98	2192.98	ND	2143.48	2134.19	98	97	27-149	YES	1	30	YES
2,4,5-Trichlorophenol	2192.98	2192.98	ND	2046.25	2146.04	93	98	23-142	YES	5	30	YES
1,1'-Biphenyl	2192.98	2192.98	ND	2053.74	2089.80	94	95	39-146	YES	1	30	YES
2-Chloronaphthalene	2192.98	2192.98	ND	1576.06	1568.05	72	72	42-110	YES	0	30	YES
2-Nitroaniline	2192.98	2192.98	ND	2168.03	2111.42	99	96	45-139	YES	3	30	YES
Dimethylphthalate	2192.98	2192.98	ND	2094.08	2123.90	95	97	46-131	YES	2	30	YES
2,6-Dinitrotoluene	2192.98	2192.98	ND	2171.08	2151.40	99	98	50-132	YES	1	30	YES
Acenaphthylene	2192.98	2192.98	ND	2072.03	2066.77	94	94	45-144	YES	0	30	YES
3-Nitroaniline	2192.98	2192.98	ND	2060.23	2063.99	94	94	27-140	YES	0	30	YES
Acenaphthene	2192.98	2192.98	ND	2089.08	2095.64	95	96	48-129	YES	1	30	YES
2,4-Dinitrophenol	2192.98	2192.98	ND	1779.49	1731.91	81	79	20-152	YES	2	30	YES
4-Nitrophenol	2192.98	2192.98	ND	1736.80	1674.65	79	76	5-165	YES	4	30	YES
Dibenzofuran	2192.98	2192.98	ND	2080.22	2082.51	95	95	37-135	YES	0	30	YES
2,4-Dinitrotoluene	2192.98	2192.98	ND	2173.47	2181.11	99	99	44-138	YES	0	30	YES
Diethylphthalate	2192.98	2192.98	ND	2126.90	2179.48	97	99	49-128	YES	2	30	YES
Fluorene	2192.98	2192.98	ND	2123.67	2132.45	97	97	30-146	YES	0	30	YES
4-Chlorophenyl-phenylether	2192.98	2192.98	ND	2183.52	2168.94	100	99	50-128	YES	1	30	YES
4-Nitroaniline	2192.98	2192.98	ND	1739.80	1744.68	79	80	22-129	YES	1	30	YES
4,6-Dinitro-2-methylphenol	2192.98	2192.98	ND	2150.70	2135.98	98	97	5-156	YES	1	30	YES
N-Nitrosodiphenylamine	2192.98	2192.98	ND	2178.48	2175.84	99	99	46-150	YES	0	30	YES
4-Bromophenyl-phenylether	2192.98	2192.98	ND	2176.33	2141.90	99	98	52-136	YES	1	30	YES
Hexachlorobenzene	2192.98	2192.98	ND	2146.52	2184.17	98	100	45-138	YES	2	30	YES
Atrazine	2192.98	2192.98	ND	2160.38	2178.42	99	99	16-156	YES	0	30	YES
Pentachlorophenol	2192.98	2192.98	ND	1623.25	1570.63	74	72	5-140	YES	3	30	YES
Phenanthrene	2192.98	2192.98	ND	2141.00	2127.61	98	97	4-176	YES	1	30	YES
Anthracene	2192.98	2192.98	ND	2128.97	2110.42	97	96	17-161	YES	1	30	YES
Carbazole	2192.98	2192.98	ND	2045.09	2062.06	93	94	36-143	YES	1	30	YES
Di-n-butylphthalate	2192.98	2192.98	ND	2283.44	2270.24	104	104	49-128	YES	0	30	YES
Fluoranthene	2192.98	2192.98	ND	1993.34	1967.96	91	90	23-142	YES	1	30	YES
Pyrene	2192.98	2192.98	ND	2249.32	2165.82	103	99	28-155	YES	4	30	YES
Butylbenzylphthalate	2192.98	2192.98	ND	2228.04	2187.78	102	100	46-138	YES	2	30	YES
3,3'-Dichlorobenzidine	2192.98	2192.98	ND	2006.06	1964.31	91	90	3-142	YES	1	30	YES
Benzo(a)anthracene	2192.98	2192.98	ND	2301.19	2224.96	105	101	22-158	YES	4	30	YES

COMMENTS: ______________________________

Lancaster Laboratories, Inc.
Semi Volatiles Laboratory Control Sample Recoveries

LCS: hc154.d
085WBLCS8 085WBLCS
Method: SOW OLM03.2
Instrument: HP04629

LCS Duplicate: hc155.d
085WBLCSD8 085WBLCSD
Matrix/Level: W/L
Dilution Factor: 1.0

Batch: 06085WAB026

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	LCSD CONC UG/L	LCS REC %	LCSD REC %	Range LOWER-UPPER	REC INSPEC	RPD %	RPD MAX	RPD INSPEC
Phenol	75.00	59.47	59.46	79	79	12-110	YES	0	42	YES
2-Chlorophenol	75.00	57.13	58.04	76	77	27-123	YES	2	40	YES
1,4-Dichlorobenzene	50.00	35.57	35.94	71	72	36-103	YES	1	28	YES
1,2,4-Trichlorobenzene	50.00	40.46	40.72	81	81	39-103	YES	1	28	YES

N/C = Could not calculate

Lab Chronicle: ____ Ent. by ______

____ Ver. by ______

____

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

IN322

Client Sample ID:W-TSI-INF-032207

Lab Name: Lancaster Laboratories Contract:______

Lab Code: LANCAS Case No.:________ SAS No.:_________ SDG No.:_LS433__

Matrix: (soil/water) WATER Lab Sample ID: 5013065

Sample wt/vol: 1046 (g/mL)ML Lab File ID: hc156.d

Level: (low/med) LOW Date Received: 03/23/07

% Moisture: not dec: dec: Date Extracted: 03/26/07

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/28/07

Injection Volume: 2 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: Extraction: Cont

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) LOQ UG/L	Q
108-95-2	Phenol	52	
95-57-8	2-Chlorophenol	77	E
541-73-1	1,3-Dichlorobenzene	10	U
106-46-7	1,4-Dichlorobenzene	29	
95-50-1	1,2-Dichlorobenzene	9	
120-83-2	2,4-Dichlorophenol	9	
120-82-1	1,2,4-Trichlorobenzene	6	
91-20-3	Naphthalene	10	U
88-06-2	2,4,6-Trichlorophenol	10	U
118-74-1	Hexachlorobenzene	22	U
85-01-8	Phenanthrene	10	U
206-44-0	Fluoranthene	10	U

4B

SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

SBLKWB0858

Lab Name: Lancaster Laboratories Contract:________

Lab Code: LANCAS Case No.:_______ SAS No.:________ SDG No.:__________

Lab File ID: hc153.d Lab Sample ID: SBLKWB085

Date Extracted: 01/01/00 Extraction: Cont

Date Analyzed: 03/28/07 Time Analyzed: 01:30

Matrix (soil/water): WATER Level: (low/med) LOW

Instrument ID: HP04629

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	085WBLCS8	085WBLCS	hc154.d	03/28/07
02	085WBLCSD8	085WBLCSD	hc155.d	03/28/07
03	IN322	5013065	hc156.d	03/28/07
04	IN322DL	5013065DL	hc157.d	03/28/07

COMMENTS:

page 1 of 1

FORM IV SV OLM03.0

5B

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: Lancaster Laboratories Contract:____________

Lab Code: LANCAS Case No.:_______ SAS No.:_______ SDG No.:________

Lab File ID: hb160.d DFTPP Injection Date: 02/08/07

Instrument ID: HP04629 DFTPP Injection Time: 21:19

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 80.0% of mass 198	42.9
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	62.4
70	Less than 2.0% of mass 69	0.31 (0.5)1
127	25.0 - 75.0% of mass 198	36.7
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.96
275	10.0 - 30.0% of mass 198	22.3
365	Greater than 0.75% of mass 198	2.62
441	Present, and less than mass 443	7.06
442	40.0 - 110% of mass 198	51.8
443	15.0 - 24.0% of mass 442	11.1 (21.5)2

1-Value is % mass 69 2-Value is % mass of 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD05023	CLP0197	hb161.d	02/08/07	21:43
02	SSTD16023	CLP0197	hb162.d	02/08/07	22:49
03	SSTD12023	CLP0197	hb163.d	02/08/07	23:56
04	SSTD08023	CLP0197	hb164.d	02/09/07	01:02
05	SSTD01023	CLP0197	hb165.d	02/09/07	02:08
06	~~ICV2196~~ SSTD05023	ICV2196	hb166.d	02/09/07	03:15
07	70560DL	4964245DL	hb167.d	02/09/07	04:21

G. LS 1557 2/21/07

page 1 of 1

FORM V SV OLM03.0

5B

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: Lancaster Laboratories Contract:__________

Lab Code: LANCAS Case No.:______ SAS No.:______ SDG No.:______

Lab File ID: hc150.d DFTPP Injection Date: 03/27/07

Instrument ID: HP04629 DFTPP Injection Time: 22:45

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 80.0% of mass 198	48.5
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	64.2
70	Less than 2.0% of mass 69	0.22 (0.35)1
127	25.0 - 75.0% of mass 198	37.5
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.71
275	10.0 - 30.0% of mass 198	19.5
365	Greater than 0.75% of mass 198	2.56
441	Present, and less than mass 443	7.49
442	40.0 - 110% of mass 198	49.6
443	15.0 - 24.0% of mass 442	9.6 (19.4)2

1-Value is % mass 69 2-Value is % mass of 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD05079	CLP0197	hc151.d	03/27/07	23:09
02	SBLKWB0858	SBLKWB085	hc153.d	03/28/07	01:30
03	085WBLCS8	085WBLCS	hc154.d	03/28/07	02:36
04	085WBLCSD8	085WBLCSD	hc155.d	03/28/07	03:43
05	IN322	5013065	hc156.d	03/28/07	04:49
06	IN322DL	5013065DL	hc157.d	03/28/07	05:56

8B
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: LANCASTER LABS　　Contract:________

Lab Code: LANCAS　Case No.:________　SAS No.:________　SDG No.:________

Lab File ID (Standard): hc151.d　　Date Analyzed: 03/27/07

Instrument ID: HP04629　　Time Analyzed: 23:09

		IS1(DCB) AREA #	RT #	IS2(NPT) AREA #	RT #	IS3(ANT) AREA #	RT #
	12 HOUR STD	247005	14.158	811547	17.995	532981	23.487
	UPPER LIMIT	494010	14.658	1623094	18.495	1065962	23.987
	LOWER LIMIT	123502	13.658	405774	17.495	266490	22.987
	EPA SAMPLE NO.						
01	SBLKWB0858	266693	14.163	868249	17.991	586103	23.486
02	085WBLCS8	257367	14.164	813479	17.994	584944	23.480
03	085WBLCSD8	265895	14.164	842958	17.994	596324	23.491
04	IN322	230134	14.158	702063	17.998	476596	23.485
05	IN322DL	307647	14.158	908313	17.988	621326	23.483

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

AREA UPPER LIMIT (advisory) = +100% of internal standard area
AREA LOWER LIMIT (advisory) = -50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard are and RT values with an asterisk
* Values outside of QC limits.

8C

SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: LANCASTER LABS Contract:________

Lab Code: LANCAS Case No.:________ SAS No.:________ SDG No.:________

Lab File ID (Standard): hc151.d Date Analyzed: 03/27/07

Instrument ID: HP04629 Time Analyzed: 23:09

		IS4 (PHN) AREA #	RT #	IS5 (CRY) AREA #	RT #	IS6 (PRY) AREA #	RT #
	12 HOUR STD	1006237	27.984	725087	35.490	486895	43.683
	UPPER LIMIT	2012474	28.484	1450174	35.990	973790	44.183
	LOWER LIMIT	503118	27.484	362544	34.990	243448	43.183
	EPA SAMPLE NO.						
01	SBLKWB0858	984214	27.984	637468	35.475	358546	43.678
02	085WBLCSB	992751	27.984	680707	35.476	376794	43.689
03	085WBLCSDB	1030635	27.985	706658	35.478	388947	43.690
04	IN322	800792	27.991	541905	35.485	397167	43.708
05	IN322DL	1043421	27.987	749080	35.479	478401	43.680

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT (advisory) = +100% of internal standard area
AREA LOWER LIMIT (advisory) = -50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard are and RT values with an asterisk
* Values outside of QC limits.

6B
SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:____________

Lab Code: LANCAS Case No.:_______ SAS No.:_______ SDG No.:________

Instrument ID: HPD4629 Calibration Date(s): 02/08/07 02/09/07

Calibration Times: 21:43 02:08

LAB FILE ID: RRF1023 = hb165.d RRF5023 = hb161.d
RRF8023 = hb164.d RRF12023 = hb163.d RRF16023 = hb162.d

COMPOUND	RRF1023	RRF5023	RRF8023	RRF12023	RF16023	$\overline{RRF}$	% RSD
N-Nitrosodimethylamine	1.251	1.141	1.216	1.124	1.171	1.181	4
Pyridine	1.790	1.688	1.709	1.562	1.575	1.665	6
N,N-dimethyl formamide	1.114	1.250	1.332	1.309	0.868	1.175	16
2-methylcyclohexanone	0.409	0.416	0.428	0.409	0.402	0.413	2
3-methylcyclohexanone	0.415	0.386	0.380	0.364	0.336	0.376	8
4-methylcyclohexanone	0.382	0.370	0.346	0.330	0.304	0.347	9
Benzaldehyde	1.126	0.887	0.833	0.699	0.559	0.821	26
1,3,5-Trimethylbenzene	2.745	2.726	2.789	2.700	2.569	2.706	3
Aniline	2.106	1.904	1.769	1.680	1.544	1.801	12
Phenol	* 1.928	1.668	1.810	1.641	1.594	1.728	8*
bis(2-Chloroethyl)ether	* 1.592	1.450	1.540	1.408	1.397	1.477	6*
2-Chlorophenol	* 1.340	1.205	1.280	1.157	1.168	1.230	6*
1,2,4-Trimethylbenzene	2.884	2.883	2.919	2.891	2.698	2.855	3
1,3-Dichlorobenzene	* 1.639	1.521	1.597	1.468	1.483	1.542	5*
1,4-Dichlorobenzene	* 1.641	1.517	1.601	1.480	1.499	1.548	4*
1,2,3-Trimethylbenzene	2.827	2.903	2.912	2.849	2.691	2.836	3
1,2-Dichlorobenzene	* 1.557	1.429	1.476	1.347	1.367	1.435	6*
2-Methylphenol	* 1.338	1.153	1.248	1.141	1.148	1.206	7*
2,2'-oxybis(1-Chloropropane)	3.110	2.690	2.804	2.572	2.558	2.747	8
bis(2-Chloroisopropyl)ether	3.110	2.690	2.804	2.572	2.558	2.747	8
Acetophenone	1.976	2.013	2.096	2.057	2.004	2.029	2
N-Nitroso-di-n-propylamine	* 1.639	1.488	1.594	1.443	1.435	1.520	6*
o-Toluidine	2.201	1.928	1.787	1.697	1.536	1.830	14
4-Methylphenol	* 1.396	1.231	1.361	1.235	1.229	1.290	6*
Hexachloroethane	* 0.785	0.769	0.797	0.737	0.755	0.769	3*
Nitrobenzene	* 0.633	0.594	0.616	0.569	0.594	0.601	4*
Isophorone	* 1.176	1.051	1.115	1.014	1.058	1.083	6*
2-Nitrophenol	* 0.265	0.236	0.260	0.240	0.249	0.250	5*
2,4-Dimethylphenol	* 0.541	0.493	0.529	0.483	0.513	0.512	5*
1-chloro-2-nitro-4(trifluorome	0.180	0.193	0.197	0.202	0.202	0.195	4
bis(2-Chloroethoxy)methane	* 0.582	0.516	0.574	0.522	0.537	0.546	6*
2,4-Dichlorophenol	* 0.406	0.385	0.429	0.393	0.415	0.406	4*
1,2,4-Trichlorobenzene	* 0.478	0.442	0.474	0.436	0.467	0.460	4*
2-Tertbutylphenol	0.470	0.478	0.521	0.505	0.495	0.494	4
Naphthalene	* 1.029	0.935	0.984	0.914	0.933	0.959	5*
4-Chloroaniline	0.442	0.377	0.361	0.262	0.220	0.333	27
Hexachlorobutadiene	0.303	0.295	0.308	0.297	0.319	0.304	3
Caprolactam	0.135	0.127	0.141	0.144	0.113	0.132	9
4-Chloro-3-methylphenol	* 0.325	0.286	0.313	0.284	0.296	0.301	6*
2-Methylnaphthalene	* 0.745	0.675	0.731	0.662	0.694	0.701	5*
Phthalic anhydride	0.432	0.298	0.296	0.270	0.143	0.288	36
Hexachlorocyclopentadiene	0.413	0.498	0.517	0.493	0.551	0.495	10
2,4,6-Trichlorophenol	* 0.468	0.459	0.513	0.472	0.508	0.484	5*
2,4,5-Trichlorophenol	*	0.496	0.562	0.499	0.550	0.527	6*
1,1'-Biphenyl	1.196	1.347	1.391	1.356	1.396	1.337	6
Diphenyl	1.196	1.358	1.398	1.364	1.392	1.341	6
2-Chloronaphthalene	* 1.228	1.180	1.258	1.145	1.208	1.204	4*
4-Tertbutylphenol	0.688	0.638	0.684	0.685	0.668	0.673	3
2-Nitroaniline		0.608	0.648	0.596	0.621	0.618	4
Dimethylphthalate	1.604	1.464	1.586	1.454	1.514	1.525	4
2,6-Dinitrotoluene	* 0.387	0.376	0.419	0.382	0.413	0.396	5*
Acenaphthylene	* 1.896	1.770	1.873	1.691	1.759	1.798	5*

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

B1528
2-12-07

6C
SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories   Contract:__________

Lab Code: LANCAS   Case No.:______   SAS No.:______   SDG No.:______

Instrument ID: HP04629   Calibration Date(s): 02/08/07   02/09/07

Calibration Times: 21:43   02:08

LAB FILE ID: RRF1023 = hb165.d   RRF5023 = hb161.d
RRF8023 = hb164.d   RRF12023 = hb163.d   RRF16023 = hb162.d

COMPOUND	RRF1023	RRF5023	RRF8023	RRF12023	RRF16023	RRF (mean)	% RSD
3-Nitroaniline		0.308	0.312	0.261	0.250	0.283	11
Acenaphthene	* 1.096	1.033	1.106	1.025	1.102	1.073	4*
2,4-Dinitrophenol		0.289	0.346	0.322	0.366	0.331	10
4-Nitrophenol		0.362	0.400	0.370	0.379	0.378	4
Dibenzofuran	* 1.780	1.657	1.814	1.634	1.751	1.727	4*
2,4-Dinitrotoluene	* 0.517	0.505	0.572	0.527	0.553	0.535	5*
2,6-Dinitrophenol		0.121	0.144	0.146	0.151	0.140	10
2,6-Ditertbutylphenol	0.650	0.881	0.720	0.741	0.711	0.741	12
Diethylphthalate	1.700	1.534	1.684	1.522	1.604	1.609	5
Fluorene	* 1.354	1.231	1.351	1.231	1.346	1.303	5*
4-Chlorophenyl-phenylether	* 0.727	0.679	0.743	0.683	0.755	0.717	5*
4(tert-Octyl)phenol	1.002	1.021	1.035	0.984	0.969	1.002	3
4-Nitroaniline		0.324	0.351	0.323	0.333	0.333	4
4,6-Dinitro-2-methylphenol		0.183	0.212	0.206	0.215	0.204	7
N-Nitrosodiphenylamine (1)	0.591	0.548	0.616	0.567	0.602	0.585	5
2,4-Ditertbutylphenol	1.413	1.455	1.579	1.613	1.612	1.534	6
1,2-Diphenylhydrazine	1.017	0.926	0.964	0.874	0.896	0.935	6
3,5-Ditertbutylphenol	1.092	1.119	1.216	1.221	1.221	1.174	5
4-Bromophenyl-phenylether	* 0.232	0.228	0.254	0.235	0.262	0.242	6*
Hexachlorobenzene	* 0.282	0.262	0.290	0.275	0.301	0.282	5*
Atrazine	0.208	0.227	0.228	0.221	0.224	0.222	4
Pentachlorophenol	*	0.190	0.221	0.208	0.224	0.211	7*
Phenanthrene	* 1.095	0.997	1.091	1.016	1.047	1.049	4*
Anthracene	* 1.150	1.014	1.090	1.015	1.041	1.062	6*
Carbazole	1.056	0.922	1.013	0.935	0.947	0.975	6
Di-n-butylphthalate	1.464	1.289	1.327	1.212	1.203	1.299	8
Fluoranthene	* 1.176	0.997	1.094	1.010	1.010	1.058	7*
Pyrene	* 1.515	1.497	1.636	1.466	1.618	1.546	5*
Butylbenzylphthalate	0.790	0.799	0.857	0.777	0.840	0.813	4
3,3'-Dichlorobenzidine	0.431	0.253	0.285	0.232	0.235	0.287	29
Benzo(a)anthracene	* 1.223	1.152	1.283	1.180	1.261	1.220	4*
Chrysene	* 1.059	1.037	1.172	1.079	1.160	1.102	6*
bis(2-Ethylhexyl)phthalate	1.027	1.030	1.135	1.039	1.111	1.068	5
Di-n-octylphthalate	2.499	2.584	2.942	2.742	2.816	2.717	6
Benzo(b)fluoranthene	* 1.628	1.518	1.736	1.626	1.682	1.638	5*
Benzo(k)fluoranthene	* 1.576	1.486	1.668	1.538	1.631	1.580	4*
Benzo(a)pyrene	* 1.432	1.362	1.542	1.453	1.521	1.462	5*
Indeno(1,2,3-cd)pyrene	* 1.084	1.088	1.162	1.107	1.244	1.137	6*
Dibenz(a,h)anthracene	* 1.020	1.016	1.114	1.068	1.204	1.085	7*
Benzo(g,h,i)perylene	* 1.047	1.108	1.209	1.148	1.319	1.166	9*
2-Fluorophenol	* 1.479	1.368	1.463	1.324	1.326	1.392	5*
Phenol-d5	* 1.944	1.674	1.770	1.585	1.579	1.710	9*
2-Chlorophenol-d4	* 1.394	1.261	1.359	1.242	1.245	1.300	5*
1,2-Dichlorobenzene-d4	* 1.103	1.005	1.070	0.995	1.005	1.035	5*
Nitrobenzene-d5	* 0.622	0.596	0.630	0.579	0.609	0.607	3*
2-Fluorobiphenyl	* 1.445	1.392	1.523	1.366	1.462	1.438	4*
2,4,6-Tribromophenol	0.146	0.136	0.157	0.146	0.166	0.150	8
Terphenyl-d14	* 1.018	1.010	1.112	1.022	1.161	1.065	6*

(1) Cannot be separated from Diphenylamine
All other compounds must meet a minimum RRF of 0.010.

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:____________

Lab Code: LANCAS Case No.:_______ SAS No.:________ SDG No.:_________

Instrument ID: HP04629 Calibration Date: 03/27/07 Time: 23:09

Lab File ID: hc151.d Init. Calib. Date(s): 02/08/07 02/09/07

Init. Calib. Times(s): 21:43 02:08

COMPOUND	$\overline{\text{RRF}}$	RRF50	MIN RRF	%D	MAX %D	
N-Nitrosodimethylamine	1.181	1.228		4		
Pyridine	1.665	1.688		1		
N,N-dimethyl formamide	1.175	1.261		7		
2-methylcyclohexanone	0.413	0.442		7		
3-methylcyclohexanone	0.376	0.389		3		
4-methylcyclohexanone	0.346	0.367		6		
Benzaldehyde	0.821	0.902		10		
1,3,5-Trimethylbenzene	2.706	2.656		-2		
Aniline	1.801	1.794		0		
* Phenol	1.728	1.711	0.800	-1	25	*
* bis(2-Chloroethyl)ether	1.477	1.443	0.700	-2	25	*
* 2-Chlorophenol	1.230	1.217	0.800	-1	25	*
1,2,4-Trimethylbenzene	2.855	2.807		-2		
* 1,3-Dichlorobenzene	1.542	1.532	0.600	-1	25	*
* 1,4-Dichlorobenzene	1.548	1.522	0.500	-2	25	*
1,2,3-Trimethylbenzene	2.836	2.807		-1		
* 1,2-Dichlorobenzene	1.435	1.425	0.400	-1	25	*
* 2-Methylphenol	1.206	1.167	0.700	-3	25	*
2,2'-oxybis(1-Chloropropane)	2.747	2.621		-4		
bis(2-Chloroisopropyl)ether	2.747	2.621		-4		
Acetophenone	2.029	1.984		-2		
* N-Nitroso-di-n-propylamine	1.520	1.397	0.500	-8	25	*
o-Toluidine	1.830	1.748		-4		
* 4-Methylphenol	1.290	1.287	0.600	0	25	*
* Hexachloroethane	0.769	0.716	0.300	-7	25	*
* Nitrobenzene	0.601	0.539	0.200	-10	25	*
* Isophorone	1.083	0.997	0.400	-8	25	*
* 2-Nitrophenol	0.250	0.227	0.100	-9	25	*
* 2,4-Dimethylphenol	0.512	0.484	0.200	-6	25	*
1-chloro-2-nitro-4(trifluorome	0.195	0.174		-11		
* bis(2-Chloroethoxy)methane	0.546	0.510	0.300	-7	25	*
* 2,4-Dichlorophenol	0.406	0.386	0.200	-5	25	*
* 1,2,4-Trichlorobenzene	0.460	0.435	0.200	-5	25	*
2-Terthutylphenol	0.494	0.458		-7		
* Naphthalene	0.959	0.934	0.700	-2	25	*
4-Chloroaniline	0.332	0.364		9		

All other compounds must meet a minimum RRF of 0.010.

03/28/07

FORM VII SV-1

OLM03.0

7C
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____________

Lab Code: LANCAS Case No.:_______ SAS No.:________ SDG No.:_________

Instrument ID: HP04629 Calibration Date: 03/27/07 Time: 23:09

Lab File ID: hc151.d Init. Calib. Date(s): 02/08/07 02/09/07

Init. Calib. Times(s): 21:43 02:08

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Hexachlorobutadiene	0.304	0.287		-6	
Caprolactam	0.132	0.133		1	
* 4-Chloro-3-methylphenol	0.301	0.289	0.200	-4	25 *
* 2-Methylnaphthalene	0.701	0.678	0.400	-3	25 *
Phthalic anhydride	0.288	0.225		-22	
Hexachlorocyclopentadiene	0.494	0.424		-14	
* 2,4,6-Trichlorophenol	0.484	0.449	0.200	-7	25 *
* 2,4,5-Trichlorophenol	0.527	0.496	0.200	-6	25 *
1,1'-Biphenyl	1.337	1.355		1	
Diphenyl	1.341	1.355		1	
* 2-Chloronaphthalene	1.204	1.142	0.800	-5	25 *
4-Tertbutylphenol	0.672	0.627		-7	
2-Nitroaniline	0.618	0.582		-6	
Dimethylphthalate	1.525	1.483		-3	
* 2,6-Dinitrotoluene	0.396	0.384	0.200	-3	25 *
* Acenaphthylene	1.798	1.773	0.900	-1	25 *
3-Nitroaniline	0.283	0.300		6	
* Acenaphthene	1.073	1.021	0.900	-5	25 *
2,4-Dinitrophenol	0.331	0.204		-38	
4-Nitrophenol	0.378	0.276		-27	
* Dibenzofuran	1.727	1.631	0.500	-6	25 *
* 2,4-Dinitrotoluene	0.535	0.504	0.200	-6	25 *
2,6-Dinitrophenol	0.140	0.084		-40	
2,6-Ditertbutylphenol	0.740	0.623		-16	
Diethylphthalate	1.609	1.524		-5	
* Fluorene	1.303	1.156	0.900	-11	25 *
* 4-Chlorophenyl-phenylether	0.717	0.625	0.400	-13	25 *
4(tert-Octyl)phenol	1.002	0.984		-2	
4-Nitroaniline	0.333	0.281		-16	
4,6-Dinitro-2-methylphenol	0.204	0.160		-21	
N-Nitrosodiphenylamine (1)	0.585	0.520		-11	
2,4-Ditertbutylphenol	1.534	1.350		-12	
1,2-Diphenylhydrazine	0.935	0.824		-12	
3,5-Ditertbutylphenol	1.174	1.057		-10	
* 4-Bromophenyl-phenylether	0.242	0.224	0.100	-8	25 *
* Hexachlorobenzene	0.282	0.253	0.100	-10	25 *

(1) Cannot be Separated from Diphenylamine

All other compounds must meet a minimum RRF of 0.010.

7C cont
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:____________

Lab Code: LANCAS Case No.:______ SAS No.:_______ SDG No.:________

Instrument ID: HP04629 Calibration Date: 03/27/07 Time: 23:09

Lab File ID: hc151.d Init. Calib. Date(s): 02/08/07 02/09/07

Init. Calib. Times(s): 21:43 02:08

COMPOUND	$\overline{\text{RRF}}$	RRF50	MIN RRF	%D	MAX %D	
Atrazine	0.222	0.226		2		
* Pentachlorophenol	0.211	0.163	0.050	-23	25	*
* Phenanthrene	1.049	0.994	0.700	-5	25	*
* Anthracene	1.062	0.998	0.700	-6	25	*
Carbazole	0.975	0.912		-6		
Di-n-butylphthalate	1.299	1.312		1		
* Fluoranthene	1.058	1.080	0.600	2	25	*
* Pyrene	1.546	1.512	0.600	-2	25	*
Butylbenzylphthalate	0.813	0.822		1		
3,3'-Dichlorobenzidine	0.287	0.288		0		
* Benzo(a)anthracene	1.220	1.161	0.800	-5	25	*
* Chrysene	1.102	1.042	0.700	-5	25	*
bis(2-Ethylhexyl)phthalate	1.068	1.151		8		
Di-n-octylphthalate	2.717	2.743		1		
* Benzo(b)fluoranthene	1.638	1.564	0.700	-4	25	*
* Benzo(k)fluoranthene	1.580	1.495	0.700	-5	25	*
* Benzo(a)pyrene	1.462	1.359	0.700	-7	25	*
* Indeno(1,2,3-cd)pyrene	1.137	0.857	0.500	-25	25	*
* Dibenz(a,h)anthracene	1.085	0.739	0.400	-32	25	*
* Benzo(g,h,i)perylene	1.166	0.908	0.500	-22	25	*
* 2-Fluorophenol	1.392	1.469	0.600	6	25	*
* Phenol-d5	1.710	1.708	0.800	0	25	*
* 2-Chlorophenol-d4	1.300	1.250	0.800	-4	25	*
* 1,2-Dichlorobenzene-d4	1.035	1.037	0.400	0	25	*
* Nitrobenzene-d5	0.607	0.553	0.200	-9	25	*
* 2-Fluorobiphenyl	1.438	1.322	0.700	-8	25	*
2,4,6-Tribromophenol	0.150	0.120		-20		
* Terphenyl-d14	1.065	1.003	0.500	-6	25	*

All other compounds must meet a minimum RRF of 0.010.

APPENDIX A

GC VOLATILES
DATA DELIVERABLES FORMS

Quality Control Summary
SDG# WRF18

Surrogate Recovery
Volatiles by GC - Soil

LL Sample#	Sample Code	Dilution Factor	TFT-F Soil--FID % Recovery	TOT OUT
4997216 %	13-60	25.0	77	
4997216MS	13-60	25.0	80	
4997216MSD	13-60	25.0	75	
5015033	HA-18	2561.48	2D	1
5015034 %	76SMP	585937.5	3 D	1
BLK3438	METHOD BLANK	25.0	79	
LCS3438	LAB CONTROL	1.0	102	

* = Values outside quality control limits.
D = Surrogates diluted - not counted towards total out.
TOT OUT = Total # of surrogates with recovery outside control limits.

		Control Limits Lower	Control Limits Upper
TFT-F	= Trifluorotoluene (Soil - FID)	61	122

Matrix Spike
Petroleum Analysis - Water

Unspiked Sample Number....: 4912610
Spiked Sample Number......: 4912610MS
Method Reference..........: GRO

Batch Number..............: 06318A53
Date......................: 11/14/06
Instrument................: 7530

Compound	Spike Added (UG/L)	Sample Conc (UG/L)	MS Conc (UG/L)	MS % Recov	QC Limits Recov
GRO	1100	0.00	1500	136	63-154

MS=Matrix Spike; ND=None Detected; * = Value outside quality control limits.

Lab Control/Lab Control Duplicate
Petroleum Analysis - Water

Lab Control Sample Number....: LCS5458
Lab Control Sample Number....: LDS5458
Method Reference.............: GRO

Batch Number.................: 06278A54
Date.........................: 10/05/06
Instrument...................: 7550

Compound	Spike Added (UG/L)	LCS Conc (UG/L)	LDS Conc (UG/L)	LCS % Recov	LDS % Recov	LCS Limits Recov	RPD	LCS Limits RPD
GRO	1100	1170	1220	107	111	70-130	4	30

LCS=Lab Control Sample; LDS=Lab Control Sample Duplicate; RPD=Relative Percent Difference

* = Value outside quality control limits.

Quality Control Summary
SDG# WRF18

Method Blank
Volatiles by GC - Water

Blank ID..................: BLK343B
Date......................: 03/27/07
Instrument................: 539B

Batch Number.....: 07086A34A
Time.............: 22:35
Matrix...........: Water

Sample Information			
LL Sample#	Sample Code	Analysis Date	Analysis Time
LCS343B	LAB CONTROL	03/27/07	23:47
4997216 %	13-60	03/28/07	00:24
4997216MS	13-60	03/28/07	01:00
4997216MSD	13-60	03/28/07	01:36
5015033	HA-18	03/28/07	02:26
5015034 %	76SMP	03/28/07	09:20

Method Blank Results				
CAS Number	Compound	Blank Conc. (UG/L)	LOQ (UG/L)	MDL (UG/L)
0000-00-0	GRO	ND	1000	200

LOQ = Limit of Quantitation; MDL = Method Detection Limit
ND = None Detected; * = Above Limit of Quantitation

Initial Calibration Summary

Instrument ID: 5398
Calibration Batch: 07052A34A
Method Reference: GRO
Initial Calibration Date(s): 02/21/07(FID)

8015B 34052

STANDARD DATE INJECTED TIME INJECTED	LEVEL 1 02/21/07 14:04	LEVEL 2 02/21/07 14:40	LEVEL 3 02/21/07 15:16	LEVEL 4 02/21/07 15:52	LEVEL 5 02/21/07 16:28

COMPOUND (DETECTOR)		Retention Time LEVEL 3	Window	Relative Response Factor (RRF) LEVEL1	LEVEL2	LEVEL3	LEVEL4	LEVEL5	MEAN	% RSD
GRO	(FID)	2.000	0.03	70634.4	66016.3	62956.7	62844.4	60486.2	64587.6	6
SURR-TFT-F	(FID)	6.990	0.03	80601.9	71244.0	76701.1	79460.0	75906.4	76782.7	5

Page 1 of 1

SS/JM
2/23/07

Calibration Verification Summary

Instrument ID: 5398
Method Reference: GRO
Data File: C:\DEPT25\34052B.0014.RAW
Date Injected: 02/21/07 Time Injected: 18:52

COMPOUND (DETECTOR)	RETENTION TIME			THEORETICAL CONCENTRATION (UG/L)	ACTUAL CONCENTRATION (UG/L)	% DRIFT	%DRIFT LIMITS
	ACTUAL	WINDOW START	WINDOW END				
GRO (FID)				220.0	195.8	-11	-15 to +15
SURR-TFT-F (FID)	6.980	6.900	7.060	30.0	26.2	-13	-43 to +46

* = %DRIFT outside control limits.

APPENDIX A

PESTICIDES/PCBs
DATA DELIVERABLES FORMS

2E
WATER SURROGATE RECOVERY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.: LS433

GC Column (1): RTXCLP ID: .32 GC Column (2): RTXCLPII ID: .32

Batchnumber: 070830012A

SAMPLE	SAMPLE CODE NO.	TCX 1 % REC #	TCX 2 % REC #	DCB 1 % REC #	DCB 2 % REC #	TOT OUT
5013065	IN322	163 *	79	95	101	1
BLANKA	PBLKOB	89	87	102	105	0
LCSA	LCSX0	93	92	95	99	0
LCSDA	LCSDX0	89	89	100	104	0

		ADVISORY QC LIMITS	NOMINAL CONCENTRATION	
TCX	= Tetrachloro-m-xylene	(30 - 150)	0.200	ug/l
DCB	= Decachlorobiphenyl	(30 - 150)	0.204	ug/l

Column to be used to flag recovery values

* Values outside of QC Limits

D Surrogate diluted out

3E

Water Matrix Spike/Matrix Spike Duplicate Recovery

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix Spike - Sample Code No.: WO-10

Compound	Spike Added (ug/l)	Sample Concen (ug/l)	MS Concen (ug/l)	MSD Concen (ug/l)	MS % Rec #	MSD % Rec #	MS-MSD % REC Limits	% RPD #	% RPD Lim
Formaldehyde	500	70	520	510	90	88	(70 - 124)	2	30

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

* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

Comments: Results calculated on as-received basis.

Sample No.: 5000751 Batch: 070680018A

3E
Water Lab Control Spike/Lab Control Spike Duplicate Recovery

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Laboratory Control Spike - EPA Sample No.: LCSX0

Compound	Spike Added (ug/l)	LCS Concen (ug/l)	LCS % Rec #	LCS-LCSD % REC Limits
gamma-BHC (Lindane)	0.50	0.51	102	56 - 123
Heptachlor	0.50	0.45	90	40 - 131
Aldrin	0.50	0.38	76	40 - 120
Dieldrin	1.0	1.0	100	52 - 126
Endrin	1.0	1.1	110	56 - 121
4,4'-DDT	1.0	1.0	100	38 - 127

Compound	Spike Added (ug/l)	LCSD Concen (ug/l)	LCSD % Rec #	% RPD #	% RPD Lim	LCS-LCSD % REC Limits
gamma-BHC (Lindane)	0.50	0.50	100	2	15	56 - 123
Heptachlor	0.50	0.44	88	2	20	40 - 131
Aldrin	0.50	0.35	70	8	22	40 - 120
Dieldrin	1.0	1.0	100	0	18	52 - 126
Endrin	1.0	0.99	99	10	21	56 - 121
4,4'-DDT	1.0	0.96	96	4	27	38 - 127

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

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

Comments: Results calculated on as-received basis.

Sample No.: LCSA Batch: 070830012A

1D

ORGANICS ANALYSIS DATA SHEET

SAMPLE CODE NO.

IN322

Client Sample ID: W-TSI-INF-032207

Lab Name: Lancaster Laboratories Contract: Batchnumber: 070830012A

Lab Code: Case No.: SAS No.: SDG No.: LS433

Matrix: (soil/water) WATER Lab Sample ID: 5013065

Sample wt/vol: 1015 (g/ml) ml Lab File ID: 5D1053.29R

% Moisture: Decanted: (Y/N) Date Received: 3/23/2007

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 3/25/2007

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 3/29/2007

Injection Volume: 1 (uL) Dilution Factor: 1

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS (UG/L or UG/KG) ug/l	Q
72-55-9	4,4'-DDE	0.35	U
959-98-8	Endosulfan I	0.050	U
50-29-3	4,4'-DDT	0.34	U

4C

METHOD BLANK SUMMARY

SAMPLE CODE NO.
PBLKOB

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Lab Sample ID BLANKA Batch 070830012A

Lab File ID: 5D1053.26R 5D1053B.26R

Matrix: (soil/water) WATER

Extraction: (SepF/Cont/Sonc) SEPF

Sulfur Cleanup: (Y/N) N

Date Extracted: 3/25/2007

Date Analyzed (1): 3/29/2007

Date Analyzed (2): 3/29/2007

Time Analyzed (1): 13:46:38

Time Analyzed (2): 13:46:38

Instrument ID (1): V5807A

Instrument ID (2): V5807B

GC Column: RTXCLP ID: 0.32 (mm)

GC Column: RTXCLPII ID: 0.32 (mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS, AND MSD

	SAMPLE CODE NO.	LAB SAMPLEID	DATE ANALYZED 1	DATE ANALYZED 2
01	IN322	5013065	3/29/2007	3/29/2007
02	PBLKOB	BLANKA	3/29/2007	3/29/2007
03	LCSX0	LCSA	3/29/2007	3/29/2007
04	LCSDX0	LCSDA	3/29/2007	3/29/2007

COMMENTS: ______

6D

INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument ID: V5807A Level (x Low): low 1.0 mid 4.0 high 20.0

GC Column (1) : RTXCLP ID: 0.32 (mm) Date(s) Analyzed: 02/22/07 02/23/07

COMPOUND	RT OF STANDARDS			MEAN RT	RT WINDOW	
	LOW	MID	HIGH		FROM	TO
alpha-BHC	7.45	7.44	7.44	7.44	7.39	7.49
gamma-BHC (Lindane)	8.20	8.19	8.20	8.19	8.14	8.24
beta-BHC	8.43	8.42	8.43	8.42	8.37	8.47
delta-BHC	8.83	8.82	8.83	8.82	8.77	8.87
Heptachlor	9.31	9.30	9.30	9.30	9.25	9.35
Aldrin	9.99	9.98	9.99	9.98	9.93	10.03
Heptachlor epoxide	11.34	11.34	11.35	11.34	11.29	11.39
gamma-Chlordane	11.62	11.61	11.62	11.61	11.56	11.66
alpha-Chlordane	11.91	11.90	11.91	11.90	11.85	11.95
4,4'-DDE	12.10	12.10	12.11	12.10	12.03	12.17
Endosulfan I	12.19	12.18	12.18	12.18	12.13	12.23
Dieldrin	12.70	12.69	12.70	12.69	12.62	12.76
Endrin	13.19	13.18	13.18	13.18	13.11	13.25
4,4'-DDD	13.37	13.35	13.36	13.35	13.28	13.42
Endosulfan II	13.67	13.66	13.67	13.66	13.59	13.73
4,4'-DDT	13.95	13.94	13.94	13.94	13.87	14.01
Endrin aldehyde	14.55	14.54	14.56	14.54	14.48	14.62
Methoxychlor	14.97	14.96	14.96	14.96	14.89	15.03
Endosulfan sulfate	15.46	15.45	15.46	15.45	15.38	15.52
Endrin ketone	16.04	16.03	16.04	16.03	15.96	16.10
Tetrachloro-m-xylene	6.09	6.08	6.08	6.08	6.03	6.13
Decachlorobiphenyl	18.36	18.35	18.35	18.35	18.25	18.45

*Surrogate retention times are measured from Standard Mix A analyses.

Retentiontime Windows are +/- 0.05 minutes for all compounds that elute before Heptachlor epoxide, +/- 0.07 minutes for all other compounds, except +/- 0.100 minutes for Decachlorobiphenyl

6D

INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument ID: V5807B Level (x Low): low 1.0 mid 4.0 high 20.0

GC Column (2) : RTXCLPII ID: 0.32 (mm) Date(s) Analyzed: 02/22/07 02/23/07

	RT OF STANDARDS			MEAN	RT WINDOW	
COMPOUND	LOW	MID	HIGH	RT	FROM	TO
alpha-BHC	7.57	7.56	7.56	7.56	7.51	7.61
gamma-BHC (Lindane)	8.42	8.41	8.42	8.41	8.36	8.46
beta-BHC	8.65	8.64	8.65	8.65	8.60	8.70
delta-BHC	9.32	9.31	9.32	9.31	9.26	9.36
Heptachlor	9.41	9.40	9.40	9.40	9.35	9.45
Aldrin	10.13	10.12	10.13	10.12	10.07	10.17
Heptachlor epoxide	11.43	11.42	11.43	11.42	11.37	11.47
gamma-Chlordane	11.83	11.82	11.83	11.82	11.77	11.87
alpha-Chlordane	12.15	12.14	12.15	12.14	12.09	12.19
Endosulfan I	12.26	12.25	12.25	12.25	12.20	12.30
4,4'-DDE	12.55	12.54	12.56	12.54	12.48	12.62
Dieldrin	12.85	12.84	12.84	12.84	12.77	12.91
Endrin	13.49	13.48	13.48	13.48	13.41	13.55
4,4'-DDD	13.78	13.77	13.77	13.77	13.70	13.84
Endosulfan II	13.95	13.94	13.95	13.95	13.88	14.02
4,4'-DDT	14.43	14.41	14.42	14.42	14.34	14.48
Endrin aldehyde	14.68	14.67	14.68	14.67	14.60	14.74
Endosulfan sulfate	15.26	15.25	15.26	15.25	15.18	15.32
Methoxychlor	15.89	15.88	15.88	15.88	15.81	15.95
Endrin ketone	16.37	16.36	16.37	16.36	16.29	16.43
Tetrachloro-m-xylene	6.04	6.03	6.03	6.03	5.98	6.08
Decachlorobiphenyl	19.51	19.50	19.50	19.50	19.40	19.60

*Surrogate retention times are measured from Standard Mix A analyses.

Retentiontime Windows are +/- 0.05 minutes for all compounds that elute before Heptachlor epoxide, +/- 0.07 minutes for all other compounds, except +/- 0.100 minutes for Decachlorobiphenyl

6E
INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument: V5807A Level (x Low): low 1.0 mid 4.0 high 20.0

GC Column (1) : RTXCLP ID: 0.32 (mm) Date(s) Analyzed: 2/22/2007 2/23/2007

	CALIBRATION FACTORS				
COMPOUND	LOW	MID	HIGH	MEAN	%RSD
alpha-BHC	5.06E+02	4.94E+02	5.17E+02	5.06E+02	2.3
gamma-BHC (Lindane)	4.55E+02	4.37E+02	4.51E+02	4.48E+02	2.1
beta-BHC	1.76E+02	1.81E+02	1.53E+02	1.70E+02	8.7
delta-BHC	4.05E+02	4.25E+02	4.20E+02	4.16E+02	2.5
Heptachlor	4.50E+02	4.34E+02	4.42E+02	4.42E+02	1.8
Aldrin	3.95E+02	4.25E+02	4.03E+02	4.08E+02	3.8
Heptachlor epoxide	3.61E+02	3.78E+02	3.50E+02	3.63E+02	4.0
gamma-Chlordane	3.47E+02	3.65E+02	3.46E+02	3.53E+02	3.0
alpha-Chlordane	3.43E+02	3.42E+02	3.24E+02	3.37E+02	3.2
4,4'-DDE	3.24E+02	3.41E+02	3.43E+02	3.36E+02	3.1
Endosulfan I	3.58E+02	3.44E+02	3.37E+02	3.46E+02	3.1
Dieldrin	3.61E+02	3.53E+02	3.66E+02	3.60E+02	1.8
Endrin	2.83E+02	2.64E+02	2.69E+02	2.72E+02	3.5
4,4'-DDD	2.59E+02	2.53E+02	2.80E+02	2.64E+02	5.4
Endosulfan II	2.85E+02	2.84E+02	2.87E+02	2.85E+02	.4
4,4'-DDT	2.84E+02	2.70E+02	2.95E+02	2.83E+02	4.4
Endrin aldehyde	2.02E+02	2.12E+02	1.98E+02	2.04E+02	3.5
Methoxychlor	1.27E+02	1.29E+02	1.22E+02	1.26E+02	2.8
Endosulfan sulfate	2.16E+02	2.22E+02	2.22E+02	2.20E+02	1.5
Endrin ketone	2.63E+02	2.75E+02	2.79E+02	2.73E+02	3.1
Tetrachloro-m-xylene	2.83E+02	2.68E+02	2.51E+02	2.68E+02	5.9
Decachlorobiphenyl	1.93E+02	1.85E+02	1.75E+02	1.84E+02	4.7

*Surrogate calibration factors are measured from standard Mix A analyses.

6E

INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument: V5807B Level (x Low): low 1.0 mid 4.0 high 20.0

GC Column (2) : RTXCLPII ID: 0.32 (mm) Date(s) Analyzed: 2/22/2007 2/23/2007

COMPOUND	CALIBRATION FACTORS				%RSD
	LOW	MID	HIGH	MEAN	
alpha-BHC	7.08E+02	6.75E+02	6.37E+02	6.73E+02	5.2
gamma-BHC (Lindane)	6.22E+02	5.89E+02	5.65E+02	5.92E+02	4.8
beta-BHC	2.34E+02	2.39E+02	2.01E+02	2.25E+02	9.1
delta-BHC	5.48E+02	5.56E+02	5.15E+02	5.40E+02	4.0
Heptachlor	6.29E+02	5.87E+02	5.50E+02	5.89E+02	6.7
Aldrin	5.46E+02	5.69E+02	4.15E+02	5.10E+02	16.3
Heptachlor epoxide	5.00E+02	5.13E+02	4.47E+02	4.87E+02	7.2
gamma-Chlordane	4.74E+02	4.98E+02	4.50E+02	4.74E+02	5.0
alpha-Chlordane	4.55E+02	4.69E+02	4.31E+02	4.52E+02	4.2
Endosulfan I	4.85E+02	4.49E+02	4.20E+02	4.52E+02	7.2
4,4'-DDE	3.68E+02	3.93E+02	3.62E+02	3.74E+02	4.4
Dieldrin	5.10E+02	4.81E+02	4.13E+02	4.68E+02	10.6
Endrin	3.81E+02	3.55E+02	3.25E+02	3.54E+02	8.0
4,4'-DDD	2.93E+02	3.28E+02	3.00E+02	3.07E+02	6.1
Endosulfan II	3.65E+02	3.83E+02	3.39E+02	3.62E+02	6.2
4,4'-DDT	3.37E+02	3.28E+02	3.31E+02	3.32E+02	1.4
Endrin aldehyde	2.66E+02	2.85E+02	2.53E+02	2.68E+02	6.0
Endosulfan sulfate	2.90E+02	2.87E+02	2.67E+02	2.82E+02	4.4
Methoxychlor	1.42E+02	1.44E+02	1.09E+02	1.31E+02	14.6
Endrin ketone	3.41E+02	3.50E+02	3.25E+02	3.39E+02	3.8
Tetrachloro-m-xylene	3.71E+02	3.56E+02	3.26E+02	3.51E+02	6.6
Decachlorobiphenyl	2.23E+02	2.01E+02	1.85E+02	2.03E+02	9.2

*Surrogate calibration factors are measured from standard Mix A analyses.

6F
INITIAL CALIBRATION OF MULTICOMPONENT ANALYTES

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument: V5807A Date(s) Analyzed: 02/22/07 02/23/07

GC Column (1) : RTXCLP ID: 0.32 (mm)

COMPOUND	AMOUNT (ng)	PEAK[1]	RT	RT WINDOW FROM	TO	CALIBRATION FACTOR
Aroclor-1016	100.000	1	6.98	6.92	7.06	5.255
	100.000	2	7.82	7.75	7.89	6.495
	100.000	3	9.19	9.12	9.26	7.362
Aroclor-1221	200.000	1	6.54	6.47	6.61	2.834
	200.000	2	6.89	6.82	6.96	1.953
	200.000	3	6.99	6.92	7.06	7.039
Aroclor-1232	100.000	1	6.99	6.92	7.06	6.607
	100.000	2	7.82	7.75	7.89	3.013
	100.000	3	9.19	9.12	9.26	3.562
Aroclor-1242	100.000	1	6.98	6.91	7.05	4.524
	100.000	2	7.82	7.75	7.89	5.321
	100.000	3	9.19	9.12	9.26	6.025
Aroclor-1248	100.000	1	10.29	10.22	10.36	5.856
	100.000	2	11.02	10.95	11.09	8.605
	100.000	3	11.08	11.01	11.15	7.418
Aroclor-1254	100.000	1	11.48	11.41	11.55	10.544
	100.000	2	12.33	12.26	12.40	16.462
	100.000	3	12.91	12.84	12.98	15.280
Aroclor-1260	100.000	1	15.27	15.20	15.34	35.549
	100.000	2	15.86	15.79	15.93	15.273
	100.000	3	17.18	17.11	17.25	8.034
Toxaphene	500.000	1	14.75	14.68	14.82	3.868
	500.000	2	15.59	15.52	15.66	3.919
	500.000	3	16.30	16.23	16.37	3.514

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[1] At least 3 peaks for each column are required for identification of multicomponent analytes.

6F

INITIAL CALIBRATION OF MULTICOMPONENT ANALYTES

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument: V5807B Date(s) Analyzed: 02/22/07 02/23/07

GC Column (2) : RTXCLPII ID: 0.32 (mm)

COMPOUND	AMOUNT (ng)	PEAK[1]	RT	RT WINDOW FROM	TO	CALIBRATION FACTOR
Aroclor-1016	100.000	1	7.25	7.18	7.32	6.263
	100.000	2	9.52	9.44	9.58	9.020
	100.000	3	9.74	9.67	9.81	6.989
Aroclor-1221	200.000	1	6.77	6.70	6.84	3.822
	200.000	2	7.11	7.04	7.18	2.626
	200.000	3	7.25	7.18	7.32	7.759
Aroclor-1232	100.000	1	7.25	7.18	7.32	7.140
	100.000	2	9.52	9.45	9.59	3.918
	100.000	3	9.74	9.67	9.81	3.722
Aroclor-1242	100.000	1	7.25	7.18	7.32	5.216
	100.000	2	9.51	9.44	9.58	7.377
	100.000	3	9.74	9.67	9.81	6.113
Aroclor-1248	100.000	1	10.55	10.48	10.62	10.083
	100.000	2	10.81	10.74	10.88	8.861
	100.000	3	11.36	11.29	11.43	10.650
Aroclor-1254	100.000	1	12.45	12.38	12.52	4.379
	100.000	2	13.30	13.23	13.37	12.352
	100.000	3	13.66	13.59	13.73	10.155
Aroclor-1260	100.000	1	15.73	15.66	15.80	39.034
	100.000	2	16.50	16.44	16.58	13.662
	100.000	3	17.81	17.74	17.88	8.267
Toxaphene	500.000	1	14.12	14.05	14.19	13.687
	500.000	2	16.55	16.48	16.62	4.388
	500.000	3	16.96	16.89	17.03	2.660

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[1] At least 3 peaks for each column are required for identification of multicomponent analytes.

7D
PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name: Lancaster Laboratories Contract:
Lab Code: Case No.: SAS No.: SDG No.:
GC Column (1) : RTXCLP ID: .32 (mm) Init. Calib Date(s):02/22/07 02/23/07
EPA Sample No. (PIBLK): PIBLKAA Date Analyzed: 02/22/07
Lab Sample ID (PIBLK): IBLKX0624B Time Analyzed: 19:10
EPA Sample No. (PEM): PEMAA Date Analyzed: 02/22/07
Lab Sample ID (PEM): PEMXX0724D Time Analyzed: 19:41

PEM COMPOUND	RT	RT WINDOW		CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
		FROM	TO			
Tetrachloro-m-xylene	6.08	6.04	6.14	0.018	0.020	-8.8
alpha-BHC	7.44	7.39	7.49	0.009	0.010	-7.2
gamma-BHC (Lindane)	8.19	8.15	8.25	0.010	0.010	-3.8
beta-BHC	8.42	8.38	8.48	0.010	0.010	-0.4
4,4'-DDE	12.09	12.03	12.17	0.003		
Endrin	13.18	13.11	13.25	0.050	0.050	0.2
4,4'-DDD	13.36	13.29	13.43	0.000		
4,4'-DDT	13.94	13.87	14.01	0.093	0.100	-7.6
Endrin aldehyde	14.54	14.48	14.62	0.001		
Methoxychlor	14.96	14.90	15.04	0.232	0.251	-7.5
Endrin ketone	16.02	15.96	16.10	0.001		
Decachlorobiphenyl	18.35	18.25	18.45	0.018	0.020	-9.8

4'4-DDT % Breakdown (1) : 3.4 Endrin % Breakdown (1) : 4.6

Combined % Breakdown (1) : 8

7E

PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name: Lancaster Laboratories
Contract:
Lab Code:
Case No.:
SAS No.:
SDG No.:
GC Column (1) : RTXCLP
ID: .32 (mm)
Init. Calib Date(s):02/22/07 02/23/07
EPA Sample No. (PIBLK): PIBLKDM
Date Analyzed: 03/29/07
Lab Sample ID (PIBLK): IBLKX0724A
Time Analyzed: 12:16
EPA Sample No. (INDAM): INDAMUG
Date Analyzed: 03/29/07
Lab Sample ID (INDA): INDAM0724A
Time Analyzed: 12:46

INDIVIDUAL MIX A COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
Tetrachloro-m-xylene	6.08	6.04	6.14	0.020	0.020	-2.2
alpha-BHC	7.44	7.39	7.49	0.020	0.020	-0.7
gamma-BHC (Lindane)	8.20	8.15	8.25	0.020	0.020	0.7
Heptachlor	9.30	9.26	9.36	0.020	0.020	-2.4
Endosulfan I	12.18	12.13	12.23	0.019	0.020	-4.6
Dieldrin	12.69	12.63	12.77	0.040	0.040	-0.7
Endrin	13.18	13.11	13.25	0.032	0.040	-18.8
4,4'-DDD	13.36	13.29	13.43	0.040	0.040	1.2
4,4'-DDT	13.94	13.87	14.01	0.038	0.040	-4.8
Methoxychlor	14.96	14.90	15.04	0.171	0.200	-14.6
Decachlorobiphenyl	18.34	18.25	18.45	0.039	0.040	-2.7

EPA Sample No. (INDBM): INDBMUE
Date Analyzed: 03/29/07
Lab Sample ID (INDB): INDBM0724A
Time Analyzed: 13:16

INDIVIDUAL MIX B COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
Tetrachloro-m-xylene	6.08	6.04	6.14	0.020	0.020	-0.9
beta-BHC	8.42	8.38	8.48	0.019	0.020	-3.2
delta-BHC	8.82	8.78	8.88	0.020	0.020	1.5
Aldrin	9.98	9.92	10.02	0.019	0.020	-3.0
Heptachlor epoxide	11.33	11.29	11.39	0.020	0.020	-1.1
gamma-Chlordane	11.60	11.57	11.67	0.020	0.020	-0.2
alpha-Chlordane	11.89	11.85	11.95	0.020	0.020	0.2
4,4'-DDE	12.09	12.03	12.17	0.037	0.040	-6.8
Endosulfan II	13.65	13.60	13.74	0.039	0.040	-2.2
Endrin aldehyde	14.54	14.48	14.62	0.039	0.040	-2.1
Endosulfan sulfate	15.44	15.39	15.53	0.039	0.040	-2.2
Endrin ketone	16.02	15.96	16.10	0.039	0.040	-2.5
Decachlorobiphenyl	18.34	18.25	18.45	0.039	0.040	-1.5

8D
ANALYTICAL SEQUENCE

Sequence: 1D1053 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: RTXCLP ID: 0.32

Instrument: V5807A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	TCX	DCB
001		CONDITIONER	02/22/2007	17:09:43	2D1053	6.08	18.35
002		CONDITIONER	02/22/2007	17:40:00	2D1053	6.09	18.36
003		CONDITIONER	02/22/2007	18:10:13	2D1053	6.09	18.36
004	AA	RCMXX0724A	02/22/2007	18:40:29	2D1053	6.09	18.36
005	PIBLKAA	IBLKX0624B	02/22/2007	19:10:46	2D1053	6.09	18.36
006	PEMAA	PEMXX0724D	02/22/2007	19:41:09	2D1053	6.08	18.35
007	AR1660AA	PR16X0624B	02/22/2007	20:11:26	2D1053	6.09	18.36
008	AR1221AA	PR21X0624B	02/22/2007	20:41:44	2D1053	6.09	18.36
009	AR1232AA	PR32X0624B	02/22/2007	21:12:02	2D1053	6.09	18.36
010	AR1242AA	PR42X0624B	02/22/2007	21:42:19	2D1053	6.09	18.36
011	AR1248AA	PR48X0624B	02/22/2007	22:12:35	2D1053	6.10	18.36
012	AR1254AA	PR54X0624B	02/22/2007	22:42:50	2D1053	6.09	18.36
013	TOXAPHAA	PTOXX0624B	02/22/2007	23:13:02	2D1053	6.09	18.35
014	INDALAA	INDAL0624C	02/22/2007	23:43:16	1D1053	6.09	18.36
015	INDBLAA	INDBL0624C	02/23/2007	00:13:29	1D1053	6.09	18.36
016	INDAMAA	INDAM0624C	02/23/2007	00:43:46	1D1053	6.08	18.35
017	INDBMAA	INDBM0624C	02/23/2007	01:14:00	1D1053	6.09	18.35
018	INDAHAA	INDAH0624C	02/23/2007	01:44:14	1D1053	6.08	18.35
019	INDBHAA	INDBH0624C	02/23/2007	02:14:26	1D1053	6.09	18.36
020	PIBLKAA	IBLKX0624B	02/23/2007	02:44:40	2D1053	6.09	18.36
021	PEMAB	PEMXX0724D	02/23/2007	03:14:52	2D1053	6.09	18.35
022	PBLKNL	BLANKA	02/23/2007	03:45:07	2D1053	6.09	18.35
023	LCSX7	LCSA	02/23/2007	04:15:17	2D1053	6.08	18.35
024	LCSDBV	LCSDA	02/23/2007	04:45:28	2D1053	6.09	18.36
025	KQA-1	4975036	02/23/2007	05:15:41	2D1053	6.08	18.35
026	KQA-2	4975037	02/23/2007	05:45:55	2D1053	6.09	18.35
027	AA	GPC38BL051	02/23/2007	06:16:06	2D1053		
028	AA	GPC38MS051	02/23/2007	06:46:17	2D1053		
029	AA	CONTROL	02/23/2007	07:16:26	2D1053		
030	AA	GPC38AR051	02/23/2007	07:46:38	2D1053		18.36
031	PIBLKYN	IBLKX0624B	02/23/2007	08:16:50	2D1053	6.09	18.36

	ICAL Dates		ICAL RT	QC Limits
1D1053	02/22/2007 - 02/23/2007	TCX = Tetrachloro-m-xylene	6.08	(6.03 - 6.13 Minutes)
		DCB = Decachlorobiphenyl	18.35	(18.25 - 18.45 Minutes)
2D1053	02/22/2007 - 02/23/2007	TCX = Tetrachloro-m-xylene	6.09	(6.04 - 6.14 Minutes)
		DCB = Decachlorobiphenyl	18.35	(18.25 - 18.45 Minutes)

8D
ANALYTICAL SEQUENCE

Sequence: 1D1053 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: RTXCLP ID: 0.32

Instrument: V5807A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	TCX	DCB
032	INDAMTP	INDAM0624C	02/23/2007	08:47:03	2D1053	6.08	18.35
033	INDBMTN	INDBM0624C	02/23/2007	09:17:13	2D1053	6.08	18.35
034	PIBLKZL	IBLKX0724A	03/05/2007	15:41:41	2D1053	6.09	18.35
035	PEMAA	PEMXX0724E	03/05/2007	16:11:57	2D1053	6.09	18.35
036	PBLK5F	BLANKA	03/05/2007	16:42:12	2D1053	6.09	18.35
037	LCSEU	LCSA	03/05/2007	17:12:22	2D1053	6.09	18.36
038	LCSDM9	LCSDA	03/05/2007	17:42:33	2D1053	6.09	18.36
039	228IN	4994055	03/05/2007	18:12:48	2D1053	6.09	18.35
040	AA	GPC38BL059	03/05/2007	18:42:59	2D1053		
041	AA	GPC38MS059	03/05/2007	19:13:15	2D1053		
042	AA	CONTROL	03/05/2007	19:43:28	2D1053		
043	AA	GPC38AR059	03/05/2007	20:13:40	2D1053		18.35
044	PIBLKZM	IBLKX0724A	03/05/2007	20:43:51	2D1053	6.09	18.35
045	INDAMTR	INDAM0624C	03/05/2007	21:14:05	2D1053	6.08	18.34
046	INDBMTP	INDBM0624C	03/05/2007	21:44:19	2D1053	6.08	18.34

	ICAL Dates		ICAL RT	QC Limits
1D1053	02/22/2007 - 02/23/2007	TCX = Tetrachloro-m-xylene	6.08	(6.03 - 6.13 Minutes)
		DCB = Decachlorobiphenyl	18.35	(18.25 - 18.45 Minutes)
2D1053	02/22/2007 - 02/23/2007	TCX = Tetrachloro-m-xylene	6.09	(6.04 - 6.14 Minutes)
		DCB = Decachlorobiphenyl	18.35	(18.25 - 18.45 Minutes)

APPENDIX A

METALS
DATA DELIVERABLES FORMS

QUALITY ASSURANCE SUMMARY

FORM 2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Initial Calibration Source: LLI

Continuing Calibration Source: LLI

Concentration Units: UG/L

Analyte	Initial Calibration			Continuing Calibration						M
	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)	
Arsenic 75	50.0	51.21	102.4	25.0	25.33	101.3	25.0	25.06	100.2	MS
Barium	600.0	578.03	96.3	500.0	491.13	98.2	500.0	475.35	95.1	P
Chromium	600.0	586.88	97.8	500.0	502.75	100.6	500.0	489.44	97.9	P
Nickel	600.0	584.35	97.4	500.0	495.62	99.1	500.0	489.82	98.0	P
Selenium 77	50.0	52.27	104.5	25.0	25.72	102.9	25.0	25.36	101.4	MS
Vanadium	600.0	584.96	97.5	500.0	501.66	100.3	500.0	488.71	97.7	P
Zinc	600.0	588.77	98.1	500.0	503.05	100.6	500.0	492.14	98.4	P

(1) Control Limits: All Metals: 90-110
(2) Control Limits: All Metals: 90-110

QUALITY ASSURANCE SUMMARY

FORM 2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Initial Calibration Source: LLI

Continuing Calibration Source: LLI

Concentration Units: UG/L

	Initial Calibration			Continuing Calibration						
Analyte	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)	M
Arsenic 75				25.0	25.25	101.0	25.0	24.47	97.9	MS
Barium				500.0	478.29	95.7	500.0	489.38	97.9	P
Chromium				500.0	494.53	98.9	500.0	505.76	101.2	P
Nickel				500.0	490.61	98.1	500.0	506.80	101.4	P
Selenium 77				25.0	25.55	102.2	25.0	24.65	98.6	MS
Vanadium				500.0	491.82	98.4	500.0	503.92	100.8	P
Zinc				500.0	495.91	99.2	500.0	508.08	101.6	P

(1) Control Limits: All Metals: 90-110
(2) Control Limits: All Metals: 90-110

QUALITY ASSURANCE SUMMARY

FORM 2B

LOW LEVEL CHECK STANDARD FOR AA AND ICP

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

AA CRDL Standard Source: LLI

ICP CRDL Standard Source: LLI

Concentration Units: UG/L

	AA			ICP				
					Initial		Final	
Analyte	True	Found	%R	True	Found	%R	Found	%R
Arsenic 75				2.0	1.99	99.5	2.13	106.5
Barium				5.0	4.90	98.0	4.94	98.8
Chromium				15.0	14.63	97.5	15.00	100.0
Nickel				10.0	10.10	101.0	13.42	134.2
Selenium 77				2.0	2.18	109.0	2.16	108.0
Vanadium				5.0	4.99	99.8	4.87	97.4
Zinc				20.0	20.34	101.7	20.44	102.2

Control limits apply to values up to 10 times the true value of the low level check standard. Mercury, GFAA and ICP-MS: 50 - 150%. ICP: See statistical windows form.

QUALITY ASSURANCE SUMMARY

FORM 2B

LOW LEVEL CHECK STANDARD FOR AA AND ICP

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

AA CRDL Standard Source: LLI

ICP CRDL Standard Source: LLI

Concentration Units: UG/L

Analyte	AA			ICP				
					Initial		Final	
	True	Found	%R	True	Found	%R	Found	%R
Arsenic								
Barium								
Chromium								
Nickel								
Selenium 82				2.0	2.15	107.5	2.23	111.5
Vanadium								
Zinc								

Control limits apply to values up to 10 times the true value of the low level check standard. Mercury, GFAA and ICP-MS: 50 - 150%. ICP: See statistical windows form.

Statistical Windows for Low Level Check

Element	True Value ug/L	Statistical Window (%)
Aluminum	200	0 - 200
Antimony	20	25 - 175
Arsenic	20	50 - 150
Barium	5	75 - 125
Beryllium	5	50 - 150
Boron	50	50 - 150
Cadmium	5	75 - 125
Calcium	200	0 - 200
Chromium	15	50 - 150
Cobalt	5	25 - 175
Copper	10	25 - 175
Iron	200	25 - 175
Lead	15	50 - 150
Magnesium	100	0 - 200
Manganese	5	50 - 150
Molybdenum	10	25 - 175
Nickel	10	50 - 150
Potassium	200	75 - 125
Selenium	20	50 - 150
Silver	5	50 - 150
Sodium	1000	25 - 175
Strontium	5	75 - 125
Thallium	20	0 – 200
Tin	20	25 - 175
Titanium	10	50 - 150
Vanadium	5	50 - 150
Zinc	20	75 - 125

Effective: 12/29/2005

QUALITY ASSURANCE SUMMARY

FORM 3

BLANKS

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank				
	Mass		C	1	C	2	C	3	C	Mass		C	Sample ID	M
Arsenic	75	0.15	U	0.15	U	0.15	U	0.15	U	75	0.670	U	P06850AB	MS
Barium		0.26	B	0.32	B	-0.13	B	-0.21	B		0.620	U	P06805AB	P
Chromium		1.1	U	1.1	B	1.1	U	1.1	U		2.300	U	P06805AB	P
Nickel		2.3	U	2.3	U	2.3	U	2.3	U		5.600	U	P06805AB	P
Selenium	77	0.47	U	0.47	U	0.47	U	0.47	U	77	0.500	U	P06850AB	MS
Vanadium		0.91	U	0.91	U	0.91	U	0.91	U		1.500	U	P06805AB	P
Zinc		0.41	U	0.42	B	0.41	U	0.41	U		8.200	U	P06805AB	P

QUALITY ASSURANCE SUMMARY

FORM 3

BLANKS

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank				M
	Mass		C	1	C	2	C	3	C	Mass		C	Sample ID	
rsenic	75			0.15	U									MS
arium				0.13	U									P
hromium				1.1	U									P
ickel				2.3	U									P
elenium	77			0.47	U					82	0.500	U	P06850AB	MS
anadium				0.91	U									P
inc				0.41	U									P

QUALITY ASSURANCE SUMMARY

FORM 4A

ICP-AES INTERFERENCE CHECK SAMPLE

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP-AES Instrument ID: 05478 ICS Source: LLI

Concentration Units: UG/L

	True		Initial Found				Final Found			
Analyte	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
luminum	500000	500000	507410	101.5	507449.7	101.5	511273	102.3	517378.3	103.5
arium	0	500	0		516.2	103.2	0		524.3	104.9
alcium	500000	500000	533296	106.7	532441.7	106.5	541195	108.2	545142.3	109.0
hromium	0	500	-3		504.3	100.9	-2		514.4	102.9
ron	200000	200000	209770	104.9	209485.3	104.7	212076	106.0	213971.8	107.0
agnesium	500000	500000	511293	102.3	511328.1	102.3	516461	103.3	522030.4	104.4
ickel	0	1000	1		992.2	99.2	-1		1013.0	101.3
anadium	0	500	-2		502.2	100.4	-3		514.0	102.8
inc	0	1000	6		1029.4	102.9	7		1055.6	105.6

Control Limits: All Metals 80%-120%

QUALITY ASSURANCE SUMMARY

4B-IN

ICP-MS INTERFERENCE CHECK SAMPLE

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP-MS Instrument ID: 10007 ICS Source: LLI

Concentration Units: UG/L

	True		Found			
Analyte	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R
Aluminum 27	10000	10000	10480	104.8	10517.9	105.2
Arsenic 75	0	20	0		19.9	99.5
Calcium 43	10000	10000	10466	104.7	10836.9	108.4
Carbon 13	20000	20000	NA		NA	
Chloride 37	100000	100000	NA		NA	
Iron 54	10000	10000	10384	103.8	10559.7	105.6
Magnesium 24	10000	10000	10427	104.3	10553.0	105.5
Molybdenum 98	200	200	209	104.5	216.4	108.2
Phosphorus 31	10000	10000	NA		NA	
Potassium 39	10000	10000	10328	103.3	10785.3	107.9
Selenium 77	0	0	2		2.1	
Sodium 23	10000	10000	10354	103.5	10653.0	106.5
Sulfur 34	10000	10000	NA		NA	
Titanium 47	200	200	241	120.5	243.3	121.7

Control Limits: All Metals 80%-120%

QUALITY ASSURANCE SUMMARY

16

ICP-MS INTERNAL Standards Relative Intensity Summary

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP-MS Instrument ID: 10007

Start Date: 03/12/2007 End Date: 03/13/2007

EPA Sample No.	Time	Internal Standards %RI For:											
		Element		Element		Element		Element		Element		Element	
		GE-72	Q		Q		Q		Q		Q		Q
S0	2234	100											
S	2237	103											
LRS	2240	97											
CCS	2243	98											
ICV	2246	102											
ICB	2248	100											
LLC	2251	100											
ICSA	2254	105											
ICSAB	2257	103											
CCV	2300	101											
CCB	2303	98											
P06850AB	2305	99											
P06850AQ	2308	97											
WO-10	2311	95											
WO-10A	2314	96											
WO-10D	2317	96											
WO-10S	2319	98											
WO-10M	2322	97											
WO-10L	2325	105											
DWM16	2328	103											
DWM39	2331	101											
CCV	2334	100											
CCB	2336	97											
DWM46	2339	97											
BINAB	2342	96											
BINEB	2345	94											
BIN36	2348	97											
BIN35	2351	96											
BI35D	2354	96											
BIN45	2356	95											
BINM6	2359	100											
BIN40	0002	97											

QUALITY ASSURANCE SUMMARY

16

ICP-MS INTERNAL Standards Relative Intensity Summary

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP-MS Instrument ID: 10007

Start Date: 03/12/2007 End Date: 03/13/2007

EPA Sample No.	Time	Internal Standards %RI For:											
		Element		Element		Element		Element		Element		Element	
		GE-72	Q		Q		Q		Q		Q		Q
BIN22	0005	97											
CCV	0008	98											
CCB	0011	94											
BIN44	0013	95											
BINM7	0016	98											
BIN43	0019	94											
BIN19	0022	95											
BI19D	0025	95											
WO-47	0028	94											
WO-48	0031	95											
LLC	0033	93											
ICSA	0036	99											
ICSAB	0039	97											
CCV	0042	97											
CCB	0045	94											

QUALITY ASSURANCE SUMMARY

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Lab Name: LANCASTER_LABORATORIES

CLIENT SAMPLE NO.

WO-10S

SDG No.: DWD02

Matrix (Soil/Water): WATER

% Solids for sample: 0.0

Concentration Units (ug/l or mg/kg dry weight): UG/L

Level (low/med): LOW

Batch Id(s): P06850A, P06805A

Analyte	M	Sample Result	C	MS Sample Result	C	MSD Sample Result	C	MS Spike Added	MSD Spike Added	MS %R	Q	MSD %R	Q	Control Limit %R	RPD	Q	Ctl Lim RPD
Arsenic 75	MS	7.2762		17.6185		17.5774		10.0000	10.0000	103		103		75 - 125	0		20
Barium	P	69.8800		2079.7500		2071.7500		2000.0000	2000.0000	100		100		75 - 125	0		20
Chromium	P	4.6300	B	203.1000		203.6000		200.0000	200.0000	99		99		81 - 120	0		20
Nickel	P	5.6000	U	504.2600		500.1100		500.0000	500.0000	101		100		86 - 115	1		20
Selenium 77	MS	4.3854		8.1721		8.0053		10.0000	10.0000	38	N	36	N	75 - 125	2		20
Vanadium	P	5.5500		508.3900		505.7900		500.0000	500.0000	101		100		90 - 111	1		20
Zinc	P	8.2000	U	514.3700		508.3500		500.0000	500.0000	103		102		75 - 125	1		20

QUALITY ASSURANCE SUMMARY

FORM 5B

POST DIGEST SPIKE SAMPLE RECOVERY

CLIENT SAMPLE No.

WO-10A

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: UG/L

Batch ID(s): P06850A

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Arsenic									NR
Barium									NR
Chromium									NR
Nickel									NR
Selenium 77		8.7440		4.3854		4.0000	109		MS
Vanadium									NR
Zinc									NR

Comments:

QUALITY ASSURANCE SUMMARY

Form 6

DUPLICATES

CLIENT SAMPLE No.

WO-10D

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

% Solids of Duplicate: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Batch ID(s): P06850A, P06805A

Analyte	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Arsenic 75	2.0	7.2762		7.2397		1		MS
Barium		69.8800		72.5500		4		P
Chromium		4.6300	B	4.2700	B	8		P
Nickel		5.6000	U	5.6000	U			P
Selenium 77	2.0	4.3854		4.1497		6		MS
Vanadium	5.0	5.5500		5.4700		1		P
Zinc		8.2000	U	8.2000	U			P

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR |(S) - (D)| > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample page of the Quality Assurance Summary.

QUALITY ASSURANCE SUMMARY

FORM 7

LABORATORY CONTROL SAMPLE

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Solid LCS Source: ____________________

Aqueous LCS Source: LLI

Analyte	Sample ID	Aqueous (ug/L)			Solid (mg/kg)					
		True	Found	%R(1)	True	Found	C	Limit		%R
Arsenic 75	P06850AQ	10.0	10.32	103						
Barium	P06805AQ	2000.0	1997.55	100						
Chromium	P06805AQ	200.0	200.56	100						
Nickel	P06805AQ	500.0	509.26	102						
Selenium 82	P06850AQ	10.0	10.06	101						
Vanadium	P06805AQ	500.0	507.01	101						
Zinc	P06805AQ	500.0	512.14	102						

(1) Control Limits: Statistically determined

Statistical Windows: Waters LCS/LCSD

EPA600 ICP

Element	True value ug/L	Statistical Window
AL	2000	85-115
SB	500	85-115
AS	140	85-115
BA	2000	85-115
BE	50	85-115
B	2000	85-115
CD	50	85-115
CA	4000	85-115
CR	200	85-115
CO	500	85-115
CU	250	85-115
FE	1000	85-115
PB	120	85-115
MG	2000	85-115
MN	500	85-115
MO	2000	85-115
NI	500	85-115
K	4000	85-115
SE	110	85-115
AG	50	85-115
NA	4000	85-115
SR	1000	85-115
TL	150	85-115
SN	4000	85-115
TI	1000	85-115
V	500	85-115
ZN	500	85-115

EPA600 GFAA

Element	True value ug/L	Statistical Window
SB	50	85-115
AS	40	85-115
BE	2.5	85-115
CD	2.5	86-110
CR	10	85-115
CU	20	87-110
PB	20	85-115
NI	20	85-115
SE	10	85-115
AG	2.5	85-115
TL	50	90-110

EPA600 Mercury

Element	True value ug/L	Statistical Window
HG	1	85-115

Effective Date: 03/26/2007

Statistical Windows: Waters LCS/LCSD

SW846 ICP

Element	True value ug/L	Statistical Window
AL	2000	90-112
SB	500	88-111
AS	140	90-119
BA	2000	90-110
BE	50	90-111
B	2000	90-110
CD	50	90-112
CA	4000	90-112
CR	200	90-110
CO	500	90-110
CU	250	90-112
FE	1000	90-112
PB	120	90-113
LI	4000	80-120
MG	2000	89-110
MN	500	90-110
MO	2000	90-110
NI	500	90-111
K	4000	88-119
SE	110	80-120
AG	50	90-117
NA	4000	80-120
SR	1000	90-110
TL	150	80-120
SN	4000	90-110
TI	1000	90-113
V	500	90-110
ZN	500	90-111

SW846 GFAA

Element	True value ug/L	Statistical Window
SB	50	80-120
AS	40	80-120
BE	2.5	86.6-112.2
CD	2.5	80-120
CR	10	80-111
CU	20	87-110
PB	20	80-120
NI	20	80-120
SE	10	80-120
AG	2.5	85-116
TL	50	80-120

SW846 Mercury

Element	True value ug/L	Statistical Window
HG	1	80-120

Effective Date: 03/26/2007

Statistical Windows: Waters LCS/LCSD

SW846 ICP-MS

	True value	Statistical
Element	ug/L	Window
Antimony	6	80 - 120
Arsenic	10	80 - 120
Barium	50	80 - 120
Beryllium	4	89 - 113
Cadmium	5	90 - 114
Chromium	50	90 - 118
Copper	50	80 - 120
Lead	15	90 - 115
Nickel	50	80 - 120
Selenium	10	80 - 120
Silver	50	80 - 120
Thallium	2	89 - 116
Zinc	50	80 - 120

Effective 03/26/2007

QUALITY ASSURANCE SUMMARY

FORM 9

SERIAL DILUTIONS

CLIENT SAMPLE No.

WO-10 L

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: UG/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Arsenic 75	7.2762		7.1069	B	2		MS
Barium	69.8800		64.9500		7		P
Chromium	4.6300	B	11.5000	U	100		P
Nickel	5.6000	U	28.0000	U			P
Selenium 77	4.3854		4.9209	B	12		MS
Vanadium	5.5500		7.5000	U	100		P
Zinc	8.2000	U	41.0000	U			P

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

QUALITY ASSURANCE SUMMARY

FORM 10

INSTRUMENT DETECTION LIMITS (BIANNUALLY)

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP Instrument ID: 05478 Date: 01/2007

Flame Instrument ID: ______________

Furnace Instrument ID: ______________

Method: P

Analyte	Wavelength (nm)	Back-ground	IDL (ug/L)
Arsenic			
Barium	493.40		0.13
Chromium	267.71		1.1
Nickel	231.60		2.3
Selenium			
Vanadium	292.40		0.91
Zinc	213.85		0.41

Comments:

QUALITY ASSURANCE SUMMARY

FORM 10 MDL

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Method: P

Date: 05/2006

Matrix (soil/water): WATER

Analyte	Wavelength (nm)	Background	LOQ (ug/L)	MDL (ug/L)
Arsenic				
Barium	493.40		5.0	0.62
Chromium	267.71		15.0	2.3
Nickel	231.60		10.0	5.6
Selenium				
Vanadium	292.40		5.0	1.5
Zinc	213.85		20.0	8.2

** The LOQ must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug.

Comments:

QUALITY ASSURANCE SUMMARY

FORM 11

ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES

SDG No. : DWD02

ICP Instrument ID: 05478 Date: 11/2006

Analyte	Wave-length (nm)	Interelement Correction Factor for:				
		AL	CA	FE	MG	CO
Arsenic						
Barium	493.40	0.0000000	0.0000020	0.0000020	0.0000000	0.0000000
Chromium	267.71	0.0000000	0.0000000	-0.0000200	0.0000060	0.0000000
Nickel	231.60	0.0000000	0.0000000	0.0000000	0.0000060	-0.0005702
Selenium						
Vanadium	292.40	0.0000008	0.0000000	-0.0002904	0.0000000	0.0000000
Zinc	213.85	0.0000050	0.0000020	0.0000910	0.0000028	0.0000000

Comments:

QUALITY ASSURANCE SUMMARY

FORM 12

LINEAR RANGES

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP Instrument ID: 05478 Date: 01/2007

Method: P

Analyte	Wavelength (nm)	Integration Time (Sec.)	Concentration (ug/L)
Arsenic			
Barium	493.4	10.00	10000.0
Chromium	267.71	10.00	10000.0
Nickel	231.6	10.00	10000.0
Selenium			
Vanadium	292.4	10.00	10000.0
Zinc	213.85	10.00	10000.0

Comments:

QUALITY ASSURANCE SUMMARY

Form 15

ICP-MS TUNE

Lab Name: LANCASTER_LABORATORIES___

SDG No.: DWD02____

Matrix: WATER

ICP-MS Instrument ID: 10007

Date: 03/12/2007

Element - Mass	Avg. Measured Mass (amu)	Avg.Peak Width at 5% Peak Height (amu)	%RSD
LI - 6.015	6.03	0.65	1.9
MG - 23.985	23.98	0.65	1.8
RH - 102.905	102.98	0.65	1.0
IN - 114.904	114.93	0.66	0.6
CE - 139.905	139.93	0.65	0.8
PB - 207.977	207.98	0.65	1.5
U - 238.050	238.03	0.65	0.9

Comments:

QUALITY ASSURANCE SUMMARY

FORM 13

PREPARATION LOG

Lab Name: LANCASTER_LABORATORIES___

SDG No.: DWD02_

Method: P_

Batch ID: P06805A

EPA Sample No.	Preparation Date	Weight (gram)	Volume (ml)
BI19D	03/11/2007		50
BI35D	03/11/2007		50
BIN19	03/11/2007		50
BIN22	03/11/2007		50
BIN35	03/11/2007		50
BIN36	03/11/2007		50
BIN40	03/11/2007		50
BIN43	03/11/2007		50
BIN44	03/11/2007		50
BIN45	03/11/2007		50
BINAB	03/11/2007		50
BINEB	03/11/2007		50
BINM6	03/11/2007		50
BINM7	03/11/2007		50
DWM16	03/11/2007		50
DWM39	03/11/2007		50
DWM46	03/11/2007		50
WO-47	03/11/2007		50
WO-48	03/11/2007		50
WO-10	03/11/2007		50
WO-10D	03/11/2007		50
WO-10M	03/11/2007		50
WO-10S	03/11/2007		50
P06805AB	03/11/2007		50
P06805AQ	03/11/2007		50

QUALITY ASSURANCE SUMMARY

FORM 14

ANALYSIS RUN LOG

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Instrument ID Number: 05478 Method: P

Start Date: 03/12/2007 End Date: 03/12/2007

EPA Sample No.	D/F	Time	% R	AS	BA	CR	NI	SE	V	ZN
	1.00	2053			X	X	X		X	X
	1.00	2057								
	1.00	2101			X		X			X
	1.00	2104				X			X	
V	1.00	2109			X	X	X		X	X
B	1.00	2113			X	X	X		X	X
C	1.00	2116			X	X	X		X	X
SA	1.00	2120			X	X	X		X	X
SAB	1.00	2124			X	X	X		X	X
V	1.00	2127			X	X	X		X	X
B	1.00	2131			X	X	X		X	X
6805AB	1.00	2135			X	X	X		X	X
6805AQ	1.00	2138			X	X	X		X	X
-10	1.00	2142			X	X	X		X	X
-10A	1.00	2146								
-10D	1.00	2149			X	X	X		X	X
-10S	1.00	2153			X	X	X		X	X
-10M	1.00	2157			X	X	X		X	X
-10L	5.00	2200			X	X	X		X	X
VM16	1.00	2204			X	X			X	X
VM39	1.00	2208			X	X			X	X
V	1.00	2211			X	X	X		X	X
B	1.00	2215			X	X	X		X	X
VM46	1.00	2219			X	X			X	X
NAB	1.00	2222			X	X	X		X	X
NEB	1.00	2226			X	X	X		X	X
N36	1.00	2230			X	X			X	X
N35	1.00	2234			X	X			X	X
35D	1.00	2237			X	X			X	X
N45	1.00	2241			X	X			X	X
NM6	1.00	2245			X	X			X	X
N40	1.00	2248			X	X			X	X

QUALITY ASSURANCE SUMMARY

FORM 14

ANALYSIS RUN LOG

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Instrument ID Number: 0547B Method: P

Start Date: 03/12/2007 End Date: 03/12/2007

EPA Sample No.	D/F	Time	% R	Analytes																													
				AS	BA	CR	NI	SE	V	ZN																							
BIN22	1.00	2252			X	X			X	X																							
CCV	1.00	2256			X	X	X		X	X																							
CCB	1.00	2259			X	X	X		X	X																							
BIN44	1.00	2303			X	X			X	X																							
BINM7	1.00	2307			X	X	X		X	X																							
BIN43	1.00	2311			X	X			X	X																							
BIN19	1.00	2314			X	X			X	X																							
BI19D	1.00	2318			X	X			X	X																							
WO-47	1.00	2322			X	X			X	X																							
WO-48	1.00	2325			X	X			X	X																							
LLC	1.00	2329			X	X	X		X	X																							
ICSA	1.00	2333			X	X	X		X	X																							
ICSAB	1.00	2336			X	X	X		X	X																							
CCV	1.00	2340			X	X	X		X	X																							
CCB	1.00	2344			X	X	X		X	X																							

APPENDIX A

WET CHEMISTRY
DATA DELIVERABLES FORMS

Quality Control Summary
Method Blank
Miscellaneous Wet Chemistry
SDG: DWD02
Matrix: LIQUID

Analyte	Analysis Date	Method	Batch Number	Blank Results	Units	MDL	LOQ
Fluoride (distilled)	03/13/07	MTR	07071144801	N.D.	mg/l	0.03	0.1
	03/15/07	MTR	07073144801	N.D.	mg/l	0.03	0.1
Sulfide	03/12/07	CO	07071023002	N.D.	mg/l	0.054	0.16
	03/14/07	CO	07073023001	N.D.	mg/l	0.054	0.16

Comments: The blank is acceptable when the result is less than the limit of quantitation.

Quality Control Summary
Matrix Spike Analysis/ Matrix Spike Duplicate (MS/MSD)
Miscellaneous Wet Chemistry
SDG: BLH25
Matrix: LIQUID

Sample Number	Sample Code	Analyte	Spike Analysis Date	ME	Batch #	Sample Result	MS Spike Added	MSD Spike Added	MS Result	MSD Result	Units	MS Rec (%)	MSD Rec (%)	Acceptance Window (%)	RPD (%)	% RPD Limits </=
P016170 P016170	6170R 6170M	Sulfate (turbidimetr.)Code 418	03/31/07	MTR	07090112502A	20.3	40	40	58.0	58.7	mg/l	94	96	66 - 134	1	6
P010917 P010917	0917R 0917M	Total Diss. Solids Code 072	03/26/07	G	07085021201A	604.	800	800	1430.	1400.	mg/l	103	100	60 - 140	2	5

Comments: If the background and/or matrix spike/matrix spike duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

If the background result was more than four times the spike added amount the percent recovery is program deleted.

Lancaster Laboratories

Quality Control Summary
Duplicate Analysis
Miscellaneous Wet Chemistry
SDG: DWD02
Matrix: LIQUID

Sample Number	Sample Code	Analyte	Analysis Date	ME	Batch #	Sample Result	Duplicate Result	Units	RPD (%)	Control Limits %
P999045	9045D	Fluoride (distilled)	03/13/07	MTR	07071144801A	62.3	62.5	mg/l	NA	NA
4998486	DWM46	Sulfide	03/12/07	CO	07071023002A	0.71	0.70	mg/l	NA	NA

Comments: If the background and/or the duplicate result was less than the limit of quantitation, the RPD is not required.

If the background and/or duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate (LCSD)
Miscellaneous Wet Chemistry
SDG: DWD02
Matrix: LIQUID

Batch #	Analyte	Analysis Date	ME	True LCS/LCSD Value	LCS Results	LCSD Results	Units	Acceptance Range	% RPD Results	% RPD Acceptance </=
07071144801	Fluoride (distilled)	03/13/07	MTR	1	0.929	NA	mg/l	0.89 - 1.04	NA	NA
07073144801	Fluoride (distilled)	03/15/07	MTR	1	0.912	NA	mg/l	0.89 - 1.04	NA	NA
07071023002	Sulfide	03/12/07	CO	1	1.1	NA	mg/l	0.9 - 1.1	NA	NA
07073023001	Sulfide	03/14/07	CO	1	0.96	NA	mg/l	0.9 - 1.1	NA	NA

Lancaster Laboratories

Quality Control Summary
Initial Calibration
Miscellaneous Wet Chemistry
Total Petroleum Hydrocarbons
Instrument Identification: 10097
Calibration Date: 04/03/06
SDG: KIA22

Batch Number	Units Conc. mg/L	Blank 0.0000	STD 1 1.0000	STD 2 5.0000	STD 3 10.0000	STD 4 20.0000	STD 5 30.0000	STD 6 40.0000	Correlation Coefficient
06100112601A	ABS	0.001	0.019	0.099	0.212	0.418	0.620	0.762	0.996

Analysis Date: 04/11/06

Units mg/L

Parameter	Reference Concentration	Result	% Recovery	Acceptance Range
ICV	5.0	5.142	103	4.475 - 5.52495
CCV	20.0	19.378	97	17.9 - 22.0998
CCV	30.0	29.024	97	26.85 - 33.1497
CCV	20.0	19.411	97	17.9 - 22.0998

ABBREVIATION KEY
ICV = Initial Calibration Verification
CCV = Conti. Calibration Verification

APPENDIX A

INSTRUMENTAL WATER QUALITY DATA DELIVERABLES FORMS

Quality Control Summary
Method Blank
Instrumental Water Quality
SDG: DWD02
Matrix: LIQUID

Analyte	Analysis Date	Method	Batch Number	Blank Results	Units	MDL	LOQ
Total Cyanide (water)	03/12/07	AK	07068117102	N.D.	mg/l	0.0050	0.010
	03/12/07	AK	07068117101	N.D.	mg/l	0.0050	0.010
	03/14/07	AK	07073117101	N.D.	mg/l	0.0050	0.010

Comments: The blank is acceptable when the result is less than the limit of quantitation.

Quality Control Summary
Matrix Spike Analysis/ Matrix Spike Duplicate (MS/MSD)
Instrumental Water Quality
SDG: BLH25
Matrix: LIQUID

Sample Number	Sample Code	Analyte	Spike Analysis Date	ME	Batch #	Sample Result	MS Spike Added	MSD Spike Added	MS Result	MSD Result	Units	MS Rec (%)	MSD Rec (%)	Acceptance Window (%)	RPD (%)	% RPD Limits </=
5012388	-171-	Chloride Code 404	04/03/07	IC	07092196101B	34.0	40	NA	72.9	NA	mg/l	97	NA	90 - 110	NA	NA
5012394	MFG-3	Total Nitrite/Nitrate Nitrogen	03/26/07	AK	07085118101A	N.D.	1	NA	0.96	NA	mg/l	96	NA	90 - 110	NA	NA

Comments: If the background and/or matrix spike/matrix spike duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

If the background result was more than four times the spike added amount the percent recovery is program deleted.

Lancaster Laboratories

Quality Control Summary
Duplicate Analysis
Instrumental Water Quality
SDG: DWD02
Matrix: LIQUID

Sample Number	Sample Code	Analyte	Analysis Date	ME	Batch #	Sample Result	Duplicate Result	Units	RPD (%)	Control Limits %
5000754	WO-10	Total Cyanide (water)	03/14/07	AK	07073117101A	N.D.	N.D.	mg/l	NA	NA

Comments: If the background and/or the duplicate result was less than the limit of quantitation, the RPD is not required.

If the background and/or duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate (LCSD)
Instrumental Water Quality
SDG: DWD02
Matrix: LIQUID

Batch #	Analyte	Analysis Date	ME	True LCS/LCSD Value	LCS Results	LCSD Results	Units	Acceptance Range	% RPD Results	% RPD Acceptance </=
07068117101	Total Cyanide (water)	03/12/07	AK	0.2	0.20	NA	mg/l	0.179 - 0.2208	NA	NA
07068117102	Total Cyanide (water)	03/12/07	AK	0.2	0.20	NA	mg/l	0.179 - 0.2208	NA	NA
07073117101	Total Cyanide (water)	03/14/07	AK	0.2	0.20	NA	mg/l	0.179 - 0.2208	NA	NA

Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis
Total Cyanide
SDG: DWD02
Instrument Identification: 09037

Initial Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
ICV	0.15	0.14800	99
ICB	0	ND	NA
ICV	0.15	0.14780	99
ICB	0	ND	NA
ICV	0.15	0.14800	99
ICB	0	ND	NA

*=Out of Specifications

Initial Calibration Date: 03/12/07, 03/14/07, 03/16/07
Continuing Calibration Dates:03/12/07, 03/14/07, 03/16/07

	True Value (mg/L)	Acceptance Range
ICV/CCV	Varies	+/- 10%
ICB/CCB	0	< LOQ

Continuing Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
CCV2	0.15	0.14910	99
CCB 1	0	ND	NA
CCV2	0.15	0.14850	99
CCB 2	0	ND	NA
CCV2	0.15	0.14880	99
CCB 3	0	ND	NA
CCV2	0.15	0.14870	99
CCB 4	0	ND	NA
CCV2	0.15	0.14670	98
CCB 1	0	ND	NA
CCV2	0.15	0.14950	100
CCB 2	0	ND	NA
CCV2	0.15	0.14690	99
CCB 3	0	ND	NA
CCV2	0.15	0.14940	100
CCB 4	0	ND	NA
CCV2	0.15	0.14680	98
CCB 5	0	ND	NA
CCV2	0.15	0.15400	103
CCB 1	0	ND	NA

Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis
Nitrite-N
SDG: ALT03
Instrument Identification: 09106

Initial Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
ICV	0.6	0.60600	101
ICB	0	ND	NA
ICV	0.6	0.59903	100
ICB	0	ND	NA
ICV	0.6	0.59204	99
ICB	0	ND	NA
ICV	0.6	0.61535	103
ICB	0	ND	NA

*=Out of Specifications

Initial Calibration Date: 06/14/07, 06/15/07, 06/16/07, 06/19/07
Continuing Calibration Dates:06/14/07, 06/15/07, 06/16/07, 06/19/07

	True Value (mg/L)	Acceptance Range
ICV/CCV	Varies	+/- 10%
ICB/CCB	0	< LOQ

Continuing Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
CCV2	0.6	0.54778	91
CCB 1	0	ND	NA
CCV2	0.6	0.61808	103
CCB 2	0	ND	NA
CCV2	0.6	0.57776	96
CCB 2	0	ND	NA
CCV2	0.6	0.55228	92
CCB 3	0	ND	NA
CCV2	0.6	0.57059	95
CCB 4	0	ND	NA
CCV2	0.6	0.61444	102
CCB 5	0	ND	NA
CCV2	0.6	0.60041	100
CCB 1	0	ND	NA
CCV2	0.6	0.59272	99
CCB 2	0	ND	NA
CCV2	0.6	0.57452	96
CCB 3	0	ND	NA
CCV2	0.6	0.60555	101
CCB 5	0	ND	NA
CCV2	0.6	0.60408	101
CCB 6	0	ND	NA
CCV2	0.6	0.61322	102
CCB 1	0	ND	NA
CCV2	0.6	0.61275	102
CCB 2	0	ND	NA

Lancaster Laboratories

Quality Control Summary
Initial and Continuing Calibration
Instrumental Analysis/Anion Scan

Instrument Identification: 08022
Calibration Date: 04/01/07
SDG: BLH25

Batch Number	Analysis/ Parameter	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
07092196101A	Fluoride							
07092196101B	Chloride	0.143	0.274	0.666	1.427	2.293	0.997053	0.998525
	Nitrite-N							
	Bromide							
	Nitrate-N							
	Sulfate							

ICV/CCV Control Limits: 90% - 110%   ICB/CCB < LOQ of the Analyte   Concentration units: mg/L

Analysis Dates: 04/01/07, 04/02/07, 04/03/07

	Initial Calibration Verification/Blank				Continuing Calibration Verification/Blank			
Analyte	True	ICV	%Rec	ICB	True	CCV1	%Rec	CCB1
Fl								
Cl	3	2.9202	97	0.0000	3	2.8851	96	0.0000
NO2								
Br								
NO3								
SO4								

	Continuing Calibration Verification/Blank				Continuing Calibration Verification/Blank			
Analyte	True	CCV2	%Rec	CCB2	True	CCV3	%Rec	CCB3
Fl								
Cl	3	2.8854	96	0.0000	3	2.8879	96	0.0000
NO2								
Br								
NO3								
SO4								

	Continuing Calibration Verification/Blank				Continuing Calibration Verification/Blank			
Analyte	True	CCV4	%Rec	CCB4	True	CCV5	%Rec	CCB5
Fl								
Cl	3	2.8953	97	0.0000				
NO2								
Br								
NO3								
SO4								

Lancaster Laboratories

Quality Control Summary

Initial Calibration & Linearity Check
Instrumental Analysis
Total Organic Carbon
Instrument Identification: 5214
Calibration Date: 1/09/
SDG: CVL38
Matrix: WATER

Correlation Coefficient: 0.99992

Blank: 8.17679 mv
Blank: 6.09124 mv
Blank: 6.61163 mv
Blank: mv
Blank: mv
Blank Average: 6.96 mv

Standard: 372.312 mv
Standard: 374.753 mv
Standard: 372.312 mv
Standard: mv
Standard: mv
Average: 373.13 mv

Batch Number	Method Blank	ICV/ 2.0 mg/L	ICV/ 7.5 mg/L	ICV/ 10 mg/L	ICV/ 25 mg/L	ICV/ 50 mg/L	ICV/ 75 mg/L
07022049513A/B	0.35847	2.89716	7.54704	10.27330	24.74500	48.45170	NA

Continuing Calibration Verification	TRUE Value	Result (mg/L)	% Recovery
CCV	25.0	24.47370	98
CCV	25.0	24.27840	97
CCV	25.0	24.47370	98
CCV	25.0	24.50630	98

Continuing Calibration

	True Value (mg/L)	Acceptance Range
ICV/CCV	Varies	+/- 10%

* Out of Specification

APPENDIX A

EPA MISC GC METHOD
DATA DELIVERABLES FORMS

2E
WATER SURROGATE RECOVERY

Lab Name: Lancaster Laboratories

Contract:

Lab Code:

Case No.:

SAS No:

SDG No.: ETX15

GC Column (1): GS-ALUMINA ID: .53

GC Column (2):

ID:

Batchnumber: 062780007A

SAMPLE	SAMPLE CODE NO.	PROP 1 % REC #	PROP 2 % REC #	TOT OUT
4879969	TUTC3	93		0
4879970	TUT10	65		0
4880903	FRE02	79		0
4880903 MS	FRE02MS	77		0
4880903 MSD	FRE02MSD	80		0
BLANKA	PBLKRK	109		0
LCSA	LCSZP	107		0

	ADVISORY QC LIMITS	NOMINAL CONCENTRATION
PROP = PROPENE	(38 - 129)	20.7 ug/l

Column to be used to flag recovery values

* Values outside of QC Limits

D Surrogate diluted out

3E

Water Lab Control Spike/Lab Control Spike Duplicate Recovery

ɔ Name: Lancaster Laboratories Contract:

ɓ Code: Case No.: SAS No.: SDG No.:

boratory Control Spike - Sample Code No.: LCSZP

Compound	Spike Added (ug/l)	LCS Concen (ug/l)	LCSD Concen (ug/l)	LCS % Rec #	LCSD % Rec #	LCS-LCSD % REC Limits	% RPD #	% RPD Lim
METHANE	59	62		105		(80 - 120)		20
ETHANE	61	63		103		(80 - 120)		20
ETHENE	61	64		105		(80 - 120)		20
PROPANE	61	64		105		(73 - 125)		20

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

* Values outside of QC limits

RPD: 0 out of 4 outside limits

Spike Recovery: 0 out of 4 outside limits

ɔmments: Results calculated on as-received basis.

Sample No.: LCSA Batch: 062780007A

3E

Water Matrix Spike/Matrix Spike Duplicate Recovery

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix Spike - Sample Code No.: FRE02

Compound	Spike Added (ug/l)	Sample Concen (ug/l)	MS Concen (ug/l)	MSD Concen (ug/l)	MS % Rec #	MSD % Rec #	MS-MSD % REC Limits	% RPD #	% RPD Lim
METHANE	59	2.7	61	66	99	107	(63 - 124)	8	20
ETHANE	61	0	64	69	105	113	(63 - 127)	8	20
ETHENE	61	0	81	87	133*	143*	(69 - 126)	7	20
PROPANE	61	0	57	59	93	97	(56 - 136)	3	20

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

* Values outside of QC limits.

RPD: 0 out of 4 outside limits

Spike Recovery: 2 out of 8 outside limits

Comments: Results calculated on as-received basis.

Sample No.: 4880903 Batch: 062780007A

1D

ORGANICS ANALYSIS DATA SHEET

SAMPLE CODE NO.

PBLKRK

Lab Name: Lancaster Laboratories **Contract:** **Batchnumber:** 062780007A

Lab Code: **Case No.:** **SAS No.:** **SDG No.:**

Matrix: (soil/water) WATER

Lab Sample ID: BLANKA

Sample wt/vol: 5 **(g/ml)** ml

Lab File ID: 7S19254.44R

% Moisture: **Decanted: (Y/N)**

Date Received:

Extraction: (SepF/Cont/Sonc) Headspace

Date Extracted: 10/5/2006

Concentrated Extract Volume: 5000 **(uL)**

Date Analyzed: 10/6/2006

Injection Volume: 1000 **(uL)**

Dilution Factor: 1

GPC Cleanup: (Y/N) N **pH:**

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS (UG/L or UG/KG) ug/l	Q
74-82-8	METHANE	2.0	U
74-84-0	ETHANE	1.0	U
74-85-1	ETHENE	1.0	U
74-98-6	PROPANE	1.0	U

4C

METHOD BLANK SUMMARY

SAMPLE CODE NO.
PBLKRK

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: ETX15

Lab Sample ID BLANKA Batch 062780007A Lab File ID: 7S19254.44R

Matrix: (soil/water) WATER Extraction: (SepF/Cont/Sonc) Headspace

Sulfur Cleanup: (Y/N) N Date Extracted: 10/5/2006

Date Analyzed (1): 10/6/2006 Date Analyzed (2):

Time Analyzed (1): 10:50:03 Time Analyzed (2):

Instrument ID (1): H4132A Instrument ID (2):

GC Column: GS-ALUMINA ID: 0.53 (mm) GC Column: ID: (mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS, AND MSD

	SAMPLE CODE NO.	LAB SAMPLEID	DATE ANALYZED 1	DATE ANALYZED 2
01	TUTC3	4879969	10/6/2006	
02	TUT10	4879970	10/6/2006	
03	FRE02	4880903	10/6/2006	
04	FRE02MS	4880903	10/6/2006	
05	FRE02MSD	4880903	10/6/2006	
06	PBLKRK	BLANKA	10/6/2006	
07	LCSZP	LCSA	10/6/2006	

COMMENTS: ______________________

6D

INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H4132A Calibration File: 1S19254

GC Column (1) : GS-ALUMINA ID: 0.53 (mm) Update File:

Date(s) Analyzed: 9/11/2006 9/12/2006

COMPOUND	RT OF STANDARDS					MIDPOINT RT	RT WINDOW	
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5		FROM	TO
METHANE	1.24	1.24	1.23	1.23	1.24	1.24	1.21	1.27
ETHANE	1.47	1.47	1.46	1.47	1.47	1.47	1.44	1.50
ETHENE	1.78	1.77	1.78	1.78	1.78	1.78	1.73	1.83
PROPANE	2.22	2.21	2.21	2.22	2.22	2.22	2.16	2.28
PROPENE	2.89	2.86	2.88	2.88	2.88	2.89	2.76	3.02

6D

INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H4132A Calibration File: 2S19254

GC Column (1) : GS-ALUMINA ID: 0.53 (mm) Update File: 6S19254.19R

Date(s) Analyzed: 10/3/2006 10/3/2006

COMPOUND	RT OF STANDARDS					MIDPOINT RT	RT WINDOW	
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5		FROM	TO
METHANE				1.17		1.17	1.14	1.20
ETHANE				1.39		1.39	1.36	1.42
ETHENE				1.69		1.69	1.64	1.74
PROPANE				2.13		2.13	2.07	2.19
PROPENE				2.80		2.79	2.66	2.92

6E

INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H2739A Calibration File: 1M27137

GC Column (1) : RTX-200 ID: 0.53 (mm) Date(s) Analyzed: 5/17/2007 5/18/2007

COMPOUND	CALIBRATION FACTORS LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	MEAN	%RSD
Methanol	1.15E+00	1.11E+00	1.00E+00	1.02E+00	9.88E-01		1.06E+00	6.9
ethanol	1.75E+00	1.62E+00	1.39E+00	1.39E+00	1.60E+00		1.55E+00	10.1
ISOPROPANOL	1.81E+00	1.77E+00	1.64E+00	1.67E+00	2.03E+00		1.78E+00	8.6
Acetone	1.76E+00	1.70E+00	1.70E+00	1.69E+00	1.65E+00		1.70E+00	2.4

Average % RSD: 7

6E

INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H4132A Calibration File: 2S19254

GC Column (1) : GS-ALUMINA ID: 0.53 (mm) Date(s) Analyzed: 10/3/2006 10/3/2006

	CALIBRATION FACTORS						
COMPOUND	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	MEAN	%RSD
METHANE	2.51E+03	1.83E+03	1.52E+03	1.45E+03	1.53E+03	1.77E+03	25.0
ETHANE	1.30E+03	1.41E+03	1.40E+03	1.34E+03	1.47E+03	1.39E+03	4.8
ETHENE	1.64E+03	1.81E+03	1.77E+03	1.73E+03	1.84E+03	1.76E+03	4.4
PROPANE	2.50E+03	2.69E+03	2.87E+03	2.70E+03	2.64E+03	2.68E+03	5.0
PROPENE	5.91E+03	5.90E+03	5.58E+03	5.79E+03	5.93E+03	5.82E+03	2.5

Average % RSD: 8.3

7E

CALIBRATION VERIFICATION SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H4132A Init. Calib Date(s): 09/12/06 09/12/06

GC Column (1) : GS-ALUMINA ID: .53 (mm) Date Analyzed: 09/12/06

Lab File ID: 1S19254.16R Time Analyzed: 10:48

Lab Standard ID: 71053AI Initial Calibration: 1S19254

COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT	NOM AMOUNT	%D
METHANE	1.23	1.21	1.27	57.67	59.84	-3.6
ETHANE	1.46	1.44	1.50	58.62	59.08	-0.8
ETHENE	1.77	1.73	1.83	59.77	60.56	-1.3
PROPANE	2.21	2.16	2.28	57.72	60.60	-4.8
PROPENE	2.89	2.76	3.02	19.53	21.27	-8.2

Average of %D: 3.7

8D
ANALYTICAL SEQUENCE

Sequence: 1S19254 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: GS-ALUMINA ID: 0.53

Instrument: H4132A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	PROP
001		CONDITIONER	09/11/2006	13:24:07	1S19254	
002		CONDITIONER	09/11/2006	13:36:59	1S19254	
003	71051AA	710510632E	09/11/2006	13:50:31	1S19254	2.90
004	71052AA	710520632BE	09/11/2006	14:03:32	1S19254	2.90
005	71053AA	710530632CV	09/11/2006	14:16:45	1S19254	2.88
006	71054AA	710540632CG	09/11/2006	14:30:02	1S19254	2.88
007	71055AA	710550632E	09/11/2006	14:43:22	1S19254	2.88
008	HSMDXAA	HSMDX0632E	09/11/2006	14:56:32	1S19254	2.88
009	71053AI	710530632CW	09/11/2006	15:09:42	1S19254	2.88
010	71051AA	710510632E	09/11/2006	15:26:05	1S19254	2.86
011	71052AA	710520632BE	09/11/2006	15:42:08	1S19254	2.86
012		CONDITIONER	09/12/2006	08:05:17	1S19254	
013		CONDITIONER	09/12/2006	08:18:01	1S19254	
014	71051AA	710510632E	09/12/2006	08:31:13	1S19254	2.90
015	71051AA	710510632E	09/12/2006	09:07:30	1S19254	2.89
016	71053AI	710530632CW	09/12/2006	10:48:55	1S19254	2.89
017	AA	CONDITIONER	09/12/2006	13:49:44	1S19254	2.93
018		CONDITIONER	09/12/2006	14:02:36	1S19254	
019	71053AJ	710530632CX	09/12/2006	14:15:57	1S19254	2.88
020	PBLK30	BLANKA	09/12/2006	14:29:23	1S19254	2.87
021	LCS9D	LCSA	09/12/2006	14:42:25	1S19254	2.87
022	UR11D	4856709	09/12/2006	14:55:40	1S19254	2.87
023	UR11DMS	4856710	09/12/2006	15:08:54	1S19254	2.85
024	UR11DMSD	4856711	09/12/2006	15:22:14	1S19254	2.84
025	GW20A	4855970	09/12/2006	15:35:25	1S19254	2.84
026	ADL04	4856192	09/12/2006	15:48:46	1S19254	2.84
027	ADL06	4856194	09/12/2006	16:02:14	1S19254	2.84
028	ADL4D	4856202	09/12/2006	16:15:20	1S19254	2.84
029	URS03	4856706	09/12/2006	16:28:47	1S19254	2.84
030	71053AK	710530632CX	09/12/2006	16:41:52	1S19254	2.84
031	URS09	4856707	09/12/2006	16:55:20	1S19254	2.84
032	URS11	4856708	09/12/2006	17:08:35	1S19254	2.84
033	URS23	4856712	09/12/2006	17:21:41	1S19254	2.83

	ICAL Dates		ICAL RT	QC Limits
1S19254	09/11/2006 - 09/12/2006	PROP = PROPENE	2.89	(2.76 - 3.02 Minutes)

8D
ANALYTICAL SEQUENCE

Sequence: 1S19254 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: GS-ALUMINA ID: 0.53

Instrument: H4132A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	PROP
034	URS26	4856713	09/12/2006	17:34:58	1S19254	2.83
035	URSFD	4856714	09/12/2006	17:48:10	1S19254	2.83
036	GW-8A	4855968	09/12/2006	18:01:26	1S19254	2.81
037	GW20A	4855970	09/12/2006	18:14:43	1S19254	2.81
038	ETV11	4856164	09/12/2006	18:28:13	1S19254	2.81
039	ADL05	4856193	09/12/2006	18:41:15	1S19254	2.81
040	ADL08	4856196	09/12/2006	18:54:40	1S19254	2.82
041	71053AL	710530632CX	09/12/2006	19:07:46	1S19254	2.82
042	ADL13	4856199	09/12/2006	19:21:04	1S19254	2.82
043	URS03	4856706	09/12/2006	19:34:29	1S19254	2.79
044	URS09	4856707	09/12/2006	19:47:38	1S19254	2.95
045	URS11	4856708	09/12/2006	20:00:51	1S19254	2.79
046	URS23	4856712	09/12/2006	20:14:07	1S19254	2.80
047	URS26	4856713	09/12/2006	20:27:24	1S19254	2.79
048	URSFD	4856714	09/12/2006	20:40:44	1S19254	2.79
049	71053AM	710530632CX	09/12/2006	20:58:38	1S19254	2.81
050	PBLK4B	BLANKA	09/12/2006	21:11:35	1S19254	2.82
051	LCSAV	LCSA	09/12/2006	21:25:00	1S19254	2.81
052	GW7BT	4857525	09/12/2006	21:38:38	1S19254	2.81
053	GW7B-	4857526	09/12/2006	21:51:47	1S19254	2.82
054	GW7B-MS	4857527	09/12/2006	22:05:23	1S19254	2.80
055	GW7B-MSD	4857528	09/12/2006	22:18:31	1S19254	2.81
056	GW7BD	4857530	09/12/2006	22:32:01	1S19254	2.81
057	GW7BB	4857531	09/12/2006	22:45:15	1S19254	2.82
058	GAR1R	4859180	09/12/2006	22:58:41	1S19254	2.81
059	GAR2R	4859181	09/12/2006	23:11:58	1S19254	2.81
060	71053AN	710530632CX	09/12/2006	23:25:30	1S19254	2.81
061	GARM3	4859182	09/12/2006	23:38:50	1S19254	2.79
062	GARM4	4859183	09/12/2006	23:52:12	1S19254	2.80
063	GARM5	4859184	09/13/2006	00:05:42	1S19254	2.79
064	GAR6R	4859185	09/13/2006	00:18:55	1S19254	2.79
065	GAR7R	4859186	09/13/2006	00:32:16	1S19254	2.80
066	GAR8R	4859187	09/13/2006	00:45:50	1S19254	2.79

	ICAL Dates		ICAL RT	QC Limits
1S19254	09/11/2006 - 09/12/2006	PROP = PROPENE	2.89	(2.76 - 3.02 Minutes)

8D
ANALYTICAL SEQUENCE

Sequence: 1S19254 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: GS-ALUMINA ID: 0.53

Instrument: H4132A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	PROP
067	GARM9	4859188	09/13/2006	00:59:04	1S19254	2.80
068	GAR10	4859189	09/13/2006	01:12:27	1S19254	2.80
069	GAR11	4859190	09/13/2006	01:25:45	1S19254	2.79
070	GAR12	4859191	09/13/2006	01:39:14	1S19254	2.79
071	71053AO	710530632CX	09/13/2006	01:52:45	1S19254	2.81
072	GAR13	4859192	09/13/2006	02:05:57	1S19254	2.79
073	GAR14	4859193	09/13/2006	02:19:13	1S19254	2.80
074	MNA20	4859283	09/13/2006	02:32:40	1S19254	2.78
075	MN114	4859284	09/13/2006	02:46:02	1S19254	2.79
076	71053AP	710530632CX	09/13/2006	02:59:23	1S19254	2.81

	ICAL Dates		ICAL RT	QC Limits
1S19254	09/11/2006 - 09/12/2006	PROP = PROPENE	2.89	(2.76 - 3.02 Minutes)

Quality Control Summary

Surrogate Recovery
TPH with Ranges
EPH/Misc Organics

Matrix.................Water
Batch Number.... 062770002A

LL Sample No.	Client Designation	S1	S2
BLANKA	PBLKQ6	72	85
LCSA	LCSXV	63	62
LCSDA	LCSDOU	86	92
4879968	TUTG8	85	98
4879969	TUTC3	116	63
4879970	TUT10	75	85

	QC LIMITS
S1 = Chlorobenzene	28-152
S2 = o-Terphenyl	52-131

ABBREVIATION KEY

* = VALUES OUTSIDE QC LIMITS
NC = NOT CALCULATED DUE TO MATRIX INTERFERENCE
D = DILUTED OUT

Quality Control Summary

Method Blank
TPH with Ranges
EPH/Misc Organics

*** BLANK INFORMATION ***

Matrix....................................... Water
Extraction Date........................ 10/4/2006
Concentration Units................. mg/l
Batch Number.......................... 062770002A

Sample Information		Blank Contamination Information			
LL Sample No.	Client Designation	CAS Number	Compound	Blank Result	MDL
BLANKA	PBLKQ6				
LCSA	LCSXV				
LCSDA	LCSDOU		C10-C28	ND	0.2
4879968	TUTG8		>C28-C40	ND	0.2
4879969	TUTC3		Total TPH	ND	0.2
4879970	TUT10				

ABBREVIATION KEY

MDL = MINIMUM DETECTION LIMIT
LOQ = LIMIT OF QUANTITATION
ND = NONE DETECTED
J = ESTIMATED VALUE BELOW THE LOQ

Quality Control Summary

Laboratory Control Sample
TPH with Ranges
EPH/Misc Organics

Matrix........................ Water
Units.......................... mg/l
Batch Number........... 062770002A

Compound	Amount Spiked	LCS Result	LCS % Rec	LCSD Result	LCSD % Rec	QC Rec Limits	% RPD	RPD Limits
Total TPH	0.801	0.522	65	0.743	93	53-120	35 *	20

ABBREVIATION KEY
* = VALUES OUTSIDE QC LIMITS
N/A = NOT APPLICABLE
ND = NONE DETECTED

Quality Control Summary

Continuing Calibration
TPH with Ranges
EPH/Misc Organics

% Difference................ +/-15
Units................................ ppm

File Number	Compound	Reference Conc.	Continuing Cal. Conc.	% Difference
R272.08R	TPH	272	276.9	1.8
R272.02R	TPH	144	141.8	-1.5
R272.17R	TPH	576	545.6	-5.3
R272.02R	Chlorobenzene	8	7.76	-3.1
R272.17R	Chlorobenzene	32	30.6	-4.4
R272.02R	o-Terphenyl	8	7.92	-1.0
R272.17R	o-Terphenyl	32	29.12	-9.0