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Hudson Valley Research Park
2070 Route 52
Hopewell Junction, NY 12533-6531

October 1, 2009

Henry Wilkie, Environmental Engineer I
New York State Department of Environmental Conservation
Bureau of Hazardous Waste and Radiation Management
Division of Solid and Hazardous Materials
625 Broadway
Albany, NY 12233-7258

Re: International Business Machines Corporation
East Fishkill Facility – Building 334
Pre-construction Soil Sampling and Analysis Program
Contained-In Demonstration

Dear Mr. Wilkie:

The purpose of this letter is to present a plan for the management of soil to be excavated as part of proposed construction activities to be undertaken at the International Business Machines Corporation (IBM) East Fishkill facility. In order to further quantify the chemical composition of the soil in the vicinity of the proposed construction activities, sampling of the subsurface soil was conducted on August 5, 2009 at three sampling locations to the south of Building 334 at the East Fishkill facility.

Background

A construction project has been initiated in conjunction with the lease of a portion of Building 334 at the IBM East Fishkill facility to SpectraWatt, Inc. IBM is coordinating this contained-in demonstration to facilitate the construction of two concrete foundation pads that will be located to the south of Building 334. These pads will be utilized for installation of rapid thermal oxidation (RTO) equipment and a liquid nitrogen (LN2) tank. The construction activity will be conducted by CH2M Hill and will require the excavation of soil along the south side of Building 334. The Pre-construction Soil Sampling and Analysis Program, which was undertaken in order to determine the appropriate management procedure for the excavated soil from the project, was electronically submitted to the New York State Department of Environmental Conservation (NYSDEC) for approval on July 23, 2009. This submission was subsequently approved on July 28, 2009.

Technical Approach

The objective of the Pre-construction Soil Sampling and Analysis Program was to collect representative soil samples at appropriate depths from within the areas proposed for construction, analyze the soil samples for appropriate constituents of concern and compare the results of the analytical testing to the Contained-In Action Levels presented in TAGM 3028 with an effective date

of March 14, 1997. Based on that comparison, IBM will properly classify the soil as either hazardous or non-hazardous waste and develop an appropriate soil management protocol for off-site transportation and disposal, on-site backfilling or other on-site reuse of the excavated soil.

Field Investigation

At each sample location, the first 4 feet of soil was removed by a vactor unit. The vactor unit consists of a high-pressure vacuum extraction system which removes soil without endangering utilities. Soil samples were then collected utilizing a hollow stem hand auger and a split spoon sampler advanced in each location to collect one 2-foot interval soil sample, starting at 4 feet below grade surface (bgs). Between boring locations, the auger and split spoon sampler were properly decontaminated. The soil boring activities were documented in a field book and a boring log was prepared for each location. The soil cuttings were collected and containerized in 55-gallons drums for proper disposal and the holes were backfilled. Oversight of the sampling activities was provided by a representative of William F. Cosulich Associates, P.C. (WFC).

The three soil sampling locations are shown on Figure 1 which is provided as Attachment 1 to this correspondence. As part of this study a total of five soil samples were collected, two from each of the three sampling locations, with the exception of CH-1 that could not be advanced due to the shallow depth to bedrock. As a result only one sample was collected from CH-1 at a depth of 4 feet bgs. At soil boring CH-2, soil was extracted down to 4 feet and the soil sample collected from 4 feet bgs. The second sample from CH-2 was collected from a depth of 4 to 6 feet bgs. At soil boring CH-3, soil was extracted down to 4 feet and the soil sample collected from 4 feet bgs. The second sample from CH-3 was a composite sample collected from two split spoons collected from 6 to 8 feet bgs. The soil samples collected from below 4 feet were put on hold at the laboratory for 10 days to provide CH2M Hill the opportunity to confirm the depth of excavation required for the pad installation. The initial foundation pad design called for excavation to four feet. Upon review of the geotechnical report, it was determined that excavation at CH-2 and CH-3 would be required to extend to 6 feet bgs. This decision was not finalized until after the 10-day window to conduct laboratory analysis on the deeper samples had lapsed. However, field observation of subsurface conditions and photoionization detector (PID) readings recorded at 6 feet bgs did not indicate any substantial difference in the soil conditions at 6 feet bgs as compared to those at 4 feet bgs. A copy of the document prepared by CH2M Hill entitled, "Geotechnical Report, LN2 Tanks and RTO South of Building B334," that includes soil boring logs that document soil conditions at the sampling locations is provided in Attachment 2 to this correspondence.

Analytical Results

Laboratory analysis performed on the collected soil samples included volatile organic compounds (VOCs) utilizing EPA Method 8260B and RCRA metals utilizing EPA Methods 6010B and 7471A. EPA Method 8260B includes, but is not limited to, the following seven compounds listed on Table 1 of Appendix B in Module III of the East Fishkill Part 373 Permit:

- cis-1,2-dichloroethene (DCE)
- 1,1,1-trichloroethane (TCA)
- trichloroethene (TCE)
- tetrachloroethene
- benzene
- ethylbenzene
- xylene

Soil samples selected for laboratory analysis were submitted under chain-of-custody to Mitkem Laboratories. Copies of the chain-of-custody forms for the samples are provided in Attachment 3.

The analytical results of the soil samples were compared to the Contained-In Action Levels for soil/sediment provided in the NYSDEC's TAGM 3028 – "'Contained-in Criteria' for Environmental Media," dated November 30, 1992. It should be noted that the Contained-In Action Levels listed in TAGM 3028 have an effective date of March 14, 1997. In addition, analytical results of the soil samples were compared to the Soil Cleanup Objectives to Protect Groundwater Quality (VOCs) or the Eastern USA Background levels (metals) presented in Appendix A of the NYSDEC's TAGM 4046 – "Determination of Soil Cleanup Objectives and Cleanup Levels," dated January 24, 1994.

As previously discussed a total of five samples were submitted to the laboratory for VOC and metal analyses. However, it should be noted the two soil samples collected from CH-2 at 4 to 6 feet and from CH-3 at 8 feet did not undergo analysis, so analytical results are provided for only three soil samples. The tabulated analytical results are presented in Attachment 4, with quality assurance/quality control documentation presented in Attachment 5. In addition to the analytical results, the tables provide a comparison to the Contained-In Action Levels for soil/sediment and the Soil Cleanup Objectives to Protect Groundwater Quality (VOCs) or the Eastern USA Background levels (metals), as appropriate.

As shown in Table 1 in Attachment 4, VOCs were not detected at concentrations exceeding the TAGM 3028 "Contained-in" Action Levels or the TAGM 4046 Soil Cleanup Objectives to Protect Groundwater Quality.

As shown in Table 2 in Attachment 4, Arsenic was detected at concentrations that exceeded the "Contained-in" Actions Levels. Although all of the soil samples collected exceeded for arsenic, the exceedances were within the TAGM 4046 Eastern USA Background levels.

Discussion

The purpose of the Pre-construction Soil Sampling and Analysis Program is to determine how to manage on-site soil excavated as part of proposed construction activities.

In order to determine whether the soil located within these areas would be considered a listed hazardous waste as a result of mixing with a particular known listed waste, the contained-in policy was used since soil is an environmental media. VOCs were not detected at concentrations exceeding the "Contained-in" Action Levels. None of the metals analyzed for were detected at concentrations above the "Contained-in" Action Levels with the exception of arsenic. Since arsenic is not one of the "listing constituents" for this waste, its concentrations in excess of the "Contained-in" Action Levels are not significant and are not to be used to determine whether the soil located within the study area is a listed hazardous waste.

To determine whether a material is a characteristic hazardous waste, the Toxicity Characteristic Leaching Procedure (TCLP) is used to determine the leachable concentrations of constituents in the soil. However, as presented in TAGM 3028, the "20 Times Rule" can be used in place of a TCLP analysis if total concentration results for the soil are available. This approach is based on the fact that when soil samples are prepared for TCLP analysis, the soil is diluted in acid at a 1 to 20 ratio. Assuming that all of the contaminant present in the soil leaches into the acid allows the actual total concentration result detected in the soil sample to be divided by 20 to yield the maximum possible contaminant concentration in the TCLP extract. If this resulting concentration is below the Toxicity Characteristic regulatory level, then the soil would not be a characteristic hazardous waste for toxicity.

Applying the "20 Times Rule" to all individual constituent soil sample concentrations which exceeded their respective Eastern USA Background level and comparing the resulting concentrations to the Toxicity Characteristic regulatory levels demonstrates that the soil located within the proposed areas of excavation is not a characteristic hazardous waste.

Therefore, based on the analytical results of the soil sampling conducted as a part of the Pre-construction Soil Sampling and Analysis Program, none of the soil located within the areas of proposed excavation would be classified as either a listed or characteristic hazardous waste.

Conclusions

Based upon the results of the supplemental Pre-construction Soil Sampling and Analysis Program, IBM is requesting that the NYSDEC approve the classification of soil proposed for excavation during the construction activities within the vicinity of the proposed excavation activities as non-hazardous waste. IBM is also requesting approval to utilize the soil to backfill the excavations or as regrading material in the general vicinity of the excavations. Furthermore, any excess soil from the excavations and regrading would be used as fill in selected areas of the IBM East Fishkill facility East Complex. In the event the excavated soil will be disposed of off-site, the material will be transported off-site as a non-hazardous industrial solid waste to a permitted Part 360 land disposal facility or a permitted hazardous waste landfill.

IBM also does not consider the proposed construction activities to constitute a "substantial change of use" of the site as defined in 6 NYCRR 375-1.3(v) because the proposed construction activities will

not disrupt or expose hazardous waste or increase direct human exposure. As a result, the notification requirements of 6 NYCRR 375-1.6 are not applicable.

It should be noted that during the excavation activities, monitoring will be conducted for Health and Safety purposes. If this monitoring indicates consistent elevated readings, then the soil will be segregated, sampled and analyzed to confirm that it is below the Contained-In Action Levels. If the soil does not meet the contained-in criteria, the soil will be managed as a hazardous waste.

After reviewing the attached information, should you have any questions, please call Ms. Jacqueline Braungart at (845) 892-1672.

Sincerely,

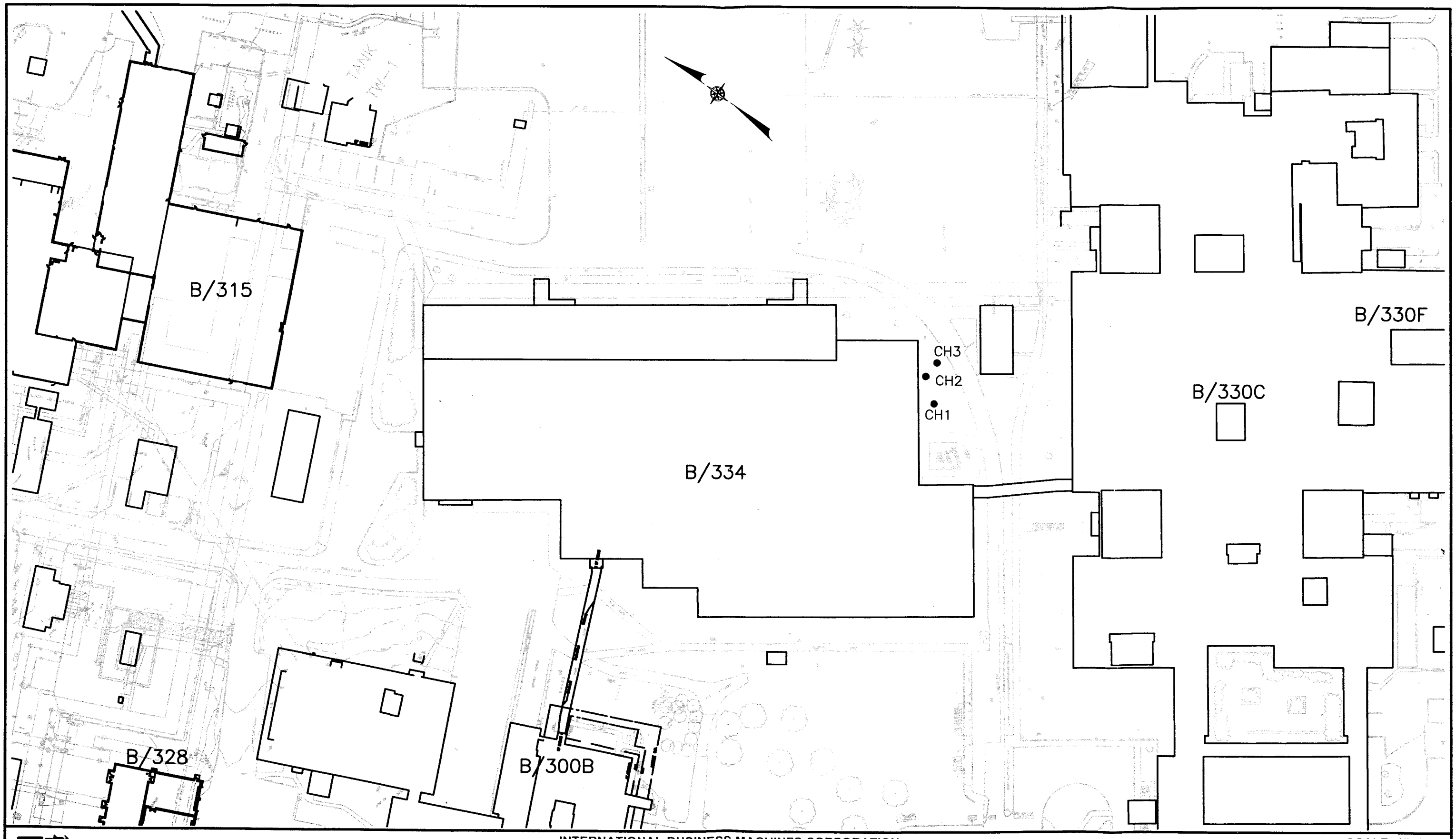
INTERNATIONAL BUSINESS
MACHINES CORPORATION

Steven C. Hawkins, Manager
Environmental Regulatory Engineering

SCH/BW/jmy,kap
Enclosure
cc: M. O'Connor (NYSDEC – New Paltz)
R. Pergadia (NYSDEC – New Paltz)
J. Braungart (IBM)
R. Walka (WFC)
B. Veith (WFC)
♦2935\MISC08109-HW.DOC(R06)

ATTACHMENT 1

FIGURE 1 – SOIL SAMPLING LOCATIONS



INTERNATIONAL BUSINESS MACHINES CORPORATION
EAST FISHKILL FACILITY - HUDSON VALLEY RESEARCH PARK
HOPEWELL JUNCTION, NEW YORK

SCALE: 1"=100'

SOIL SAMPLING LOCATIONS

FIGURE 1

William F. Cosulich Associates, P.C.
Environmental Engineers and Scientists

ATTACHMENT 2

GEOTECHNICAL REPORT

Geotechnical Report

LN2 Tank and RTO South of Building B334

IBM Corporation
East Fishkill, New York

Prepared for

IBM Corporation

Prepared by

CH2MHILL

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September 2009

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Acronyms

bgs	below the ground surface
bpf	blows per foot
FS	Factor of Safety
IBC	International Building Code
ksf	kilo-pounds-per-square-foot
pcf	pounds-per-cubic-foot
pci	pounds-per-cubic-inch
psf	pounds-per-square-foot
psi	pounds-per-square-inch
PGA	peak ground acceleration
PI	plasticity index
PID	photo ionization detector
RQD	rock quality designation
RTO	regenerative thermal oxidizer
SPT	standard penetration test
tsf	tons-per-square-foot
UCS	Unconfined Compressive Strength
USCS	Unified Soil Classification System
USGS	United States Geological Survey

SECTION 1

Introduction

This report presents results of the geotechnical subsurface explorations, laboratory analyses, and geotechnical engineering recommendations for the Liquid Nitrogen (LN2) tank and Regenerative Thermal Oxidizer (RTO) adjacent to Building 334 at the IBM Corporation facility in East Fishkill, New York. This work has been performed by CH2M HILL, as authorized by Terry Wheeler, CH2M HILL Project Manager, in accordance with the Standard Form of Agreement between Owner and Design-Builder - Lump Sum dated April 27, 2009.

1.1 Purpose and Scope

The purpose of the subsurface exploration and report is to evaluate the subsurface conditions as they relate to foundation design and earthwork for the proposed development. The scope of services consisted of planning and performing three borings, field and laboratory testing, evaluating subsurface conditions, engineering analyses, and preparing this geotechnical report.

The report contents are subject to the limitations listed at the end of this report.

1.2 Site and Project Description

The project site is located off Route 9 in East Fishkill, New York, as shown on Figure 1-1. Planned structures considered in this report include a new Liquid Nitrogen (LN2) tank and a new Regenerative Thermal Oxidizer (RTO), as shown on Figure 1-2.

The new LN2 tank and RTO will be located adjacent to building B334 on the southeast side. The structures will incorporate the following anticipated design foundation conditions and loads:

RTO:

- Equipment Pad Elevation: 256.5 feet
- Pad thickness: Two feet, with perimeter haunch extending four feet below surrounding grade to prevent frost heave.
- Bottom of concrete for RTO: 254.5 feet except for the perimeter haunch. Bottom of perimeter haunch at 249.6 feet at west corner (four feet below surrounding grade of 253.6 feet), raising in level increments to 254.5 feet at east corner (corresponding to the slab thickness where surrounding grade will be at least two feet above the slab and retained by a wall)
- Slab dimensions: 23 by 42 feet
- Weight: 45 kips

LN2 Tank:

- Slab Elevation: 252.8 feet
- Slab Thickness: Two feet, with perimeter haunch extending four feet below surrounding grade.
- Bottom of concrete for LN2: 248.8 feet (four feet below surrounding grade)
- Slab dimensions: 12 by 12 feet
- Weight: 125 kips

1.3 Description of Existing Structure

The existing building B334 is a three-story steel frame structure, with an approximate area of 89,280 square feet, according to the Dames & Moore report dated January 16, 1981. The first floor was founded on grade at elevation +251 feet. The existing building B334 is founded on rock and on drilled shafts set in rock.

The LN2 tank and RTO will be located as close as 5 feet to the southeast of building 334, as shown on Figure 1-2.

1.4 Summary of Key Findings

Section 2 presents a summary of the field explorations and laboratory tests, and Section 3 presents the subsurface conditions interpreted from these investigations. Section 4 presents the geotechnical engineering recommendations based on these conditions.

Three borings were drilled for this project, CH-1, CH-2, and CH-3, as shown on Figure 1-2. In all the borings soft digging was performed from the top of ground to 4 feet below the ground surface (bgs). The ground elevations at the boreholes were not surveyed; therefore, elevations mentioned in this report were estimated from the existing site topographic survey, and are considered accurate to within approximately 1 foot.

- At boring CH-1 (with approximate ground elevation of 253 feet), top of rock was encountered 4 feet bgs at approximate elevation 249 feet, once the soft digging was complete. The soil observed during the soft digging is described as dark brown gravelly sand, with little silt. No ground water was observed.
- At Boring CH-2 (with approximate ground elevation of 255 feet), top of rock was encountered 6 feet bgs (elevation 249 feet). Only one standard penetration test (SPT) was performed below the depth of soft digging which had SPT N-value (blowcount) of 78 blows per foot (bpf). This sample was designated for environmental testing. The soil observed during soft digging was similar to the soil observed in CH-1.
- At Boring CH-3 (with approximate ground elevation of 257 feet), top of rock was encountered at 11 feet below the ground surface (elevation 246 feet) and a total of four geotechnical samples were collected via SPT. The SPT blowcount ranged between 50 bpf and 50 blows per 3 inches. The observed soil consisted in very dense brown gravelly sand, classified as SW-SM, with about 20% of silty fines.

Due to the dense condition of granular soils over bedrock, and the relatively shallow depth to bedrock, no significant bearing capacity or settlement concerns are identified. However, due to the shallow but slightly variable depth to bedrock, specific construction recommendations are presented herein to minimize differential settlements for foundations that may be founded partially on soil and partially on rock.

SECTION 2

Field Exploration and Laboratory Testing

The field subsurface exploration program and laboratory testing program are described in this section.

2.1 Field Subsurface Explorations

The subsurface investigation program was performed between August 5th and August 6th, 2009. Drilling activities were performed by Soil Testing, Inc., with supervision and soil and rock core logging by a CH2M HILL geotechnical engineer. Boring logs are presented in Appendix A. Laboratory test results are presented in Appendix B and boring locations are shown on Figure 1-2.

Three borings were performed during the investigation (CH-1, CH-2, and CH-3), all located at the south-east side of the existing B334 building as shown on Figure 2-1. Prior to drilling, "soft dig" methods were used to a depth of 4 feet bgs to prevent damage to existing utilities. Once the soft dig was complete, each boring was drilled using a Diedrich D-50 rubber tired-truck mounted rig. Hollow stem augers with outside diameter (OD) of 4 inches were used to advance the borings into the soil.

SPTs were performed at 2-foot depth intervals from the bottom of "soft dig" to the top of bedrock (identified by auger refusal). SPTs were performed using a standard 2-inch OD split-spoon sampler, driven 24-inches into the ground with a 140-pound automatic hammer falling 30-inches, in accordance with the standard procedures outlined in ASTM International (ASTM) D1586, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils". The SPT is used to characterize the consistency of fine-grained soil or the relative density of coarse-grained soil by measuring penetration resistance expressed as the N-value. The N-value is the sum of the number of blows required to advance the standard split-spoon sampler for the second and third 6-inch increments. Low N-values indicate soft or loose soil and high N-values indicate hard or dense material. After the sampler was driven and the blow counts were recorded, the sampler was withdrawn from the boring to recover a disturbed soil sample. The soil samples were logged per ASTM D2788, placed in glass jars, and sent to the testing laboratory for soil classification and laboratory testing.

Rock coring was performed using a wireline method with an NW-sized, double-tube core barrels with a diamond bit. Upon recovery, rock cores were placed in labeled five foot long timber core boxes and photographs of the rock cores were taken.

Soil samples retrieved with split spoons were logged and stored in glass jars, while rock cores were stored in 5-foot long timber boxes. The recovery and the rock quality designation (RQD) of the cores were noted. Once the desired depth was achieved, the hole was abandoned with grout.

An engineer from William F. Cosulich Assoc. was present during the exploration and collected various samples for environmental characterization; results of these tests are not presented in this report. Photoionizaton detector (PID) readings were also recorded for each of the soil samples, which are shown on the boring logs.

Subsurface conditions encountered at the three borings are summarized as follows:

- At boring CH-1 (with approximate ground elevation of 253 feet), top of rock was encountered 4 feet bgs at approximate elevation 249 feet, once the soft digging was complete. The soil observed during the soft digging is described as dark brown gravelly sand, with little silt. No ground water was observed.
- At Boring CH-2 (with approximate ground elevation of 255 feet) top of rock was encountered 6 feet bgs (elevation 249 feet). Only one standard penetration test (SPT) was performed below the depth of soft digging which had SPT blowcount of 78 blows per foot (bpf). This sample was designated for environmental testing. The soil observed during soft digging was similar to the soil observed in CH-1.
- At Boring CH-3 (with approximate ground elevation of 257 feet) top of rock was encountered at 11 feet bgs (elevation 246 feet) and a total of four geotechnical samples were collected via SPT. The SPT blowcount ranged between 50 bpf and 50 blows per 3 inches. The observed soil consisted in very dense brown gravelly sand, classified as SW-SM, with about 20% of silty fines.

In addition to the above boring observations, rock outcrops are observed approximately 20 feet west of the proposed LN2 tank pad, with rock surface elevation of approximately 253 feet. This indicates that top of rock may be higher than indicated by boreholes CH-1 through CH-3 in these areas.

Table 2-1 presents a summary of boring information and Appendix A presents the boring logs.

TABLE 2-1
Boring Summary Information
IBM East Fishkill, NY – LN2 Tank and Regenerative Thermal Oxidizer (RTO)

Boring ID	Approximate Ground Elevation +/- 1ft (Ft. msl) [1]	Depth Excavated by Hand (feet)	Depth Drilled in Soil (feet)	Depth Cored in Rock (feet)	Total Depth (feet)	Depth to Ground Water (feet)
CH-1	253	4	0	10	14	-
CH-2	255	4	2	10	16	-
CH-3	257	4	7	10	21	-

1 Approximate ground elevation based on site topographic survey as cited on Figure 1-2

2 "-" Indicates that groundwater depth could not be measured due to start of rock coring (with water) at shallow depth. Groundwater was not encountered prior to start of rock coring in any borehole.

2.2 Laboratory Testing

Geotechnical samples from boring CH-3 were tested for the following properties: water content, particle size analyses, and soil pH. In addition, a total of four rock core samples were tested for unconfined compressive strength. Table 2-2 summarizes the number of various tests performed. Appendix B contains laboratory testing results, and Table 2-3 summarizes the results of unconfined compressive strength (UCS) tests on rock samples.

TABLE 2-2
Summary of Laboratory Tests
IBM East Fishkill, NY – LN2 Tank and Regenerative Thermal Oxidizer (RTO)

Number of Tests Performed	Type of Test	ASTM Standard
2	Sieve Analysis	ASTM D 422
2	Water Content	ASTM D 2216
2	Soil pH	ASTM D 4972
4	Rock Unconfined Compressive Strength	ASTM D2938

TABLE 2-3
Summary of Laboratory Unconfined Compressive Strength Tests on Intact Rock Core Samples
IBM East Fishkill, NY – LN2 Tank and Regenerative Thermal Oxidizer (RTO)

Boring	Bottom of Sample Depth (ft)	Unconfined Compressive Strength, UCS (psi)
CH-1	12.5	15,150
CH-2	6.5	18,850
CH-3	12.5	3,750
CH-3	15.0	10,430

SECTION 3

Subsurface Conditions

The field subsurface conditions, related soil and rock engineering properties, and groundwater conditions based on the geotechnical investigation are described in this section.

3.1 Soil and Rock Conditions

Following are descriptions of subsurface conditions encountered during the subsurface investigation.

- *Topsoil:* 2 to 3 inches of roots, grass and organic material, black and dark brown, and moist.
- *Well Graded Silty Sand (SW-SM):* very dense, dark brown, with sub-rounded particles, silty fines with low to no plasticity, and several quartz particles of maximum size 4 inches. This layer was observed during hand digging and during SPT testing in the three borings performed, with SPT blowcounts between 50 bpf and 50 blows per 3 inches. Thickness varied between 4 feet and 11 feet, depth at which top of rock was encountered.
- *Bedrock:* Shale bedrock was encountered at 4, 6, and 11 feet bgs in borings CH-1, CH-2 and CH-3, respectively. The shale is gray, with some quartz intrusions, medium to strong (R3 to R4) and moderately to slightly weathered. The RQD recorded ranged between 23 and 71 percent in the upper 5 feet of the bedrock, and between 70 and 80 percent in the following lower 5 feet, with recovery ranging between 80 and 100 percent throughout. In general, the inclination of rock core fractures was between 30 and 40 degrees from horizontal, coincident with observed bedding planes. Photographs of rock cores can be found in Appendix C.

A cross section of the soil profile based on the three borings performed in the area can be found in Appendix D.

3.2 Soil Engineering Properties for Design

Soil engineering properties have been assigned for engineering analyses based on the field observations and laboratory test data. These properties are summarized in Table 3-1.

TABLE 3-1

Soil and Rock Engineering Properties for Design

IBM East Fishkill, NY – LN2 Tank and Regenerative Thermal Oxidizer (RTO)

Layer description	Depth (feet bgs)	Avg. SPT Blow-count (bpf)	Unit Weight (pcf)	Internal Effective Stress Friction Angle ϕ' (degrees)	Modulus of Elasticity (tsf)
Very dense sandy gravel (GW)	4 to 11	50	125	32	106
Bedrock (Shale)	> 11	-	130	>40	Upper 5 ft: 250 Below 5 ft: 5000

The properties in Table 3-1 were estimated using available correlations with the SPT N-values measured during the soil exploration, as listed in the EPRI manual (1990) and the U.S. Army Corps of Engineers (USACE) publication EM-1110-2-2504 (1994).

3.3 Groundwater Conditions

The potential occurrence of groundwater was monitored in all the borings during drilling. Groundwater was not encountered at any time during soil boring. Use of water during rock coring prevented measurement of the groundwater level below the top of bedrock.

SECTION 4

Geotechnical Engineering Recommendations

This section presents geotechnical engineering recommendations for the proposed LN2 tank and RTO, including the following:

- Foundation recommendations (Section 4.1)
- Seismic design considerations (Section 4.2), and
- Other design and construction recommendations including those for retaining walls, lateral earth pressures, excavations, subgrade preparation, fills, and groundwater control (Section 4.3).

4.1 Foundation recommendations

As detailed in Section 3, the borings indicate favorable conditions for shallow foundations, with dense granular soil over shallow bedrock. The primary difference in conditions among the borings is the elevation at top of rock: approximate elevation 249 feet at borings CH-1 and CH-2, and approximate elevation 246 feet at boring CH-3. The soil encountered in the three borings consisted of very dense sandy gravel, with SPT N-values between 50 bpf and 50 blows per 3 inches. These conditions indicate that the planned structures can be founded on concrete equipment pads or slabs with minimal settlement and no bearing capacity concerns.

LN2 Tank:

The LN2 tank pad will have a bottom of concrete elevation of approximately 251 feet except at the perimeter haunch, which will have a bottom of concrete elevation of approximately 249 feet. The top of bedrock (slightly weathered to fresh) was encountered at elevation 249 feet in nearby boreholes CH-1 and CH2. Rock outcrops visible approximately 20 feet west of the proposed LN2 tank pad location indicate the top of rock increases to approximate elevation 253 feet at that location.

Based on these conditions, the perimeter haunch should be founded directly on the excavated rock surface. The excavation to top of rock will likely vary slightly above and below elevation 249 feet due to undulations in the rock surface; such variation in excavation extent is considered acceptable. Due to the relatively small dimensions of the LN2 tank pad, it is further recommended that the entire area of the LN2 tank pad be excavated to the top of rock and the equipment pad thickness extended to approximately 4 feet throughout. This will minimize potential differential stiffness and associated pad cracking due to adjacent pad regions founded alternately on rock and soil.

Alternately, the perimeter haunch could be constructed directly on rock at approximate elevation 249 feet, with the central area of the pad founded on existing dense granular soil

above rock at elevation 251 feet. This approach may pose the potential for differential stiffness and associated pad cracking between the perimeter haunch and adjacent pad areas; to eliminate this potential, the pad haunch should be over-excavated into rock approximately 2 feet (to approximate elevation 247 feet) and backfilled to elevation 249 feet with compacted structural fill, before construction of the perimeter haunch.

The allowable bearing pressure for the pad on dense granular soil is 6 ksf to provide a factor of safety (FS) against bearing failure of 3.0, and would be even greater if the pad is founded directly on rock. Anticipated settlements under this allowable bearing pressure are estimated to be less than ½- inch. Anticipated settlements under the planned LN2 tank service loads summarized in Section 1.2 are less than 0.1 inch if founded on either dense granular soil or rock. A modulus of subgrade reaction of approximately 100 pci is recommended if the pad is founded on a thin layer of dense soil over rock, and may be higher if founded on rock.

See Section 4.3 for additional excavation, subgrade preparation, and backfill recommendations. In-situ soils within 4 feet bgs were not sampled by SPT due to the soft-dig requirements; therefore, if these soils form the pad subgrade, they will need to be carefully compacted and verified.

RTO:

The proposed RTO equipment top of pad elevation is 256.5 feet. Surrounding grade varies between approximate elevation 253.6 feet at the west corner of the RTO pad to approximate elevation 259 feet at the east corner of the pad. Therefore, a retaining wall will be constructed about the eastern portion of the RTO pad, with maximum wall height of approximately 2.5 feet at the east corner of the pad.

The perimeter haunch will be constructed at least 4 feet below the surrounding grade. At the west corner of the pad, the haunch excavation will therefore extend to approximate elevation 249.6 feet, which is very close to the likely top of rock elevation at that location. Alternately, at the east corner of the pad, the haunch excavation will only need to extend to approximate elevation 254.5 feet (the thickness of the pad) to be four feet below surrounding grade. The depth of soil above rock and below the haunch elevation will therefore vary from nearly zero at the west corner of the pad to over 8 feet at the east corner.

To account for this variability in perimeter haunch excavation elevation, the perimeter haunch subgrade should be excavated as a set of horizontal "steps", with step elevation changes of 1 to 2 feet. Where the bottom of the perimeter haunch is planned within 2 feet of the anticipated rock elevation (i.e., where the bottom of haunch will be constructed at or below elevation 251 feet, near the west corner of the pad), the subgrade should be overexcavated two feet below the planned haunch subgrade, and backfilled with two feet of compacted structural fill to form the subgrade elevation. Overexcavation and backfill of portions of the perimeter haunch will minimize potential differential stiffness and associated pad cracking due to adjacent pad regions founded alternately on rock and soil.

The remainder of the pad will be founded on dense granular soil. In a small area near the west corner of the RTO pad, structural fill will need to be added to raise the pad subgrade elevation above the existing ground elevation.

As an alternate to the above, the RTO pad could be constructed entirely on rock if extensive over-excavation is performed. However, this alternative would require extensive volumes of excavation and concrete, temporary shoring, and associated controls to protect existing building B334 from damage during construction. If this alternative is selected for some reason, a geotechnical engineer would need to be consulted to design the excavation shoring system. This alternative is not considered further herein.

The allowable bearing pressure for the pad constructed on dense granular soil is 6 ksf to provide a FS against bearing failure of 3.0. However, bearing pressures should be limited to less than 2 ksf to limit settlements near the eastern corner of the pad to less than ½-inch. Anticipated settlements under the planned LN2 tank service loads summarized in Section 1.2 are less than 0.1 inch. A modulus of subgrade reaction of approximately 50 pci is recommended near the eastern corner of the pad, increasing to approximately 100 pci near the western corner of the pad due to the closer proximity of the foundation to rock in that area.

See Section 4.3 for additional excavation, subgrade preparation, backfill, and retaining wall recommendations. In-situ soils within 4 feet bgs were not sampled by SPT due to the soft-dig requirements; therefore, if these soils form the pad subgrade, they will need to be carefully compacted and verified.

4.2 Seismic Design

This section presents the testing and analyses conducted to determine the seismic site class for this project, according to the recommendations presented by the 2006 International Building Code (IBC).

4.2.1 Liquefaction Potential

Granular soils susceptible to liquefaction were not encountered during the soil exploration activities. The dense sandy gravel found on top of the shale had blow counts between 50 bpf and 57 blows per 3 inches.

4.2.2 Site Seismic Design Parameters

The seismic site class for the new structures was calculated based on the SPT N-values in borings CH-2 and CH-3. The weighted average of the SPT N-values was calculated in the upper 100 feet bgs using the guidelines presented in Section 1613.5.5 of IBC 2006. Since SPT tests were performed only in borings CH-2 and CH-3, determination of site seismic design parameters are based on the results obtained in these borings; as can be seen in the boring logs, SPT N-values varied between 50 bpf and 57 blows per 3 inches in CH-3, and an N-value of 78 bpf was obtained in CH-2. Per the criteria in IBC 2006, Table 1613.5.2, site class C corresponds to weighted average SPT N-value greater than 50 bpf.

The spectral accelerations (S_s, S_1, and PGA) and design earthquake magnitude (M_w) listed in Table 4-2 are based on values at the USGS website: http://earthquake.usgs.gov/research/hazmaps/products_data/48_States/index.php. Site coefficients F_a and F_v are determined per IBC 2006 Table 1613.5.3(1) and (2), based on the site class, S_s, and S_1 values. Values in Table 4-1 correspond to ground motions with 2 percent probability of exceedance in 50 years (2475-year return period).

TABLE 4-1
Seismic Design Parameters
IBM East Fishkill, NY – LN2 Tank and Regenerative Thermal Oxidizer (RTO)

Design Parameter	Value
Site Class	C
Design Spectral acceleration for 0.2 sec period, S_S	0.224 g
Design Spectral acceleration for 1.0 sec period, S_1	0.076 g
Design Peak ground acceleration, PGA	0.12g
Site coefficient for 0.2 sec period, F_a	1.2 (site class C)
Site coefficient for 1.0 sec period, F_v	1.7 (site class C)
Design earthquake magnitude, M_w	6.1

4.3 Other Geotechnical Recommendations

Other design and construction recommendations are presented in this subsection, including those for retaining walls, lateral earth pressures, excavations, subgrade preparation, fills, and groundwater control.

4.3.1 Retaining Walls and Lateral Earth Pressures

Retaining walls for the proposed pads should be designed to resist lateral forces due to static and dynamic soil pressures, surface surcharges, and induced lateral loads from compaction of adjacent backfill. Either active or at-rest earth pressures will act against yielding or non-yielding walls, respectively.

The lateral earth pressure recommendations are presented in Table 4-2. These are based on dense compacted structural fill with a friction angle of at least 32 degrees, and a compacted unit weight of 125 pcf. The corresponding active and at-rest earth pressure coefficients (K_a and K_o) are 0.30 and 0.47, respectively.

TABLE 4-2
Recommended Lateral Earth Pressures
IBM East Fishkill, NY – LN2 Tank and Regenerative Thermal Oxidizer (RTO)

Condition	Active Pressure (Yielding), psf	At Rest Pressure (Non-Yielding), psf
Static Lateral Earth Pressure (Equivalent fluid pressure)	38 x D	59 x D
Lateral Pressure from Surface Surcharge (Uniform pressure over wall height)	0.30 x S_v	0.47 x S_v
Seismic Forces	11 x H (distributed as inverse triangle)	11 x H (distributed as uniform pressure over wall)

D = Depth from top of wall, ft

H = Height from base of wall, ft

S_v = Vertical surface surcharge near top of wall, psf (i.e., traffic or equipment loads)

Yielding walls are defined as those with expected lateral movement at the top of at least 0.001H

In addition, compaction-induced lateral pressures of 200 psf should be considered in the wall design. Based on observed borehole conditions, the groundwater elevation is below the bottom of the planned retaining walls. If the backfill behind the wall is fully drained, hydrostatic forces need not be considered in wall design.

A coefficient of friction of 0.5 at the base of the wall is recommended for evaluation of sliding resistance.

4.3.2 Excavations

Temporary excavation slopes of 4 foot depth or greater will be required for construction of the wall below the frost depth, for removal of unsuitable subgrade materials, and for construction of retaining walls. Benching and/or shoring of excavation slopes must be performed in accordance with government regulations. Construction slopes should be frequently assessed for signs of instability; if such signs are observed, a geotechnical engineer should be consulted. Excavations should not be advanced below the foundation elevation of adjacent building B334 without further consultation with a geotechnical engineer. Rock blasting methods should not be used.

4.3.3 Subgrade Preparation

This section provides additional construction recommendations regarding subgrade preparation in soil and rock.

Subgrade in Soil

After removal of any topsoil or other deleterious material and rough excavation to the pad subgrade elevation, the subgrade should be rolled with a dynamic roller with a minimum total dynamic force of 40,000 pounds. The area should be rolled at least 10 times and observed to be in a non-yielding condition. Any unsuitable soils identified during compaction should be over-excavated and replaced with compacted structural backfill. Structural fill should then be placed up to the pad subgrade per Section 4.3.4.

In areas where fill will be added over the existing ground surface to form the pad subgrade (such as near the western corner of the RTO pad), the upper two-feet of existing soil should be excavated, the resulting excavation grade compacted, and structural fill placed and compacted to form the pad subgrade.

Subgrade in Rock

Rippable rock is defined as rock that can be ripped with common excavating equipment with a ripping-tooth attachment. Rippable rock should be treated as soil excavated to the planned pad subgrade elevation. If non-rippable (sound) rock is encountered above the planned pad subgrade elevation, excavation may be terminated at the top of non-rippable rock. In such cases, compacted structural backfill need not be placed below the foundation, unless the foundation may potentially be formed partially on soil and rock (see Section 4.1). Sound-rock subgrades should not be formed with slopes greater than 5H:1V; rather, horizontal benching is recommended. Rock blasting methods should not be used.

Due to the potential variations in subgrade conditions at different locations within the same pad (i.e., some on sound rock and others on weathered rock or soil), a geotechnical engineer should inspect and approve the foundation subgrade conditions prior to foundation construction to confirm that each foundation is in a non-yielding condition. Additional excavation of weathered soil and rock, beyond those recommended above, may be required based on the as-observed conditions during construction.

4.3.4 Fills

Structural fill is required below the equipment pads, as described in Section 4.1. Common fill may be used in other areas.

Structural Fill

Structural fill should be free of organic, frozen, or other deleterious material and conform to the gradation requirements outlined in Table 4-3. Structural fill should have a plasticity index (PI) no greater than 5.

Structural fill should be placed in loose lifts not exceeding 12 inches thick for self-propelled vibratory rollers and 8 inches for vibratory plate compactors. Structural fill placed within the bearing zone and below the pads should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D 1557, Method C. The bearing zone is defined below 1H:1V lines drawn outward from the footing edges.

TABLE 4-3
Structural Fill Gradation Requirements
IBM East Fishkill, NY – LN2 Tank and Regenerative Thermal Oxidizer (RTO)

Sieve Size	Percent Passing by Weight
8-inch [1]	100
3-inch	70 - 100
3/4-inch	45 - 95
No. 4	30 - 90
No. 10	25 - 80
No. 40	10 - 50
No. 200	0 - 12

[1] Three-inch maximum particle size within 12 inches of slab grade

Common Fill

Common fill should consist of mineral soil free from frozen soil, debris, organic, or other deleterious material. Common fill should have a plasticity index (PI) no greater than 10. The excavated soil is suitable for re-use as common fill provided it can be compacted. Topsoil can be selectively used as common fill in landscape areas only.

Common fill imported from off-site should have a maximum particle size of 8 inches and have no more than 30 percent by weight passing the No. 200 sieve. Common fill may be used to achieve finish grades outside building footprints and footing bearing zones.

Common fill should be placed in the lift thicknesses listed above for structural fill, and compacted to at least 95 percent of the maximum dry density as determined by ASTM D 1557, Method C, below pavements and sidewalks and 90 percent in landscape areas.

4.3.5 Groundwater Control and Impact of Weather on Earthwork

Groundwater was not observed during either hand digging or drilling and sampling, so it is not anticipated that significant construction dewatering will be required. However, seasonal data on groundwater table variations is not currently available for the Building 334 area; therefore, some surface dewatering may be required using conventional surface sumps and pumps.

Any over-excavation of unsuitable soils and replacement with compacted structural fill should be performed in the dry. Based on observed subsurface conditions, such work is not anticipated to be required below the water table. However, if isolated areas are found to require such treatment below the water table during construction, and dewatering cannot be maintained with pumps within the excavation, a geotechnical engineer should be consulted to develop a dewatering plan.

Limitations

This report has been prepared in accordance with generally-accepted engineering practices. It is intended for the exclusive use of the IBM Corporation. No other warranty, express or implied, is made.

Information contained in this report is limited, based on data obtained from borings that show subsurface conditions only at the specific location and time investigated, and only to the depth penetrated. Subsurface conditions and groundwater levels at other locations or depths may differ from conditions occurring at investigated locations. The passage of time may also result in changed conditions at these locations. If, prior to or during construction, subsurface conditions are found to vary from those described in this report, recommendations presented in this report should be re-evaluated.

This report includes both factual and interpreted information. Factual information is defined as objective data based on direct observations, such as boring logs and in-situ testing results. Interpreted information or geotechnical engineering interpretation is based on engineering judgment, correlation, or extrapolation from factual information. No warranty, explicit or implied, is provided for interpreted information.

References

International Code Council, Inc. (2006). *2006 International Building Code.*

US Army Corps of Engineers Technical Manual NO.5-809-12, *"Concrete Floor Slabs on Grade Subjected to Heavy Loads"*, August 1987.

US Army Corps of Engineers Publication EM 1110-1-1905, *"Bearing Capacity of Soils."*, March 1994.

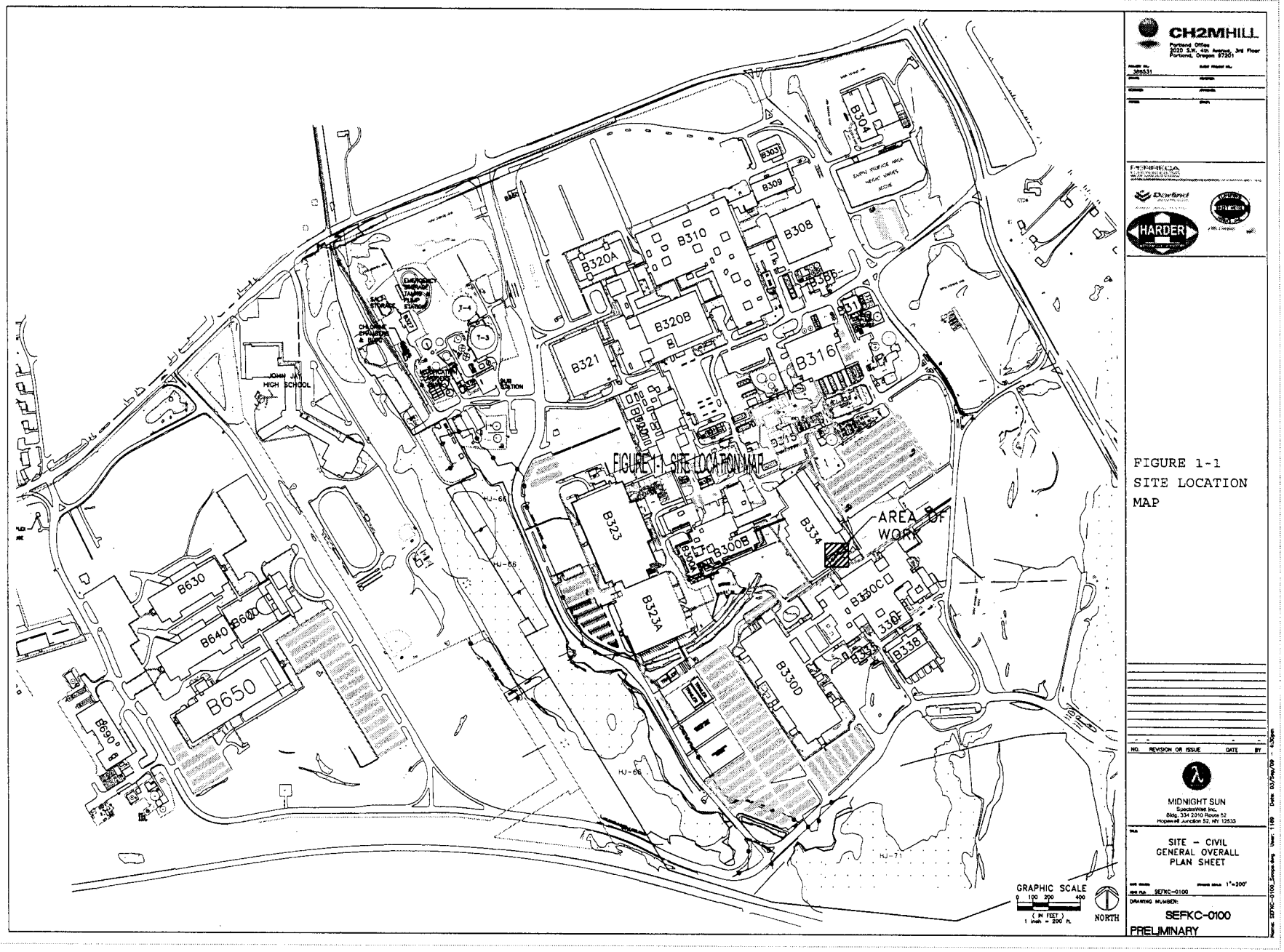


FIGURE 1-1
SITE LOCATION
MAP

CH2MHILL
Portland Office
2020 S.W. 4th Avenue, 3rd Floor
Portland, Oregon 97201

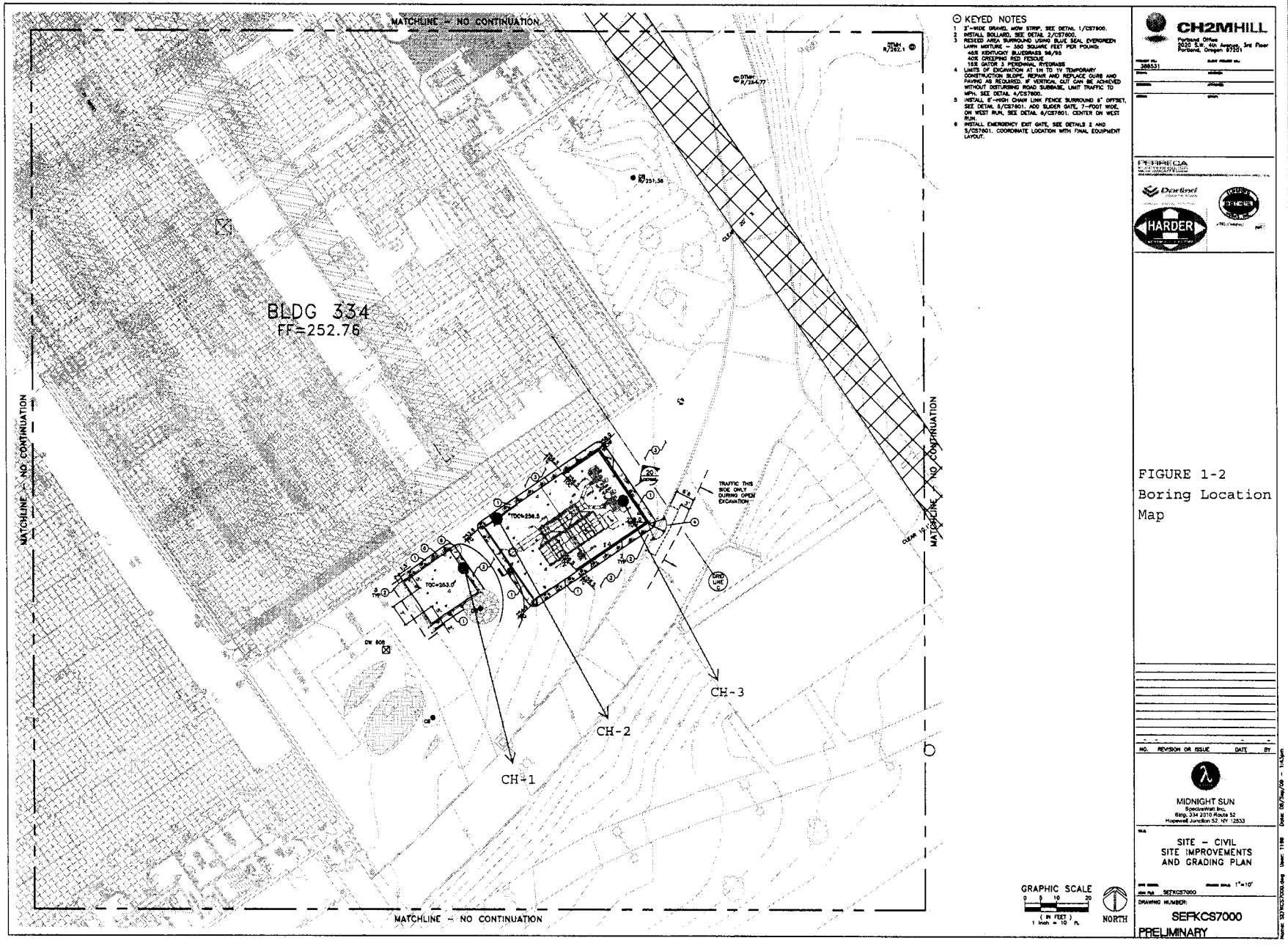
HARDER

NO. REVISION OR ISSUE DATE BY

MIDNIGHT SUN
SpectraWest Inc.
Bldg. 334 2010 Route 52
Hopewell Junction 52, NY 12533

SITE - CIVIL
GENERAL OVERALL
PLAN SHEET

DRAWING NUMBER:
SEFKC-0100
PRELIMINARY



CH2MHILL
Portland Office
2020 S.W. 4th Avenue, 3rd Floor
Portland, Oregon 97201

PREPARED

HARDER

FIGURE 1-2
Boring Location Map

NO. REVISION OR ISSUE DATE BY

MIDNIGHT SUN
Specialties Inc.
Bldg. 334 2010 Route 52
Hopewell Junction 52, NY 12533

SITE – CIVIL
SITE IMPROVEMENTS AND GRADING PLAN

DRAWING NUMBER:
SEFKCS7000
PRELIMINARY

Appendix A
CH2M HILL Boring Logs

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
388531	CH-1 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : LN2 Tank and RTO South of Building B334, East Fishkill, NY LOCATION : Southeast of Building B334

ELEVATION : Approximately 253 ft DRILLING CONTRACTOR : Soil Testing Inc.

DRILLING EQUIPMENT AND METHOD : Rubber Tired,Truck Mounted Rig, Diedrich D-50, 4 1/4" HSA; 140# Autom. Hammer ORIENTATION : Vertical

WATER LEVELS : ▼ Not Encountered START : 8/5/09 09:10 END : 8/6/09 16:31 LOGGER : J. Sandoval

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
0.0					**Topsoil** 0-0.25' - Grass, roots and organics		On site at 8:00
					Sandy Gravel(GW) 0.25-4' - Observations from hand-digging: brown, moist, no plasticity, several quartz particles of size up to 3"; gravel maximum size is 5" and subrounded; a few chunks of silt that crumble with slight finger pressure; no clay is observed, fines are about 30%.		Crew arrived at 9:00 and started with soft-digging activities in the three boreholes, from 0ft to 4ft
							PID=0 from 0ft to 4ft
							Two environmental samples were taken at 4ft, by a William F. Cosulich and Assoc. engineer
					3.8' - Auger refusal at 4ft, right after hand-digging. No recovery after 4ft		Driller tried to advance with auger, but it does not penetrate more than 1": top of rock
					Begin Rock Coring at 4.0 ft bgs See the next sheet for the rock core log		
5							
10							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
388531	CH-1	SHEET 2 OF 2

ROCK CORE LOG

PROJECT : LN2 Tank and RTO South of Building B334, East Fishkill, NY LOCATION : Southeast of Building B334

ELEVATION : Approximately 253 ft DRILLING CONTRACTOR : Soil Testing Inc.

CORING EQUIPMENT AND METHOD : Rubber Tired,Truck Mounted Rig, Diedrich D-50, NW Wireline, Double Tube Core Barrel, Diam. Bit ORIENTATION : Vertical

WATER LEVELS : Not Encountered START : 8/5/09 09:10 END : 8/6/09 16:31 LOGGER : J. Sandoval

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
4.0			2	4-9' - Joint, 30 deg and 40 deg, smooth, undulating, light gray and white, very close, Jr=1.5-2; Ja=1		**Shale** 4-9' - gray and bluish, strong (R4), hard, no apparent bedding, very fine sand, angular, slightly weathered to fresh, moderately to slightly fractured, smooth texture, very few quartz inclusions	Started coring on 8/6/09 Crew does not have water available on site, so it has to be obtained from outside IBM facilities Start run #1 at 3:40pm 1st ft: 4 min/ft 2nd ft: 5 min/ft 3rd ft: 5 min/ft 4th ft: 2 min/ft 5th ft: 2 min/ft Finish run #1 at 4:00pm Loss of circulation at 7ft
5			4				
	R1-NW 5 ft 80%	40	2				
			3				
			N/R				
9.0			>10	9-10' - Clay seam, <0.01 clay infilling, with rock chunks		**Shale** 9-14' - gray and bluish, strong (R4), hard, no apparent bedding, very fine sand, angular, slightly weathered to fresh, moderately to slightly fractured, smooth texture, very few quartz inclusions	Start run #2 at 3:40pm 1st ft: 2 min/ft 2nd ft: 4 min/ft 3rd ft: 5 min/ft 4th ft: 5 min/ft 5th ft: 5 min/ft Finish run #2 at 4:31pm No loss of circulation
10			1	10-14' - Joint, 40 deg, smooth, undulating, light gray and white, only one discontinuity at ~10.5ft. An entire rock core from ~10.5ft to the end of the run			
	R2-NW 5 ft 100%	80	0				UCS=15,150 psi
			0				
			0				Borehole is grouted upon completion
14.0						Bottom of Boring at 14.0 ft bgs on	

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
388531	CH-2 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : LN2 Tank and RTO South of Building B334, East Fishkill, NY LOCATION : Southeast of Building B334

ELEVATION : Approximately 255 ft DRILLING CONTRACTOR : Soil Testing Inc.

DRILLING EQUIPMENT AND METHOD : Rubber Tired Truck Mounted Rig, Diedrich D-50, 4 1/4" HSA; 140# Autom. Hammer ORIENTATION : Vertical

WATER LEVELS : ▼ Not Encountered START : 8/5/09 09:25 END : 8/6/09 11:50 LOGGER : J. Sandoval

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
0.0					**Topsoil** 0-0.33' - Roots and grass		Started soft digging at 9:30am
					Sandy Gravel(GW) 0.33-4' - Observations from hand-digging: brown, moist, no plasticity, several quartz particles; gravel maximum size is 4" and subrounded; a few chunks of silt that crumble with slight finger pressure; no clay is observed, fines are about 20%		PID=0 from 0ft to 4ft Environmental sample was taken at 4ft, by a William F. Cosulich and Assoc. engineer
4.0					4-6' - Same as above except very dense, with pieces of crushed rock fragments		Constant loud chatter PID=0 from 4ft to 6ft
5		8.0	SS-1	10-32-46-50/2" (78)			No geotech sample was collected: low recovery Auger refusal at 6ft
					Begin Rock Coring at 6.0 ft bgs See the next sheet for the rock core log		
10							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
388531	CH-2 SHEET 2 OF 2

ROCK CORE LOG

PROJECT : LN2 Tank and RTO South of Building B334, East Fishkill, NY LOCATION : Southeast of Building B334

ELEVATION : Approximately 255 ft DRILLING CONTRACTOR : Soil Testing Inc.

CORING EQUIPMENT AND METHOD : Rubber Tired Truck Mounted Rig, Diedrich D-50, NW Wireline, Double Tube Core Barrel, Diam. Bit ORIENTATION : Vertical

WATER LEVELS : Not Encountered START : 8/5/09 09:25 END : 8/6/09 11:50 LOGGER : J. Sandoval

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
6.0			4	6-9' - Mechanical break, vertical, rough, undulating, white and light gray, very few intact cores are retrieved, extremely to moderately fractured		**Shale** 6-11' - gray and bluish, medium strong to strong (R3 to R4), hard, no apparent bedding, very fine sand, angular, moderately weathered to slightly weathered, extremely to moderately fractured, smooth texture, very few quartz inclusions	Started coring on 8/6/09 UCS=18,850 psi Crew does not have water available on site, so it has to be obtained from outside IBM facilities Start run #1 at 9:45am 1st ft: 6 min/ft 2nd ft: 6 min/ft 3rd ft: 4 min/ft 4th ft: 4 min/ft 5th ft: 3 min/ft Loss of circulation at 8ft Stop to bring more water after loss of circulation Finish run #1 at 10:20am
			>10				
	R1-NW 5 ft 80%	23	>10				
			1	9-11' - Joint, 35 deg, slickensided, stepped, white and light gray, sound, Jr=1.5-2; Ja=1			
10			1				
11.0			0	11-16' - Joint, 40 deg, slickensided, stepped, white and light gray, few cracks are visible in walls of cores;slightly fractured to sound rock; Jr=1.5-2; Ja=1		**Shale** 11-16' - gray and bluish, medium strong to strong (R3 to R4), hard, no apparent bedding, very fine sand, angular, moderately weathered to slightly weathered, moderately to slightly fractured, smooth texture, very few quartz inclusions	Start run #2 at 11:30am 1st ft: 4 min/ft 2nd ft: 5 min/ft 3rd ft: 3 min/ft 4th ft: 3 min/ft 5th ft: 3 min/ft Finish run #2 at 11:50am No loss of circulation
			1				
	R2-NW 5 ft 80%	70	2				
			0				
15			0				Borehole is grouted upon completion
16.0							
						Bottom of Boring at 16.0 ft bgs on	

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
388531	CH-3 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : LN2 Tank and RTO South of Building B334, East Fishkill, NY LOCATION : Southeast of Building B334

ELEVATION : Approximately 257 ft DRILLING CONTRACTOR : Soil Testing Inc.

DRILLING EQUIPMENT AND METHOD : Rubber Tired Truck Mounted Rig, Diedrich D-50, 4 1/4" HSA; 140# Autom. Hammer ORIENTATION : Vertical

WATER LEVELS : ▼ Not Encountered START : 8/5/09 10:01 END : 8/6/09 08:29 LOGGER : J. Sandoval

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
0.0					**Topsoil** 0-0.33' - Grass, roots and organics		Started soft digging at 10:01am
					Well Graded Sand(SW) 0.33-4' - Observations from hand-digging: brown, moist, no plasticity, several quartz particles of size up to 2"; gravel maximum size is 4" and subrounded; a few chunks of silt that crumble with slight finger pressure; no clay is observed, fines are about 20%		PID=0 from 0ft to 4ft
4.0							Environmental sample was taken at 4ft, by a William F. Cosulich and Assoc. engineer
5	18.0	SS-1	13-24-29-23 (53)		**Well Graded Sand(SW)** 4-11' - brown and gray, dry, very dense, nonplastic, small amount of fines, subangular particles, mica and quartz, maximum size: 3/4", weak cementation on chunks of fines		Gravel: 41% Sand: 55% Fines: 4% pH: 6.82 Constant loud chatter PID=0 from 4ft to 6ft
6.0	18.0	SS-2	21-24-26-21 (50)		6' - few laminar mica particles		Constant loud chatter PID=0
8.0	18.0	SS-3	33-30-32-25 (62)				Constant loud chatter PID=0
10 10.0	12.0	SS-4	27-57/3 (57/3")		**(SW-SM)** 10' - with crushed rock, black and white stains		Gravel: 31% Sand: 59% Fines: 10% pH: 6.8 Constant loud chatter PID=0 Auger refusal at 11ft
					Begin Rock Coring at 11.0 ft bgs See the next sheet for the rock core log		
15							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
388531	CH-3 SHEET 2 OF 2

ROCK CORE LOG

PROJECT : LN2 Tank and RTO South of Building B334, East Fishkill, NY LOCATION : Southeast of Building B334

ELEVATION : Approximately 257 ft DRILLING CONTRACTOR : Soil Testing Inc.

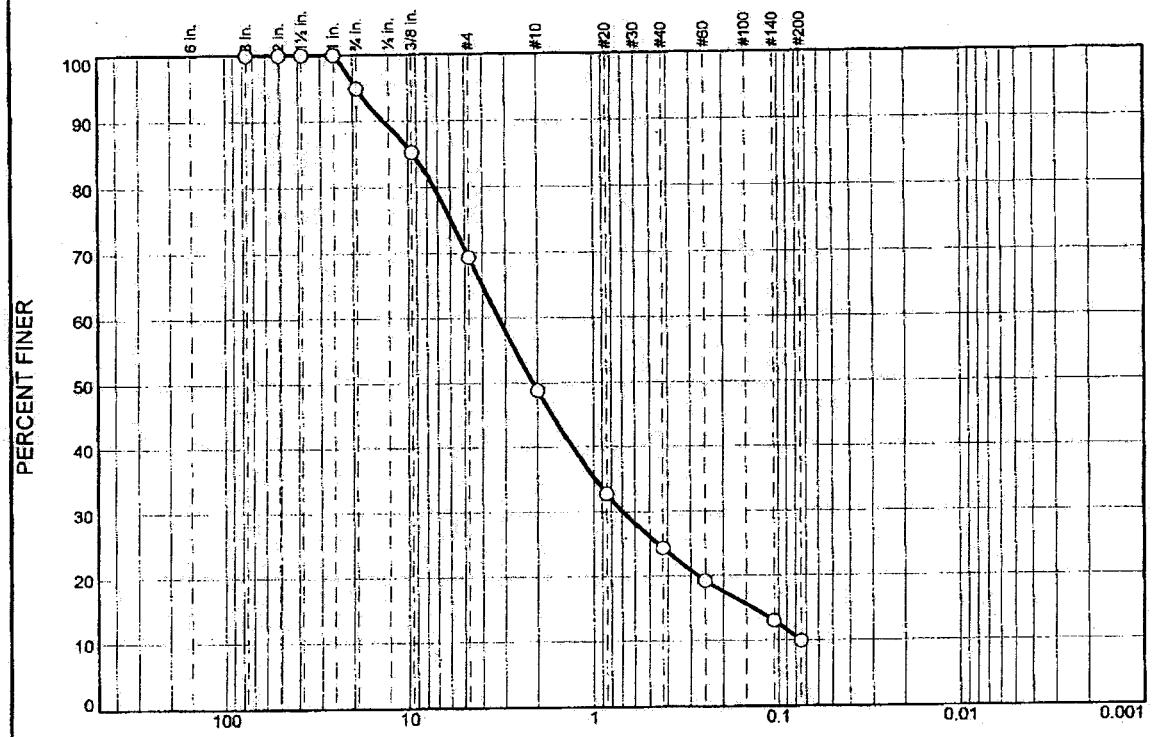
CORING EQUIPMENT AND METHOD : Rubber Tired Truck Mounted Rig, Diedrich D-50, NW Wireline, Double Tube Core Barrel, Diam. Bit ORIENTATION : Vertical

WATER LEVELS : Not Encountered START : 8/5/09 10:01 END : 8/6/09 08:29 LOGGER : J. Sandoval

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
	11.0		>10	11-16' - Joint, 30 deg, slickensided, stepped, light gray and white, Jr=1.5-2; Ja=1; extremely close		**Shale** 11-16' - gray and bluish, medium strong to strong (R3 to R4), hard, no apparent bedding, very fine sand, slightly weathered to fresh, moderately fractured	Started coring on 8/5/09 Start run #1 at 2:26pm 1st ft: 4 min/ft 2nd ft: 4 min/ft 3rd ft: 3 min/ft 4th ft: 3 min/ft 5th ft: 3 min/ft No loss of circulation Finish run #1 at 2:44pm Water tank has a leakage in the bottom and needs to be fixed or replaced UCS=3,750 psi Crew removes the remaining water in the tank, cleans site up and leaves the site at 4:30pm UCS=10,430 psi
			0				
	R1-NW 5 ft 100%	71	1				
			0				
15			3				
	16.0		1	16-18' - Joint, 30 deg, slickensided, stepped, light gray and white, Jr=1.5-2; Ja=1; extremely close		**Shale** 16-21' - gray and bluish, medium strong to strong (R3 to R4), hard, no apparent bedding, very fine sand, slightly weathered to fresh, moderately to slightly fractured	On 8/6/2009: Crew fills some containers with water for coring. The tank was not replaced for this job Start run #2 at 8:10am 1st ft: 4 min/ft 2nd ft: 3 min/ft 3rd ft: 3 min/ft 4th ft: 4 min/ft 5th ft: 4 min/ft Finish run #2 at 8:29am No loss of circulation
			3				
	R2-NW 5 ft 100%	70	2	18-19' - Mechanical break (2), 70 deg, slickensided, stepped, light gray and white			
			2	19-21' - Joint, 30 deg, slickensided, stepped, light gray and white, Jr=1.5-2; Ja=1; extremely close			
20			0				
	21.0					Bottom of Boring at 21.0 ft bgs on	Borehole is backfilled and grouted
25							

Appendix B
Laboratory Test Results

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	5	26	20	25	14	10	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	100		
1.5	100		
1	100		
.75	95		
.375	85		
#4	69		
#10	49		
#20	33		
#40	24		
#60	19		
#140	13		
#200	9.9		

* (no specification provided)

Material Description

Gray well-graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 9.3725 D_{60}= 3.2645 D_{50}= 2.1156
D_{30}= 0.6981 D_{15}= 0.1382 D_{10}= 0.0757
C_u= 43.10 C_c= 1.97

Classification

USCS= SW-SM AASHTO=

Remarks

Moisture content=4%
pH=6.82 at 72.6 F

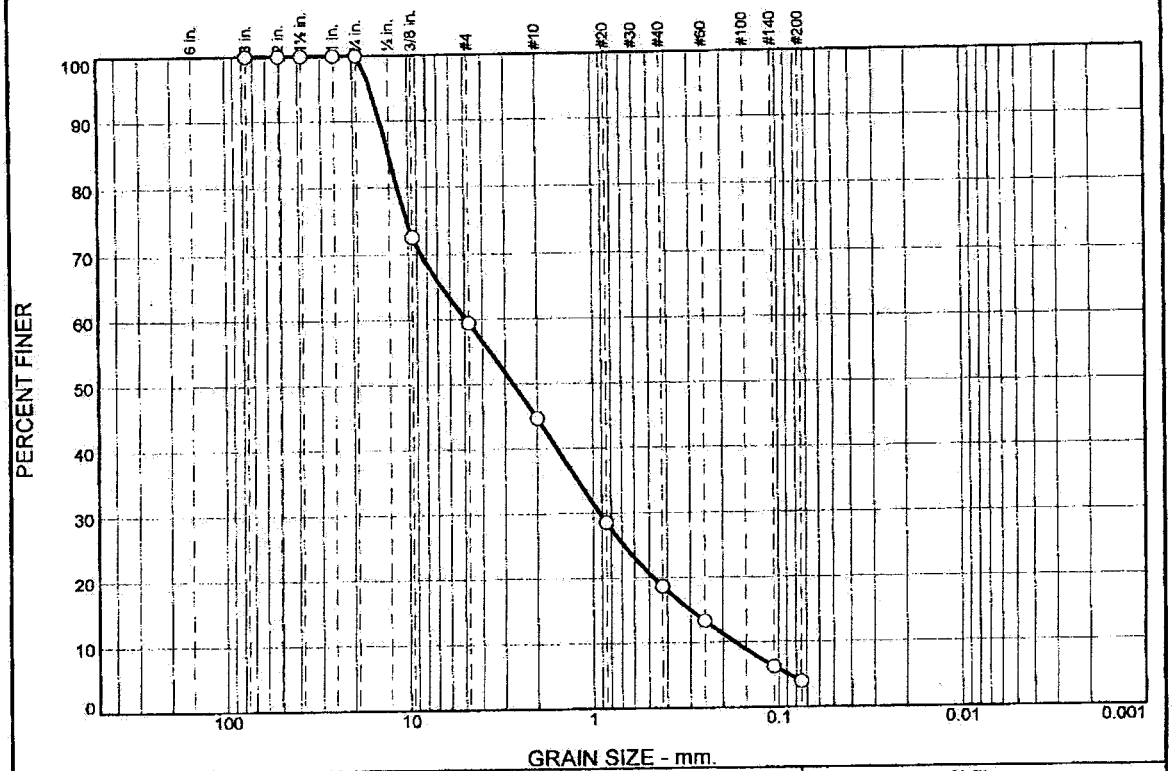
Sample Number: S-4
Source of Sample: CH-3 **Depth:** 10'-10'9" **Date:** 8-23-09

SKYLANDS TESTING, LLC
Sparta, NJ

Client: Soiltesting, Inc.
Project: IBM Fishkill, NY
Building B334
Project No: 09-024 **Plate**

Tested By: VRS **Checked By:** EJS

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	41	14	26	15	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	100		
1.5	100		
1	100		
.75	100		
.375	73		
#4	59		
#10	45		
#20	29		
#40	19		
#60	13		
#140	6		
#200	4.0		

* (no specification provided)

Material Description

Tan-gray well-graded sand with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.7416 D_{60}= 4.9248 D_{50}= 2.6976
D_{30}= 0.9233 D_{15}= 0.3017 D_{10}= 0.1728
C_u= 28.49 C_c= 1.00

Classification

USCS= SW AASHTO=

Remarks

Moisture content=2%
pH=6.80 at 72.8 F

Sample Number: S-1
Source of Sample: CH-3 **Depth:** 4.0'-6.0' **Date:** 08-23-09

SKYLANDS TESTING, LLC

Sparta, NJ

Client: Soiltesting, Inc.
Project: IBM Fishkill, NY
Building B334
Project No: 09-024 **Plate**

Tested By: VRS **Checked By:** EJS

Connecticut Materials Testing Lab, Inc.

7 Lexington Avenue, South Norwalk, CT 06854 (203) 838-6978 Fax (203) 831-8132

ROCK CORE REPORT

Client: Soiltesting, Inc
140 Oxford Rd
Oxford, CT 06478

Date of Test: 08/28/2009

Report No.: RC 01

Project: IBM Building 334
Fishkill, NY

Material: Shale Rock Core

Job No.: 09-049

Field Technician: Sampled by Client

Testing Designation: ASTM D2938 (discontinued in 2005)

Location: In-Lab

Test #	Location	Capped Length (l)	Diameter (d)	l/d	Correction Factor	Area (in x in)	Total Load (lbs)	Strength (psi)	Corrected Strength* (psi)
1	CH-1 NW-2	4.00	2.05	1.95	N/A	3.22	48,700	15,150	15,150
2	CH-2 NW-1	4.00	2.04	1.96	N/A	3.22	60,700	18,850	18,850
3	CH-3 NW-1	4.00	2.05	1.95	N/A	3.22	12,070	3,750	3,750
4	CH-3 NW-2	4.00	2.05	1.95	N/A	3.22	33,600	10,430	10,430

Remarks: Average Unit Weight of Samples: 177.0 lb/cu.ft

* the strenghts are reported to the nearest 10 psi when the diameter is measured to the nearest 0.01" and to the nearest 50 psi when the diameter is measured to the nearest 0.1"

Lab Technician Signature: *Salah Al-Babri*

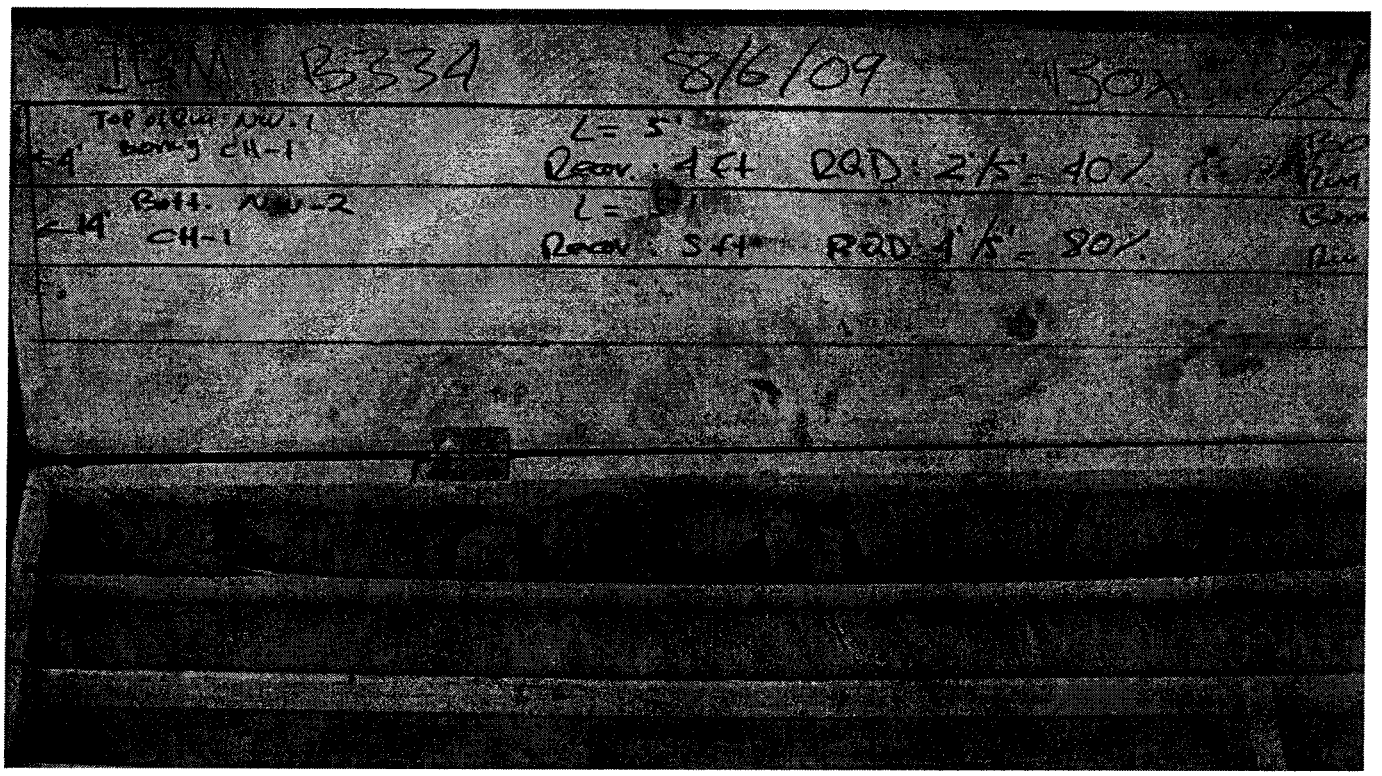
TEST SUMMARY

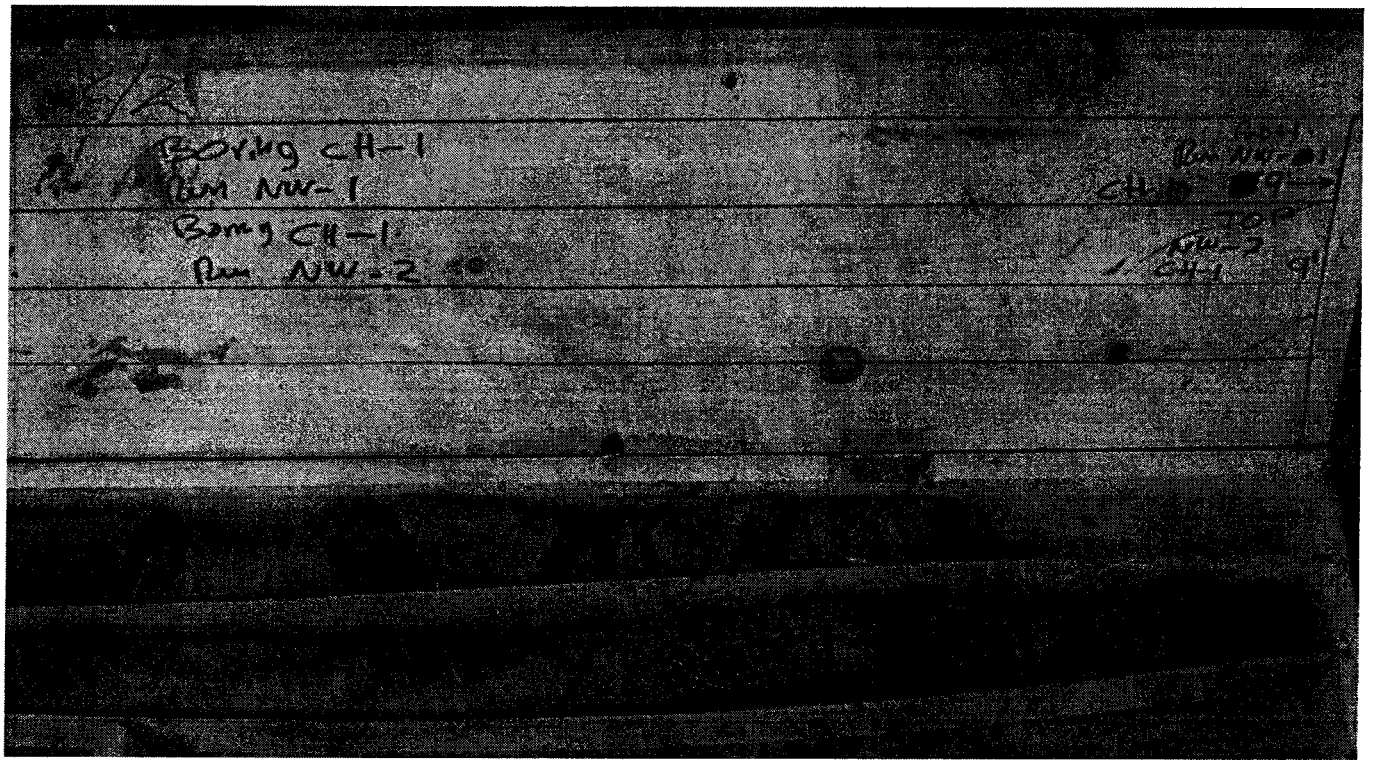
Project Soiltesting, Inc. – IBM BLDG B 334 (#G-8475) Job No. 09-024

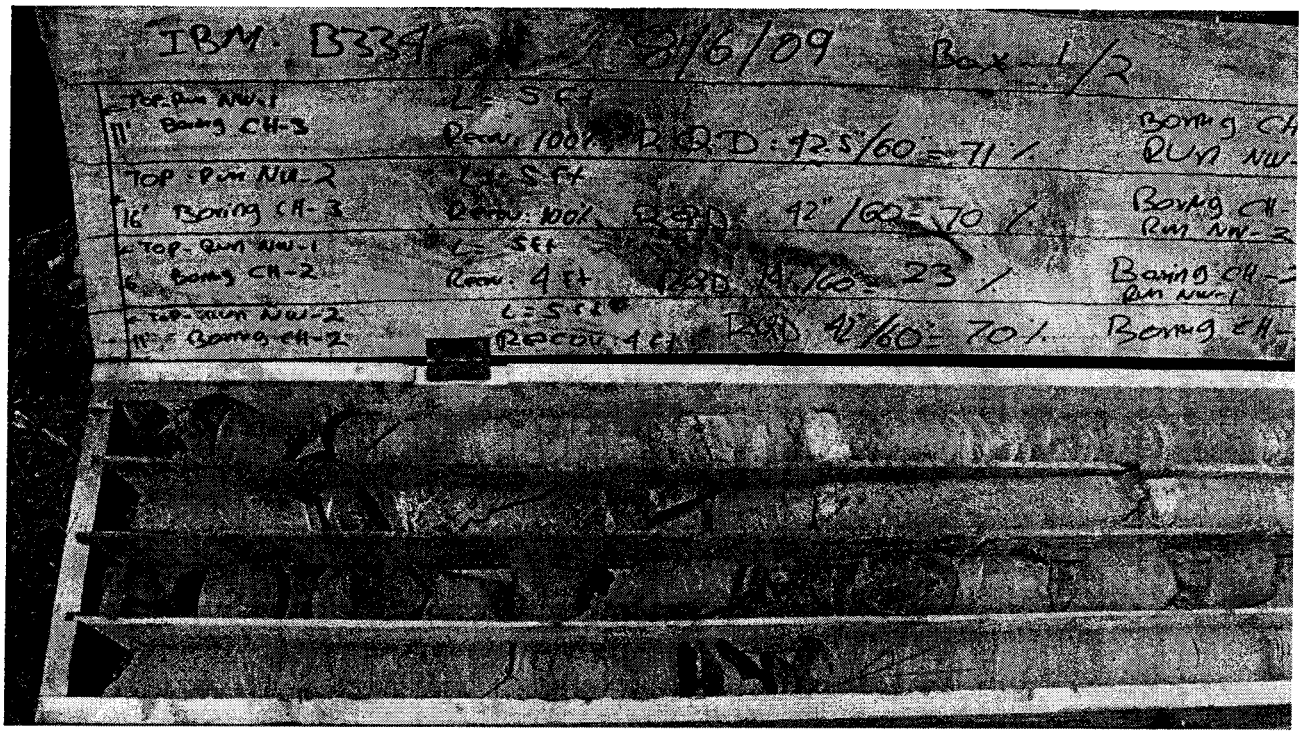
Location Fishkill, NY Date August 23, 2009

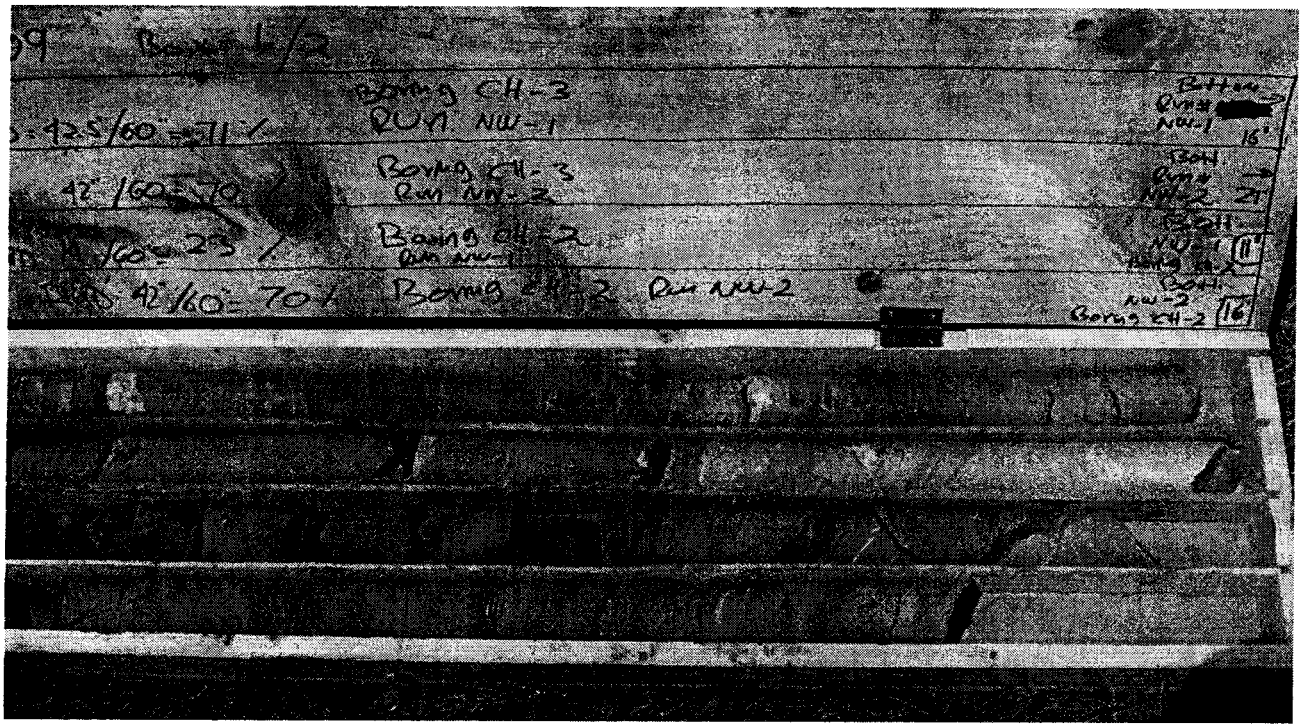
Boring	Sample	Depth	Moisture Content	pH	Note
CH-3	S-1	4'-6'	2%	6.8 at 72.8 F	Tan-gray well graded sand with gravel
CH-3	S-4	10'-10'9"	4%	6.82 at 72.6 F	Gray well-graded sand with silt and gravel

Appendix C
Photographs of Rock Cores

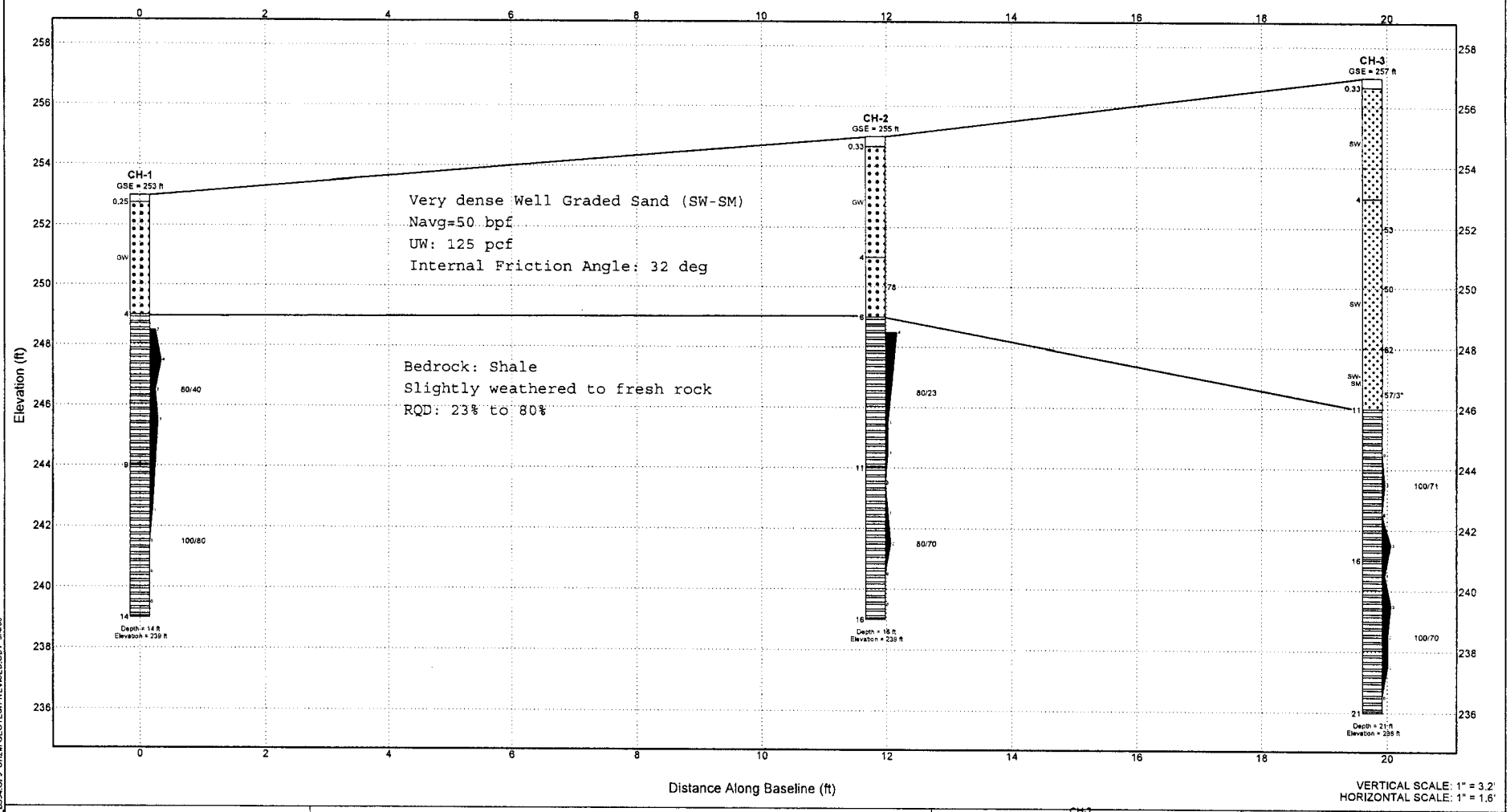

JLM B334 8/6/09 130x
Top of Run NW-1
Boring CH-1
L = 5'
Recov. 4 ft RQD 2 1/2' 40%
Bott. Run NW-2
CH-1
L =
Recov. 3 ft RQD 4 1/2 = 80%


Boring CH-1
Run NW-1
Boring CH-1
Run NW-2


IBM B339
2/6/09
Box 1/2
Boring CH-3
Run NW-1
Boring CH-3
Run NW-2
Boring CH-2
Run NW-1
Boring CH-2
Run NW-2


Box 1/2
Boring CH-3
Run NW-1
Boring CH-3
Run NW-2
Boring CH-2
Run NW-1
Boring CH-2
Run NW-2

Appendix D
Cross Section of Soil Profile



LITHOLOGY GRAPHICS

Well-Graded Gravel | Shale | Well-Graded Sand

CH2MHILL

CH-1, CH-2, CH-3

Cross Section of Soil Profile
LN2 Tank and RTO South of
Building B334
East Fishkill, NY

Project Number: 388531

11X17 STICK LOG COPY OF IBM_8334.GPJ CH2M GEOTECH-REVISED.GDT 9/4/09

ATTACHMENT 3

LABORATORY CHAIN OF CUSTODY FORMS

MITKEM LABORATORIES

A DIVISION OF SPECTRUM ANALYTICAL, INC. Featuring HANIBAL TECHNOLOGY

CHAIN OF CUSTODY RECORD

Page 1 of 1

(*) See notes below (*)

Special Handling:

- ☒ Standard TAT - 10 to 15 business days
- ☐ Rush TAT - Date Needed: _____
- All TATs subject to laboratory approval. Min. 24-hour notification needed for rushes.
- Samples disposed of after 60 days unless otherwise instructed.

Report To: Dvirka + Bartlucci
330 Crossways Park Drive
Woodbury, NY, 11797

Project Mgr.: Robbin Petrella

Invoice To: SAME

P.O. No.: _____ RQN: _____

Project No.: 2935-A

Site Name: IBM B1334

Location: IBM EFK State: NY

Sampler(s): BW

1=$Na_2S_2O_3$ 2=HCl 3=H_2SO_4 4=HNO_3 5=NaOH 6=Ascorbic Acid
7=CH_3OH 8=$NaHSO_4$ 9=_____ 10=_____

DW=Drinking Water GW=Groundwater WW=Wastewater
O=Oil SW=Surface Water SO=Soil SL=Sludge A=Air
X1=_____ X2=_____ X3=_____

G=Grab C=Composite

Lab Id:	Sample Id:	Date:	Time:	Type	Matrix	Preservative	Containers: # of VOA Vials	# of Amber Glass	# of Clear Glass	# of Plastic	Analyses: VOCs (EPA 8260B)	RCRA Metals (EPA 6010B / 7471A)	Hold samples until further notice	QA Reporting Notes: (check if needed)
H1482-01	CH-1 (4')	8/5/09	9:17am	G	SO				2		X	X		
02	CH-2 (4')	8/5/09	9:49am	G	SO				2		X	X		
03	CH-3 (4')	8/5/09	10:23am	G	SO				2		X	X		
BW	CH-1 (8')			G	SO				2		X	X		
04	CH-2 (4-6)	8/5/09	1:10 pm	G	SO				2		X	X	*	
H1482-05	CH-3 (8')	8/5/09	12:15 pm	G	SO				2		X	X	*	

(*) Please hold the (8') samples, and do not analyze until further notice (*)

(4-6')

☐ Provide MA DEP MCP CAM Report
☐ Provide CT DEP RCP Report

QA/QC Reporting Level
☐ Standard ☐ No QC
☐ Other _____

State specific reporting standards: _____

☒ Fax results when available to (516) 364-9045
☒ E-mail to Rpetrella@db-eng.com
EDD Format _____

Condition upon receipt: ☐ Iced ☐ Ambient ☐ °C 4°C

Relinquished by:	Received by:	Date:	Time:
BW	Fed Ex	8/5/09	5 pm
		8/6/09	9:35

0007

ATTACHMENT 4

TABULATED ANALYTICAL RESULTS

TABLE 1
INTERNATIONAL BUSINESS MACHINES CORPORATION
EAST FISHKILL FACILITY
PRE-CONSTRUCTION SOIL SAMPLING AND ANALYSIS CONCRETE PAD INSTALLATION (B/334)
SOIL SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

Sample Location	CH-1	CH-2	CH-3	CONTRACT REQUIRED DETECTION LIMITS	TAGM 4046 SOIL CLEANUP OBJECTIVES TO PROTECT GROUNDWATER	TAGM 3028 SOIL/SEDIMENT CONTAINED-IN ACTION LEVELS
Sample Depth (ft)	4'	4'	4'			
Date of Collection	8/5/2009	8/5/2009	8/5/2009			
Dilution Factor	1.0	1	1			
Percent Solids	90	94	93			
Units	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Acetone	U	U	U	5	110	7,800,000
Benzene	U	U	U	5	60	22,000
Bromodichloromethane	U	U	U	5	----	10,000
Bromoform	U	U	U	5	----	81,000
Bromomethane	U	U	U	5	----	110,000
2-Butanone (MEK)	U	U	U	5	300	47,000,000
Carbon Disulfide	U	U	U	5	2,700	7,800,000
Carbon Tetrachloride	U	U	U	5	600	4,900
Chlorobenzene	U	U	U	5	1,700	1,600,000
Chloroethane	U	U	U	5	1,900	49,000
Chloroform	U	U	U	5	300	100,000
Chloromethane	U	U	U	5	----	49,000
Dibromochloromethane	U	U	U	5	----	7,600
1,1-Dichloroethane	U	U	U	5	200	7,800,000
1,2-Dichloroethane	U	U	U	5	100	7,000
1,1-Dichloroethene	U	U	U	5	400	1,100
cis-1,2-Dichloroethene	U	U	U	5	----	780,000
trans-1,2-Dichloroethene	U	U	U	5	300	1,600,000
1,2-Dichrloropropane	U	U	U	5	----	9,400
cis-1,3-Dichloropropene	U	U	U	5	----	----
trans-1,3-Dichloropropene	U	U	U	5	----	----
Ethylbenzene	U	U	U	5	5,500	7,800,000
2-Hexanone	U	U	U	5	----	----
Methylene Chloride	U	U	U	5	100	85,000
4-Methyl-2-pentanone (MIBK)	U	U	U	5	1,000	6,300,000
Styrene	U	U	U	5	----	21,000
1,1,2,2-Tetrachloroethane	U	U	U	5	600	3,200
Tetrachloroethene	U	U	U	5	1,400	12,000
Toluene	U	U	U	5	1,500	16,000,000
1,1,1-Trichloroethane	U	U	U	5	760	7,000,000
1,1,2-Trichloroethane	U	U	U	5	----	11,000
Trichloroethene	U	U	U	5	700	58,000
Vinyl Chloride	U	U	U	5	120	340
o-Xylene	U	U	U	5	1,200	160,000,000
m+p-Xylene	U	U	U	5	1,200	160,000,000
Dichlorodifluoromethane	U	U	U	5	----	16,000,000
Iodomethane	U	U	U	5	----	----
Methyl tert-butyl ether	U	U	U	5	----	----
Vinyl acetate	U	U	U	5	----	78,000,000
2,2-Dichloropropane	U	U	U	5	----	----

Qualifiers:
U: Compound analyzed for but not detected.

Notes:
--- : Not established

TABLE 1
INTERNATIONAL BUSINESS MACHINES CORPORATION
EAST FISHKILL FACILITY
PRE-CONSTRUCTION SOIL SAMPLING AND ANALYSIS CONCRETE PAD INSTALLATION (B/334)
SOIL SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

Sample Location	CH-1	CH-2	CH-3	CONTRACT REQUIRED DETECTION LIMITS	TAGM 4046 SOIL CLEANUP OBJECTIVES TO PROTECT GROUNDWATER	TAGM 3028 SOIL/SEDIMENT CONTAINED-IN ACTION LEVELS
Sample Depth (ft)	4'	4'	4'			
Date of Collection	8/5/2009	8/5/2009	8/5/2009			
Dilution Factor	1.0	1	1			
Percent Solids	90	94	93			
Units	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Bromochloromethane	U	U	U	5	----	----
1,1-Dichloropropene	U	U	U	5	----	----
Dibromomethane	U	U	U	5	----	780,000
1,3-Dichloropropane	U	U	U	5	300	----
1,2-Dibromoethane	U	U	U	5	----	7,500,000
1,1,1,2-Tetrachloroethane	U	U	U	5	----	25,000
Isopropylbenzene	U	U	U	5	----	3,100,000
Bromobenzene	U	U	U	5	----	----
1,2,3-Trichloropropane	U	U	U	5	340	470,000
n-Propylbenzene	U	U	U	5	----	----
2-Chlorotoluene	U	U	U	5	----	1,600,000
1,3,5-Trimethylbenzene	U	U	U	5	----	----
4-Chlorotoluene	U	U	U	5	----	----
tert-Butylbenzene	U	U	U	5	----	----
1,2,4-Trimethylbenzene	U	U	U	5	----	----
sec-Butylbenzene	U	U	U	5	----	----
4-Isopropyltoluene	U	U	U	5	----	----
1,3-Dichlorobenzene	U	U	U	5	1,550	----
1,4-Dichlorobenzene	U	U	U	5	8,500	27,000
n-butylbenzene	U	U	U	5	----	----
1,2-Dichlorobenzene	U	U	U	5	7,900	7,800,000
1,2-Dibromo-3-chloropropane	U	U	U	5	----	29
1,2,4-Trichlorobenzene	U	U	U	5	3,400	780,000
Hexachlorobutadiene	U	U	U	5	----	8,200
1,2,3-Trichlorobenzene	U	U	U	5	----	----
Naphthalene	U	U	U	5	13,000	310,000

Qualifiers:
U: Compound analyzed for but not detected.

Notes:
--- : Not established

TABLE 2

INTERNATIONAL BUSINESS MACHINES CORPORATION

EAST FISHKILL FACILITY

PRE-CONSTRUCTION SOIL SAMPLING AND ANALYSIS CONCRETE PAD INSTALLATION (B/334)

SOIL SAMPLING RESULTS

METALS

Sample Location	CH-1	CH-2	CH-3	CONTRACT REQUIRED DETECTION LIMITS	PRACTICAL QUANTITATION LIMIT	TAGM 4046 EASTERN USA BACKGROUND LEVELS	TAGM 3028 SOIL/SEDIMENT CONTAINED-IN ACTION LEVELS
Sample Depth (ft)	4'	4'	4'				
Date of Collection	8/5/2009	8/5/2009	8/5/2009				
Dilution Factor	1.0	1.0	1.0				
Percent Solids	90	94	93				
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Arsenic	4.4	4.6	4.5	5	1.00	3-12 **	0.4
Barium	21.6 J	19.7 J	27.7 J	5	2.00	15-600	5,500
Cadmium	0.22 B	0.26	0.27	5	0.500	0.1-1, (10***)	78
Chromium	7.5	8.9	11	5	1.00	1.5 - 40*, (50***)	78,000 (iii), 390 (VI)
Lead	8.4 J	11 J	12.1 J	5	5.00	200-500**	400
Mercury	0.022 B	0.024 B	0.018 B	5	0.0500	0.001 - 0.2	23
Selenium	U	U	U	5	1.00	0.1 - 3.9	390
Silver	U	U	U	5	1.00	----	390

Qualifiers:

U: Analyte analyzed for but not detected.

B: Analyte concentration is less than the CRDL, but greater than the IDL.

J: Estimated value.

Notes:

--- : Not established

* : New York State background

** : Background for metropolitan or suburban areas.

*** : Proposed revised criteria for cadmium and chromium in TAGM 4046 Appendix A.

: Value exceeds TAGM 3028 Contained-in Action level.

ATTACHMENT 5

DATA VALIDATION SHEETS

DATA VALIDATION CHECKLIST

Project Name:	IBM EFK
Project Number:	2935-A
Sample Date(s):	August 5, 2009
Sample Team:	BW
Matrix/Number of Samples:	Water/ 0 Soil/ 3 Field Duplicates/ 0 Trip Blanks / 0 Field Blanks/ 0
Analyzing Laboratory:	Mitkem Laboratories, Warwick, RI
Analyses:	Volatile organic compounds (VOCs), by USEPA method SW846 8260 Metals: RCRA by SW846 Method 6010 and mercury (Hg) by Method 7471

Laboratory Report No:	SH1482	Date: 8/21/2009

ANALYTICAL DATA PACKAGE DOCUMENTATION GENERAL INFORMATION

	Reported		Performance Acceptable		Not
	No	Yes	No	Yes	Required
1. Sample results		X		X	
2. Parameters analyzed		X		X	
3. Method of analysis		X		X	
4. Sample collection date		X		X	
5. Laboratory sample received date		X		X	
6. Sample analysis date		X		X	
7. Copy of chain-of-custody form signed by Lab sample custodian		X		X	
8. Narrative summary of QA or sample problems provided		X		X	

QA - quality assurance

Comments:

The data packages have been reviewed in accordance with the NYSDEC 6/00 ASP Quality Assurance/ Quality Control (QA/QC) requirements. A validation was conducted on the data package and any applicable qualification of the data was determined using the USEPA National Functional Guidelines of Organic Data Review, October 1999, or USEPA National Functional Guidelines of Inorganic Data Review, October 2004, method performance criteria, and Dvirka and Bartilucci Consulting Engineers, a Division of William F. Cosulich Associates, P.C. professional judgment. The qualification of data discussed within this data validation checklist did not impact the usability of the sample results.

Laboratory Report: SH1482
SAMPLE AND ANALYSIS LIST

Sample ID	Sample Collection Date	Matrix	Lab ID	Parent ID	Analysis				
					VOC	SVOC	PCB	RCRA Metals	Hg
CH-1 (4')	8/5/2009	S	H1482-01		X			X	X
CH-2 (4')	8/5/2009	S	H1482-02		X			X	X
CH-3 (4')	8/5/2009	S	H1482-03		X			X	X

ORGANIC ANALYSES
VOCS

	Reported		Performance Acceptable		Not
	No	Yes	No	Yes	Required
1. Holding times		X		X	
2. Blanks					
A. Method blanks		X		X	
B. Trip blanks					X
C. Field blanks					X
3. Laboratory Control Sample (LCS) %R		X		X	
4. LCS duplicate (LCSD) %R		X		X	
5. LCS/LCSD precision (RPD)		X		X	
6. Surrogate spike recoveries		X		X	
7. Instrument performance check		X		X	
8. Internal standard retention times and areas		X		X	
9. Initial calibration RRF's and %RSD's		X		X	
10. Continuing calibration RRF's and %D's		X		X	
11. Transcriptions – quant report vs. Form I		X		X	
12. Tentatively Identified Compounds (TICs)		X		X	
13. Field duplicates RPD					X

VOCs –volatile organic compounds
%R - percent recovery
%D - percent difference
%RSD - percent relative standard deviation
RRF - relative response factor
RPD - relative percent difference

Comments:
Performance was acceptable.

INORGANIC ANALYSES
METALS

	Reported		Performance Acceptable		Not
	No	Yes	No	Yes	Required
1. Holding times		X			
2. Blanks					
A. Preparation and calibration blanks		X		X	
B. Field blanks					X
3. Initial calibration verification %R		X	X		
4. Continuing calibration verification %R		X	X		
5. CRDL standard %R					X
6. Interference check sample %R		X		X	
7. Laboratory control sample %R		X		X	
8. Spike sample %R					X
9. Post digestive spike sample %R					X
10. Duplicate RPD					X
11. Serial dilution check %D		X	X		
12. Total verse dissolved results					X
13. Field duplicates RPD					X

%R - percent recovery %D - percent difference RPD - relative percent difference

Comments:
Performance was acceptable with the following exceptions:

2A. Silver was detected in the preparation blank and at less ten times the concentration in CH-1, CH-2 and CH-3. Silver was qualified as non-detect (U) in the associated samples.

11. The barium and lead %Ds were above the QC limit of 10 % for the serial dilution check sample associated with CH-1, CH-2 and CH-3. The above metals were qualified as estimated (J/UJ) in the associated samples.

DATA VALIDATION AND QUALIFICATION SUMMARY

Laboratory Report: SH1482

Sample ID	Analyte(s)	Qualifier	Reason(s)
VOCS			
Qualification of the data was not necessary.			
METALS			
CH-1, CH-2 and CH-3	Silver	U	Detected in preparation blank
CH-1, CH-2 and CH-3	Barium and lead	J	%D was above the QC limit of 10 % for the serial dilution check sample

VALIDATION PERFORMED BY & DATE:	Donna M. Brown 08/31/2009
VALIDATION PERFORMED BY SIGNATURE: