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CC: amacdonald@golder.com; dwieneke@techcityny.com; ed.hinchey@erm.com; k...
Date: 4/28/2009 1:34 PM
Subject: Remaining SWMU Investigation Work Plans - Approvals

Hi Mike,

The Department has reviewed, and is approving via this email, the following Draft RFI Work Plans for IBM's proposed investigations at the TechCity/Former IBM Kingston Site:

RCRA Facility Investigation Work Plan Solid Waste Management Unit V: Portions of the B005 Plume

RCRA Facility Investigation Work Plan Solid Waste Management Unit G: Former Waste PCE Tank

RCRA Facility Investigation Work Plan Solid Waste Management Unit AB: Former B001 TCA Recovery Unit, and

RCRA Facility Investigation Work Plan Solid Waste Management Unit M: Portions of the Industrial Waste Sewer Lines

The **Triangle Plume Area Work Plan** (as amended) was previously approved.

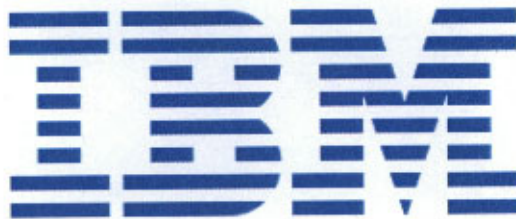
The proposed work in these additional areas may proceed as site access and conditions allow. Please keep the Department informed of schedule. I or other agency staff would like to have an opportunity to oversee some portions of these investigations.

If you have any questions at all, or if there are any changes necessary to these Work Plans, please contact me.

Regards,

Gary

Gary Casper
Engineering Geologist / Project Manager



**RCRA FACILITY INVESTIGATION WORK PLAN
SOLID WASTE MANAGEMENT UNIT G:
FORMER WASTE PCE TANK
FORMER IBM KINGSTON FACILITY**

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TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
1.0 INTRODUCTION	1
1.1 Background.....	1
1.2 Purpose	2
2.0 CONCEPTUAL SITE MODEL	4
2.1 Generalized Geology	4
2.2 Generalized Hydrogeology	5
2.3 Nature and Extent of Site Groundwater Contamination	6
2.4 SWMU-G.....	7
3.0 INVESTIGATION SCOPE OF WORK.....	9
3.1 Refinement of Conceptual Site Model.....	9
3.2 MIP/EC Investigation	10
3.3 Soil Sampling	12
3.4 Groundwater Sampling	12
4.0 SCHEDULE AND REPORTING	14
5.0 REFERENCES	15

LIST OF TABLES

Table 1	SWMU-G: Former Waste PCE Tank Sampling Schedule
Table 2	SWMU-G: Former Waste PCE Tank Sampling Schedule Sampling Constituent List

LIST OF FIGURES

Figure 1	Site Location Map
Figure 2	Site Layout and Investigation Area Map
Figure 3	Monitoring Well Network and Generalized VOC Plume Area Map
Figure 4	Generalized PCE Groundwater Plume in the SWMU-G Area
Figure 5	Proposed MIP/EC Boring and Confirmatory Sampling Locations

LIST OF APPENDICES

Appendix A	Geologic Cross Section in the Vicinity of SWMU-G
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1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this RCRA Facility Investigation Work Plan (RFIWP) on behalf of International Business Machines Corporation (IBM) for Solid Waste Management Unit G: Former Waste PCE Tank (SWMU-G) at the former IBM Kingston Facility (Facility) located at 300 Enterprise Drive, Kingston, Ulster County, New York (see Figure 1).

This RFIWP describes the objectives and methods proposed to further assess soil and groundwater quality conditions in the vicinity of SWMU-G. The investigation approach includes the collection and analysis of real-time soil and groundwater quality data to allow for adjustment of the number, location, and depth of samples as the investigation proceeds. This “dynamic” work plan approach will allow for efficient assessment of Site conditions.

1.1 Background

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 2). The approximately 258-acre property was first developed by IBM from farmland during the 1950s. The primary activities included the manufacturing of electric typewriters and the development, manufacture and testing of computer systems and related components and technologies. IBM ceased operations at the Facility during mid-1990s. In 1998 IBM sold the Facility to AG Properties of Kingston, LLC and Ulster Business Complex, LLC, who renamed the site TechCity (Site) and subdivided the property into multiple parcels. The Site is currently owned and managed by TechCity Properties, Inc. (TechCity).

The portion of the Site located east of Enterprise Drive is referred to as the East Campus and includes the majority of the buildings associated with the Facility, many of which are vacant. The portion located west of Enterprise Drive was previously referred to as the West Campus and includes the Bank of America building (former IBM Facility Buildings B201, B202 and B203); a large parking area south and west of the Bank of America facility (Parcel 1); and generally undeveloped land further to the southwest (Parcel 2) and north (Parcel 3) of the Bank of America facility.

The Site is listed as a New York State Inactive Hazardous Waste Disposal Site (6 NYCRR Part 375) and Resource Conservation and Recovery Act (RCRA) Hazardous Waste Site. The Site is currently managed in compliance with the October 4, 1996 Hazardous Waste Management Permit #3-5154-00067/00090 (6 NYCRR Part 373) referenced herein as the RCRA Permit. The RCRA Permit requires post-closure care and monitoring of the closed Industrial Waste Sludge Lagoon (IWSL) and implementation of Corrective Measures for groundwater exhibiting concentrations of volatile organic compounds (VOCs) above New York State Groundwater Quality (6 NYCRR Part 703) Standards (NYSGWQS). IBM completed extensive RCRA Facility Investigations (RFIs) during the 1990s to delineate the occurrence and extent of VOCs in groundwater beneath the Site.

Corrective Measures implemented by IBM include operation and maintenance of a perimeter control system that intercepts the groundwater plume. The perimeter control system consists of a storm sewer system, an unsaturated portion of the surficial sand unit that underlies the Site, and a groundwater collection system (GWCS). IBM currently performs groundwater quality monitoring to evaluate the effectiveness of the perimeter control system. Annual monitoring reports are submitted to the New York State Department of Environmental Conservation (NYSDEC).

1.2 Purpose

Certain SWMUs were previously determined to be inaccessible as referenced in the RCRA Permit. As part of its Site redevelopment plans TechCity plans to decommission (i.e., gut) and/or demolish select buildings at the Site. These activities will make formerly inaccessible SWMUs accessible for further investigation. Therefore, this RFIWP has been prepared pursuant to Module III Condition E.5(c) of the RCRA permit, which describes the Corrective Action Requirements for the "Inaccessible" SWMUs, and Appendix III-B, "Guidance for a RCRA Facility Investigation," of the RCRA permit.

Specifically, SWMU-G will become accessible for further investigation following demolition of Building B005S (the concrete slab will remain). In accordance with the RCRA Permit, IBM will undertake a supplemental assessment to better define the nature and extent of soil and groundwater impacts in the vicinity of SWMU-G and to evaluate whether additional Corrective Measures can be effectively implemented to reduce or prevent further migration of VOC-impacted groundwater.

This RFIWP outlines a proposed scope of work to meet the following objectives:

- Evaluate whether soil and/or groundwater conditions in the immediate SWMU-G area represent a continuing source of VOC impacts to Site groundwater;
- Better define the nature and extent of VOC-impacted groundwater downgradient of SWMU-G; and
- Obtain preliminary water quality, geologic and hydrogeologic information to support an evaluation of potential additional Corrective Measures, if appropriate.

Section 2.0 of this RFIWP provides a description of the Site geology and hydrogeology and a summary of the nature and extent of Site-wide groundwater impacts, including the immediate vicinity of SWMU-G. Section 3.0 outlines the proposed supplemental assessment activities including field investigation and sampling techniques and procedures. Section 4.0 describes the proposed schedule and reporting activities.

As required by the RCRA Permit, the following RFI Management Plans have been prepared and will be followed during the performance of this RFIWP:

- **Project Management Plan** - includes a description of the project management approach, the Project Team Organization Chart and the proposed project schedule;
- **Data Management Plan** - includes a description of the process by which investigation data will be documented, tracked and presented;
- **Quality Assurance Project Plan (QAPP)** - includes a description of the data quality objectives; sampling and field measurement standard operating procedures (SOPs); and sample analysis procedures;
- **Health and Safety Plan (HASP)** - includes the health and safety procedures that will be followed during implementation of the RFIWP ; and
- **Community Relations Plan** - includes a description of how information collected during the performance of the RFIWP will be disseminated to involved stakeholders.

These RFI Management Plans are provided in a separate document, which accompanies this RFIWP. Applicable portions of these RFI Management Plans are referenced as necessary in the RFIWP.

2.0 CONCEPTUAL SITE MODEL

This section presents the current understanding of the Conceptual Site Model (CSM) for both the entire Site and SWMU-G. The following description of geology and hydrogeology and the nature and extent of the VOC groundwater plume is based largely upon the findings of work completed by Groundwater Sciences Corporation (GSC), on behalf of IBM, including:

- IBM Kingston Phase I Environmental Site Assessment, June 5, 1995;
- RCRA Facility Assessments, Newly Identified Solid Waste Management Units, March 14, 1997;
- RCRA Facility Investigation Groundwater Plumes and Sources, March 14, 1997; and
- 2007 Annual Groundwater Monitoring Report, March 28, 2008.

A complete listing of the documents reviewed in the preparation of this RFIWP is provided in Section 5.

2.1 Generalized Geology

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 (i.e., ridge) 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 indicates 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 that is interpreted to be of lacustrine origin, with a thickness of zero (0) feet in one (1) area of the bedrock ridge where it is absent, to over 180 feet in the central portion of East Campus as determined by Site borings.

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). This surficial sand unit is pervasive across the Site and ranges in thickness from approximately six (6) feet in the area of the bedrock ridge to greater than 30 feet in the central portion of the East Campus. Notably, this surficial sand unit is unsaturated in the vicinity of the bedrock ridge. A transition zone between the varved silt and clay and surficial sand unit is present in certain areas throughout the Site, primarily where the sand unit is thickest, and consists of finer-grained silty sand deposits.

2.2 Generalized Hydrogeology

The varved silt and clay unit serves as an aquitard throughout most the Site, except in the vicinity of the bedrock high where it is not present. 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.

The estimated horizontal hydraulic conductivity of the surficial sand unit ranges from approximately 65 feet per day (ft/day) to 270 ft/day (i.e., 2.3×10^{-2} centimeters per second [cm/sec] to 9.5×10^{-2} cm/sec), with an average hydraulic conductivity of approximately 100 ft/day [2.3×10^{-2} cm/sec] (GSC, 1995). The horizontal hydraulic conductivity of the varved silt and clay unit has been estimated at approximately one (1) foot per day [3.5×10^{-4} cm/sec] (GSC, 1995). The vertical hydraulic conductivity of this unit is likely significantly lower than its horizontal hydraulic conductivity due to the horizontal bedding structure. The low vertical hydraulic conductivity and thickness of the unit support the designation of the varved silt and clay as an aquitard.

An east-west trending groundwater divide has been identified at the Site underlying Buildings B001, B002, B003, B004 and 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 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 0.2 ft/day to 0.8 ft/day.

Groundwater flow is significantly influenced by the presence of the perimeter control system (see Figure 2), which is composed of:

- A 42-inch diameter storm sewer pipe that extends to the south of Buildings B001 through B005, and then transects Enterprise Drive to the south of Building B021;
- An unsaturated portion of the surficial sand unit that intersects the 42-inch storm sewer south of Building B021, transects east across Enterprise Drive, and then continues toward the north portion of the Site near Old Neighborhood Road;
- The GWCS, which intersects the unsaturated portion of the surficial sand unit near Old Neighborhood Road, and extends along the western and northern perimeter of the North Parking Lot Area. The GWCS is comprised of a set of groundwater cut-off trenches. Water collected in the trenches is treated via air stripping; and
- A 60-inch diameter storm sewer pipe that intersects the GWCS and extends along the western portion of the North Parking Lot Area.

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

2.3 Nature and Extent of Site Groundwater Contamination

IBM has been collecting groundwater quality data at the Site since the late 1970s. The Facility monitoring well network is shown on Figure 3. Identified compounds of concern in the surficial sand aquifer include the following chlorinated VOCs: 1,1,1-trichloroethane [TCA], trichloroethene [TCE] and tetrachloroethene [PCE], and related degradation products (i.e., 1,1-dichloroethene [1,1-DCE], 1,1-dichloroethane [1,1-DCA] and 1,2-dichloroethene [1,2-DCE]). Other VOCs have been detected in groundwater, including carbon tetrachloride, Freon and petroleum hydrocarbons; however, concentrations of these VOCs are generally lower and less extensive than the chlorinated compounds.

Four (4) 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 TCE and TCA, and to a lesser degree 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 Buildings B001, B002, B003, B004 and B005S. Based on previous investigatory work, the primary source area appears to be the industrial waste sewer lines located north of Building B001 and northeast of Building B003. Concentrations of PCE originate in the northeastern portion of the plume, while TCE and TCA appear to originate in the central and western portions of the Site;

- The Building B005 Plume Area, located beneath Buildings B001, B002, B003, B004 and B005, is primarily composed of TCE and TCA. Based on historic groundwater quality sampling and soil vapor screening investigations, the plume is believed to have originated from activities in Buildings B001, B003, B004 and B005S. The primary source area appears to be the industrial waste sewer lines located in Building B003;
- An isolated PCE plume, located along the southern portion of Building B005, originated from a release from a PCE tank located in the southeastern corner of Building B005; and
- The Industrial Waste Treatment Facility (IWTF) Plume, located in the vicinity of the former IWTF, near Building B036.

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

2.4 SWMU-G

SWMU-G: Former Waste PCE Tank, includes a former waste PCE Tank and an associated former PCE supply tank, which were co-located in the southeast corner of Building 005S (see Figure 2). These tanks were installed circa 1980 within an original interior truck loading dock area composed of concrete block. Sand was emplaced around the tanks and a concrete slab was poured over the top of the tanks to serve as a containment vault.

The tanks were tested for tightness in November 1986 by filling the supply tank with PCE and the waste tank with water¹. Both tanks reportedly passed the leak test; however, the PCE supply tank was accidentally overfilled by as much as 50 gallons of PCE during the testing. The overfill from the PCE tank is postulated to be the source of the PCE impacted groundwater plume in the SWMU-G area. Both tanks were decommissioned in 1987, and then removed along with an estimated 45 cubic yards of PCE-impacted soil in 1989.

IBM began operating monitoring well MW-504S (see Figure 4) as groundwater recovery well in April 1987 following discovery of VOC-impacted groundwater downgradient of SWMU-G. Annual VOC mass removal rates during the early 1990s were estimated to be on the order of 2.6 to 3.6 pounds per year. Annual VOC mass removal rates in 2006 had decreased to approximately 0.05 pounds per year. Similarly, concentrations in MW-504S decreased by approximately three orders of magnitude since initially detected in 1987. Based on these data, IBM requested to shut

¹ The waste PCE tank was reportedly never used for the storage of waste PCE because of issues associated with solids settling. Additional detail regarding these tanks is referenced in the *IBM Kingston Phase I Environmental Site Assessment* June 5, 1995.

down recovery well MW-504S and convert it to a monitoring well in March 2007. NYSDEC approved this request.

The depth to the top the of the varved silt and clay unit south of Building B005S is relatively shallow. As such, the surficial sand unit in the area of SWMU-G ranges in thickness from approximately 10 to 16 feet. The silty sand transition zone was observed in certain borings (i.e., MW-250M) south of Building B005S. A geologic cross section previously prepared by IBM is presented in Appendix A, which depicts the general subsurface conditions in the area of SWMU-G.

The water table in this area of the Site has been encountered at a depth of approximately five (5) ft bgs. Groundwater flows toward the south-southwest where it is intercepted by the perimeter control system (42-inch sewer line) that ultimately discharges to storm sewer Outfall OF-3.

The interpreted extent of the PCE plume in the vicinity of SWMU-G is shown on Figure 4. The inferred presence of a groundwater plume emanating from SWMU-G is based on recent PCE detections below NYSGWQS in monitoring well MW-250S and low level detections (i.e., 14 to 16 ug/l) below NYSGWQS in MW-250S.

3.0 INVESTIGATION SCOPE OF WORK

As described above, the main objectives of this RFI are to:

- Evaluate whether soil and/or groundwater conditions in the immediate SWMU-G area represent a continuing source of VOC impacts to Site groundwater;
- Better define the nature and extent of VOC-impacted groundwater downgradient of SWMU-G; and
- Obtain preliminary water quality, geologic and hydrogeologic information to support an evaluation of potential additional Corrective Measures, if appropriate.

To meet these objectives, IBM has developed an investigation approach that includes the collection and analysis of real-time data to allow for field adjustments and ultimate selection of the number, location, and depth of laboratory-analyzed soil and groundwater samples. This approach will allow for the time-efficient assessment of Site conditions. As such, the scope and extent of investigations described below should be considered preliminary and subject to refinement during the course of the field investigation based on the judgement of the Project Team. IBM understands that, ultimately, all investigative work is subject to review, comment, and approval by NYSDEC.

The investigation scope of work includes the following tasks:

- Refinement of the CSM;
- A subsurface investigation consisting of a membrane interface probe/electrical conductivity (MIP/EC) investigation;
- Soil sampling; and
- Temporary well installation and groundwater sampling.

The following sections describe the scope of work for each of these tasks.

3.1 Refinement of Conceptual Site Model

To more fully-develop the existing CSM and to allow for refinement of the model as new field data are collected, IBM will develop a three-dimensional geologic and geochemical computer model of the Site using Environmental Visualization System/Mining Visualization System

(EVS/MVS[®], C-Tech Development Corporation, 2008) modeling software. Existing Site subsurface data will be input into EVS/MVS[®] to model the two near-surface hydrostratigraphic units (i.e., the surficial sand and the top of the varved silt and clay units) at the Site and in the vicinity of SWMU-G. Existing soil and groundwater chemistry data will also be input into the model to enhance the three-dimensional definition of the Site contamination sources and dissolved constituent plumes.

Data collected during this RFI will be incorporated into the EVS/MVS[®] as the field investigations progress to update the CSM. The updated CSM will be used as a decision making tool for the adjustment of drilling and sampling locations. EVS/MVS[®] is particularly useful for evaluation of MIP/EC data (see Section 3.2). At the completion of the field investigations, the model will be used to assess the vertical and horizontal extent of soil and groundwater impacts.

3.2 MIP/EC Investigation

A MIP/EC investigation will be conducted to better define the stratigraphy and distribution of VOCs in the subsurface in the vicinity of SWMU-G. MIP/EC is a direct-sensing tool that is advanced into the subsurface using direct-push equipment (e.g., GeoProbe[®]).

The MIP detects the presence of total VOCs in the vapor, sorbed, and dissolved phases. The permeable membrane, which is located on the side of the probe, is a thin film polymer impregnated into a stainless steel screen for support. The membrane is heated to approximately 100 to 120 degrees Celsius to accelerate the volatilization of any VOCs in the vicinity of the probe. A clean carrier gas is continuously swept behind the membrane, which creates a concentration gradient, thereby causing the volatilized VOCs to diffuse across the membrane into the carrier gas. The carrier gas then flows to separate gas detectors located at the surface, including a photo-ionization detector (PID) and an electron capture detector (ECD).

The PID is most effective at detecting aromatic hydrocarbons such as benzene, toluene, ethylbenzene, and xylene (BTEX compounds). The ECD is most effective at detecting chlorinated compounds such as PCE, TCE, TCA, and Freon. Information from the detectors is logged in real-time as the probe is advanced into the subsurface, thereby producing a continuous log of VOC concentration with depth.

The EC element measures soil conductivity with depth as the probe is driven into the ground. Conductivity data can be used to identify changes in lithology, the presence of contaminants, and/or other subsurface conditions (e.g. soil moisture) that change subsurface conductivity. The conductivity data are electronically logged along with depth and rate of penetration.

The MIP and EC tools are combined into one probe; therefore, simultaneous collection of both MIP and EC data are achieved in a single push and permit the field team to correlate stratigraphy and chemistry data. In addition, the real-time analysis of data allows the field team to modify and expand the depth and location of boreholes as needed to allow for a more rapid and complete assessment of the nature and extent of soil and groundwater impacts.

The general approach to the MIP/EC investigation will be to advance probes in a series of transects in the vicinity of SWMU-G, parallel and perpendicular to groundwater flow. A preliminary layout is presented in Figure 5. The MIP/EC investigation will be initiated in the immediate area of the former waste PCE tank to evaluate whether soil and/or groundwater conditions in this area represent a potential ongoing source of VOC impacts to Site groundwater. The investigation will then be advanced to the south and southeast to better assess the downgradient nature and extent of VOC impacts.

MIP/EC points will generally be advanced to the base of the surficial sand aquifer (approximately 10 to 16 ft bgs), through the silty sand transition zone (where present), to the top of the varved silt and clay unit, and then approximately one (1) to two (2) feet into the upper portion of the varved clay unit to confirm its presence. Data will be evaluated daily and probe locations and depths will be modified as appropriate based on the findings.

Before positioning the direct-push equipment for subsurface activities, each location will be pre-cleared to approximately five (5) ft bgs as an additional precaution to reduce the potential for hitting any subsurface obstructions. The MIP/EC investigation will be conducted in general accordance with American Society for Testing and Materials (ASTM) *Standard Practice for Direct Push Technology for Volatile Contaminant Logging with the Membrane Interface Probe (MIP) –D7532-07* and the SOP provided in the QAPP.

Given the nature of the surficial sand unit, it is anticipated that the boreholes will collapse upon removal of the probe. In the event the resultant boreholes remain open, the borehole will be

grouted with a cement-bentonite slurry following completion in accordance with the SOP provided in the QAPP. The majority of these borings are anticipated to be advanced through an asphalt parking lot. These areas will be patched with asphalt upon completion.

Decontamination of the down-hole direct push tools will be performed between boring locations in accordance with the SOP provided the QAPP. Investigation-derived waste (IDW) is not typically generated during the MIP/EC investigation activities. However, in the event IDW is generated, it will be managed in accordance with the SOP provided in the QAPP.

3.3 Soil Sampling

Using information collected during the MIP/EC investigation, IBM will identify locations for collection and analysis of soil samples. Soil samples will be targeted in zones of high MIP/EC response, transition areas between the surficial sand unit and silty sand transition zone, and at the top of the varved silt and clay unit. It is anticipated that up to four (4) soil boring locations will be selected for soil sampling. Multiple, discrete-depth samples may be collected at each location.

Borings for the collection of soil samples will be advanced using a direct-push rig. A piston sampler or dual-tube continuous sampler will be used to collect soil cores from the zones of interest in each boring, which will then be field-screened and lithologically logged by Golder staff. Samples will be collected from the soil core using an Encore® sampler (or equivalent) and submitted to the laboratory under appropriate chain-of-custody for analysis of VOCs using EPA Method 8260B as described in the QAPP. A subset of the soil samples will be analyzed for parameters such as natural oxygen demand, total organic carbon (TOC), grain size, and permeability for use in evaluating potential corrective measure technologies as warranted. Table 1 presents a summary of the proposed soil samples and analyses to be performed. Table 2 presents the parameters proposed for field and laboratory analysis.

3.4 Groundwater Sampling

IBM will select the location and depth of groundwater samples based on the results of the MIP/EC investigation. Targeted areas will include zones of high MIP response and/or zones of hydrogeologic interest (i.e., high flow zones or zones of distinct hydraulic contrast). These samples will be used to confirm the MIP results and better quantify constituent concentrations in groundwater.

Three (3) types of groundwater samples will be collected as follows:

- Up to four (4) groundwater grab samples will be collected using GeoProbe[®] techniques (i.e., SP-15-Sampler or DT-21-Profiler) to confirm MIP readings from specific zones in the boreholes advanced to collect the soil samples described in Section 3.3. These samples will be analyzed for VOCs using EPA Method 8260B. No purging or field parameter sampling will be performed prior to collecting these groundwater samples.
- Up to four (4) groundwater samples will be collected from temporary well casings installed at selected locations using a GeoProbe[®] drill rig. All samples will be analyzed for VOCs using EPA Method 8260B. Samples collected from two (2) locations (i.e., one (1) upgradient and one (1) downgradient of the perimeter control system) will also be analyzed for biogeochemical parameters (excluding metals) as listed in Table 2.
- Five (5) groundwater samples will be collected and analyzed for VOCs and biogeochemical parameters from existing Site monitoring wells in the vicinity of SWMU-G (i.e., MW-251S, MW-251M, MW-262S, MW-263 and MW-264S).

Groundwater purging (i.e., using low-flow procedures) and sampling will be performed in accordance with the SOPs provided in the QAPP. Table 1 presents a summary of the proposed groundwater samples and analyses to be performed. Table 2 presents the parameters proposed for field and laboratory analysis. The biogeochemical parameters will be used in the subsequent evaluation of potential corrective measures technologies as warranted.

4.0 SCHEDULE AND REPORTING

IBM will implement the scope of work outlined in this RFIWP within 30 days of either NYSDEC's approval of this RFIWP or TechCity's demolition Building B005, allowing unencumbered access, whichever occurs later. IBM anticipates that field activities can be completed within approximately four (4) to five (5) weeks, including mobilization time. All work will be subject to subcontractor availability.

Within 60 days of receipt of validated analytical data, IBM will submit an RFI Report to NYSDEC. The RFI Report will present the results of the investigations, including a description of implemented field activities and procedures, the data results, and conclusions and recommendations for additional field investigation or Corrective Measures evaluations.

5.0 REFERENCES

- Divney, Tung, Schwalbe, LLP., 2007, "Response to NYSDEC Comments for Post-Closure Permit Modification Former Industrial Waste Sludge Lagoon, Former IBM Kingston, New York Facility, DEC Permit Number 3-5154-0067/000090 EPA ID Number NYD001359694", 14 August, 2007.
- Groundwater Sciences Corporation, 1993 "Corrective Action For Solid Waste Management Units RCRA Facility Investigation Scope of Work, Volume V, Appendix K-L, Groundwater Sampling and Analysis Plan", 13 August, 1993.
- Groundwater Sciences Corporation, 1994, "Sewer Systems Assessment Report", 14 March, 1994.
- Groundwater Sciences Corporation, 1995, "IBM Kingston Phase I Environmental Site Assessment", 5 June, 1995.
- Groundwater Sciences Corporation, 1996, "IBM Kingston RCRA Facility Investigations Soil Gas Surveys and Sewer Systems Sampling", 12 April 1996.
- Groundwater Sciences Corporation, 1997 "RCRA Facility Assessments Newly Identified Solid Waste Management Units", 14 March, 1997.
- Groundwater Sciences Corporation, 1997, "RCRA Facility Investigation Groundwater Plumes and Sources", 14 March, 1997.
- Groundwater Sciences Corporation, 1999, "RCRA Facility Investigation Former Industrial Waste Sludge Lagoon", 16 April, 1999.
- Groundwater Sciences Corporation, 2002, "Expanded RCRA Facility Investigation, Former Industrial Waste Sludge Lagoon, Arsenic and VOC Plume Source Investigation and Deep Bedrock RCRA Facility Investigation", 26 February 2002.
- Groundwater Sciences Corporation, 2008, "2007 Annual Groundwater Monitoring Report", 28 March, 2008.
- Groundwater Sciences Corporation, 2008, "Former IBM Kingston Site", Power Point Presentation, 29 May, 2008.
- IBM Corporation, 2001, "IBM Post-Closure Permit Application Report", 2 April, 2001.
- IBM Corporation, 2007, "IBM Kingston Facility, Part 373 Permit No. 3-5154-0067/000090, Corrective Measures Shutdown Request (MW-504S)", 30 March, 2007.

TABLES

TABLE 1
SWMU-G: FORMER WASTE PCE TANK SAMPLING SCHEDULE
FORMER IBM KINGSTON FACILITY

Media	Estimated Number of Primary Samples ^{1,2}	Sample Analyses ³	Quality Assurance/Quality Control Samples
Soil	12	VOCs (EnCore® or equivalent)	1 Field Duplicate per 20 primary samples 1 MS/MSD per 20 primary samples
	2	Biogeochemical Parameters	
Groundwater (Grab and Temporary Wells)	8	VOCs	1 Field Duplicate per 20 primary samples 1 Trip Blank per sample group shipment 1 Rinsate Blank per day 1 MS/MSD per 20 primary samples ⁴
	2	Biogeochemical Parameters (not including metals)	
Groundwater (Existing Wells)	5	VOCs	
	2	Biogeochemical Parameters	

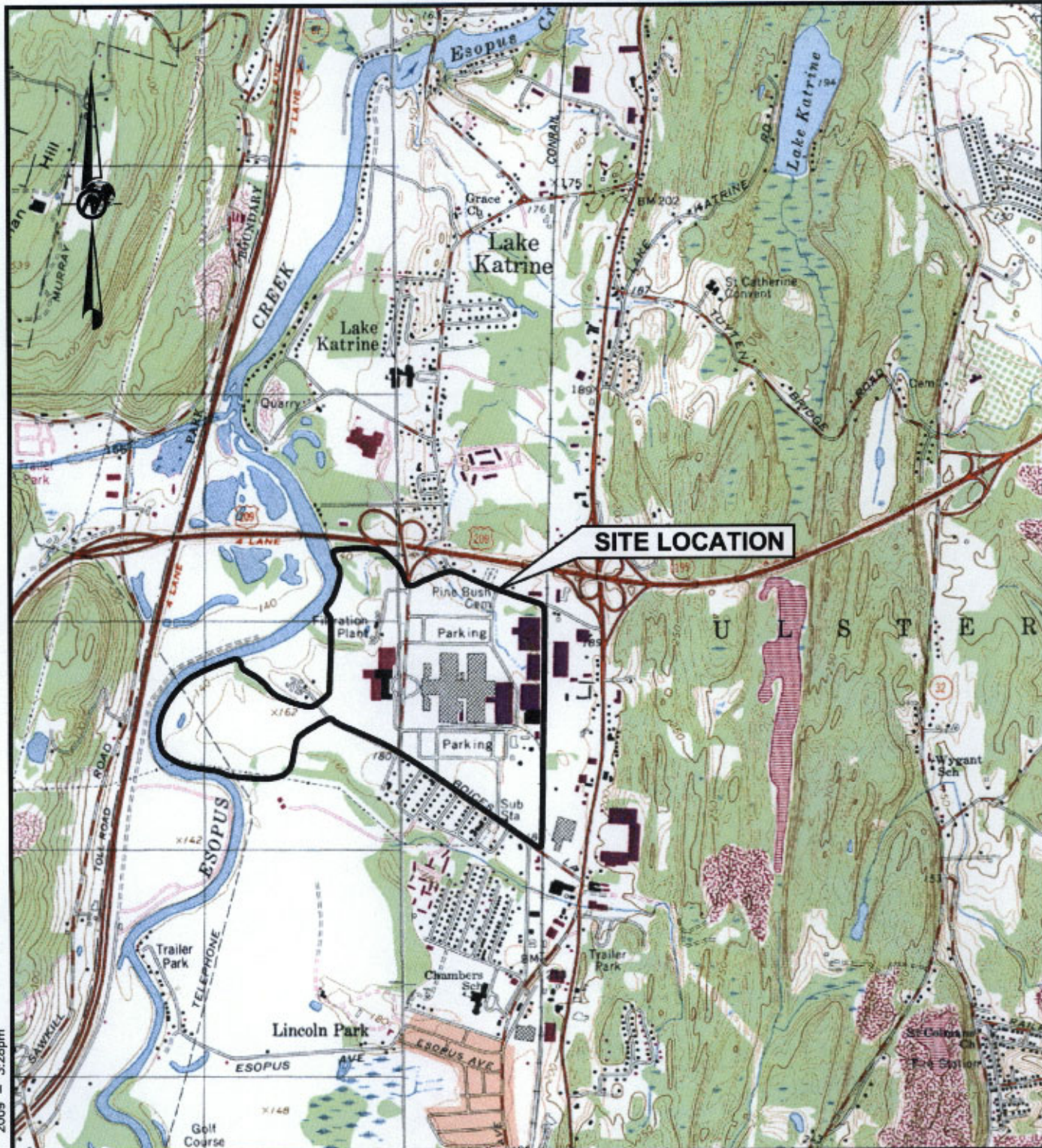
Notes:

1. The number and location of samples may be added or deleted based on MIP/EC investigation results.
2. See Figure 5 for sampling locations.
3. See Table 2 for proposed sampling analyses.
4. MS/MSD samples will be collected for all samples, excluding groundwater grab samples.

TABLE 2
SWMU-G: FORMER WASTE PCE TANK CONSTITUENT LIST
FORMER IBM KINGSTON FACILITY

TCL Volatile Organic Compounds	Biogeochemical Parameters
Soil and Groundwater	Groundwater
1,1,1,2-Tetrachloroethane	Alkalinity as CaCO ₃
1,1,1-Trichloroethane	Ammonia Nitrate
1,1,2,2-Tetrachloroethane	Biochemical Oxygen Demand (BOD)
1,1,2-Trichloro-1,2,2-Trifluoroethane	Chemical Oxygen Demand (COD)
1,1,2-Trichloroethane	Methane
1,1-Dichloroethane	Nitrate/Nitrite as N
1,1-Dichloroethylene	Phosphorous
1,2,3-Trichloropropane	Sulfate
1,2-Dichloro-1,2,2-Trifluoroethane	Sulfide
1,2-Dichlorobenzene	Total Dissolved Solids (TDS)
1,2-Dichloroethane	Total Suspended Solids (TSS)
1,2-Dichloroethylene, Total	Total Organic Carbon (TOC)
1,2-Dichloropropane	Metals
1,3-Dichlorobenzene	Antimony
1,4-Dichlorobenzene	Arsenic
1-Chlorohexane	Barium
2-Chloroethylvinyl Ether	Cadmium
2-Chlorotoluene	Chromium
4-Chlorotoluene	Copper
Benzene	Iron
Benzyl Chloride	Lead
Bromobenzene	Manganese
Bromodichloromethane	Selenium
Bromoform	Major Cations
Bromomethane	Calcium
Carbon Tetrachloride	Magnesium
Chlorobenzene	Potassium
Chlorodibromomethane	Sodium
Chloroethane	Major Anions
Chloroform	Fluoride
Chloromethane	Chloride
Cis-1,3-Dichloropropylene	Field Parameters
Dibromomethane	Dissolved Oxygen (DO)
Dichlorodifluoromethane	Oxidation-Reduction Potential (ORP)
Ethylbenzene	pH
Methylene Chloride	Specific Conductance
Tetrachloroethylene	Temperature
Toluene	Water Level
Trans-1,3-Dichloropropene	Soil
Trichloroethylene	Natural Oxidant Demand
Trichlorofluoromethane	Grain Size Analysis
Vinyl Chloride	Total Organic Carbon (TOC)

FIGURES



REFERENCE

1.) BASE MAP TAKEN FROM USGS 7.5 MINUTE SERIES QUADRANGLES OF KINGSTON EAST, NY, DATED 1963, PHOTOREVISED 1980, AND KINGSTON WEST, NY, DATED 1997.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	R/W
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PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

SITE LOCATION MAP



PROJECT No.	063-87071	FILE No.	06387071A005
DESIGN	CEJ 03/09/09	SCALE	AS SHOWN
CADD	RG 03/09/09	REV.	D
CHECK			
REVIEW			

FIGURE 1



LEGEND

- | | |
|---------------------------------------------------------------------------------------|--------------------------------------------------------------------|
|  | PROPERTY/PARCEL BOUNDARY |
|  | RAVEY/STREAM |
|  | 42-INCH DIAMETER SEWER SYSTEM
(SITE PERIMETER CONTROL SYSTEM) |
|  | UNSATURATED SAND/CLAY SAND UNIT
(SITE PERIMETER CONTROL SYSTEM) |
|  | GROUNDWATER COLLECTION SYSTEM
(SITE PERIMETER CONTROL SYSTEM) |
|  | 60-INCH DIAMETER SEWER SYSTEM
(SITE PERIMETER CONTROL SYSTEM) |
|  | BUILDING NUMBER |
|  | ENVIRONMENTAL PARCEL NUMBER AND APPROXIMATE ACREAGE |

REFERENCES

- 1) DATE: 11/11/2006. TITLE: FROM DIGITAL CAD FILE STEELAP.DWG, DRAWING NUMBER 33002-STEELAP/2. DEDICATED "SITE MAP." DATED MAY 9, 2006. PROVIDED BY: GRONDAKMER/SCIENCE CORPORATION.
- 2) PROPERTY LINES/PARCELS, BOUNDARIES DIGITIZED FROM A HARD COPY FIGURE DEDICATED ENVIRONMENTAL PARCELS, DATED DECEMBER 12, 2006. FIGURE 2. PREPARED BY: DANNY TUNG SCHALLER.

[illegible]

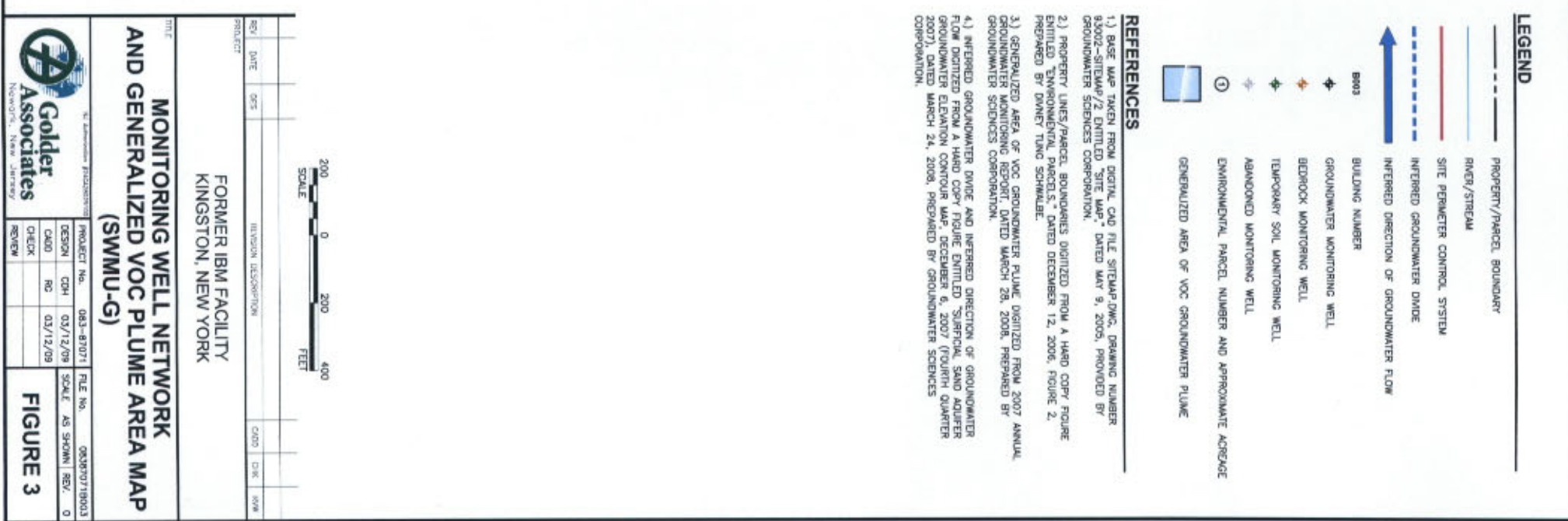
**SITE LAYOUT AND
INVESTIGATION AREA MAP
(SWMU-G)**

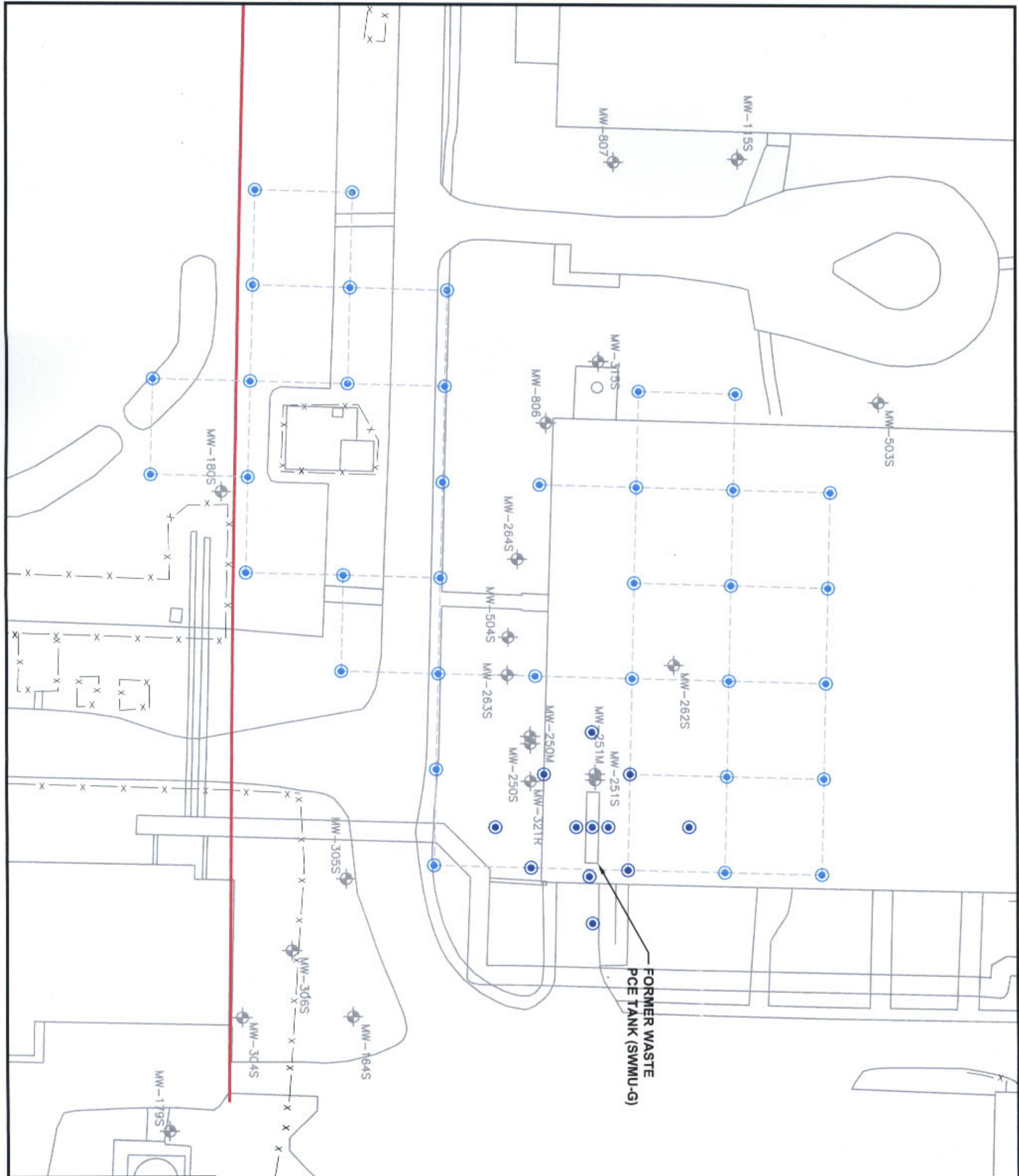


PROJECT No.	083-87071	FILE No.	08387071B00
DESIGN	CDH	SCALE	A5 SHOWN
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FIGURE 2

FIGURE 2





LEGEND

- SITE PERIMETER CONTROL SYSTEM
- EXISTING MONITORING WELL
- PROPOSED INITIAL MIP/EC POINT
- POTENTIAL MIP/EC POINT (SEE NOTE 1)

NOTE

1.) THE FINAL LOCATION AND NUMBER OF MIP/EC SOIL AND GROUNDWATER SAMPLES WILL BE ADJUSTED BASED ON INVESTIGATION FINDINGS.

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.

PROPOSED MIP/EC BORING AND CONFIRMATORY SAMPLING LOCATIONS (SWMU-G)

FORMER IBM FACILITY
KINGSTON, NEW YORK



Golder Associates
Network, New Jersey

PROJECT No.	FILE No.
083-87071	08387071B005

DESIGN	COPI	SCALE	AS SHOWN	REV.
CADD	16	03/12/09		0
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REVIEW				

FIGURE 5

APPENDIX A



LEGEND



CROSS SECTION DESIGNATION
FIGURE NUMBER WHERE CROSS SECTION IS PRESENTED

PROPERTY/PARCEL BOUNDARY
RIVER/STREAM

B003 BUILDING NUMBER

① ENVIRONMENTAL PARCEL NUMBER AND APPROXIMATE ACREAGE

REFERENCES

- 1.) BASE MAP TAKEN FROM DIGITAL CAD FILE SITEMAP.DWG, DRAWING NUMBER 93002-SITEMAP/2 ENTITLED "SITE MAP," DATED MAY 9, 2000, 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 DRIET TUNG SCHWABE.
- 1.) CROSS SECTION LOCATIONS TAKEN FROM DIGITAL CAD FILE CS_LAYER.DWG, DRAWING NUMBER 96011-CS01, DATED MAY 6, 1997, PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

SITE LAYOUT AND
INVESTIGATION AREA MAP

FORMER IBM FACILITY
KINGSTON, NEW YORK

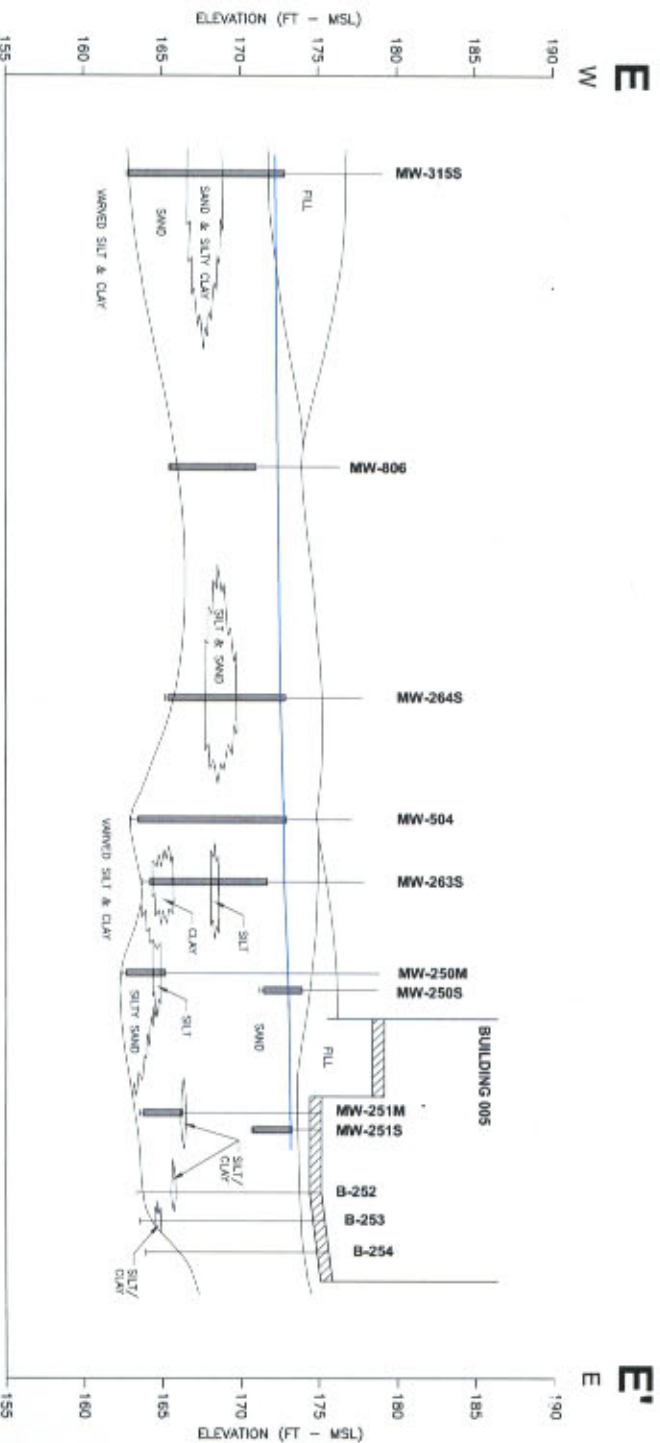
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SCALE FEET

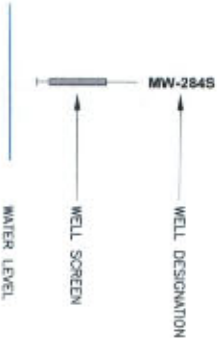


PROJECT NO.	003-B-071	FILE NO.	003B071B008
DESIGN	CDN	DATE	03/12/09
CADD	RG	SCALE	AS SHOWN
CHECK		REV.	0
REVIEW			

FIGURE A-1

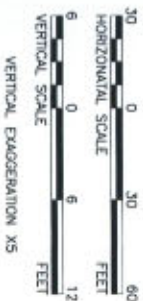


LEGEND



REFERENCE

1.) CROSS SECTIONS TAKEN FROM DIGITAL CAD FILE 6011CS01.DWG.DWG, ENTITLED "CROSS SECTIONS A-A' TO F-F'", DATED MAY 6, 1997, PROVIDED BY GROUNDWATER SCIENCES CORPORATION.



FORMER IBM FACILITY
KINGSTON, NEW YORK

CROSS SECTION E-E'

REV	DATE	DES.	REVISION DESCRIPTION	CADD	CHK	INW
PROJECT						
TITLE						
CROSS SECTION E-E'						
FORMER IBM FACILITY KINGSTON, NEW YORK						
PROJECT No. 083-87071 FILE No. 08387071B007						
DESIGN CDH 03/17/09 SCALE AS SHOWN REV. 0						
CADD RG 03/17/09						
CHECK						
REVIEW						
FIGURE A-2						



NEW YORK, NEW YORK