Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision
Former IBM Endicott Site
Operable Unit No. 6
Plume Control In Bedrock Groundwater
Endicott, Broome, New York
Site Number 704014

March 2009

New York State Department of Environmental Conservation
DAVID A PATERSON, *Governor* Alexander B Grannis, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Former IBM Endicott Inactive Hazardous Waste Disposal Site
Operable Unit No. 6
Village of Endicott, Broome County, New York
Site No. 704014

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for: Operable Unit No. 6 of the Former IBM Endicott site, a Class 2 inactive hazardous waste disposal site. The selected remedial program was chosen in accordance with the New York State Environmental Conservation Law and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for: Operable Unit No. 6 of the Former IBM Endicott inactive hazardous waste disposal site, and the public's input to the Proposed Remedial Action Plan (PRAP) presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site have been addressed by implementing the interim remedial measure (IRM) identified in this ROD. The ongoing control of the bedrock groundwater plume at the site has significantly reduced the threat to public health and the environment. Therefore, a groundwater monitoring program will be implemented to monitor the effectiveness of previous remedial actions in preventing further contamination of the groundwater and in reducing the concentration of VOCs in the bedrock groundwater to the point that they meet groundwater quality standards.

This site does not present a current or potential threat to public health or the environment.

Description of Selected Remedy

Based on the results of the Supplemental Remedial Investigation (SRI) for the Former IBM Endicott site and the performance of the IRM, the Department has selected continued operation and maintenance of the Plume Control in Bedrock Groundwater IRM as the remedy for Operable Unit No. 6. The components of the remedy are as follows:

- A bedrock groundwater recovery well will be operated on a continuing basis to contain, and ultimately reduce concentrations of the plume of VOCs that have been found in the bedrock groundwater. Collected groundwater will be treated at an IBM Groundwater Treatment System. As illustrated in Figures 4C and 7, operation of the recovery well creates a capture zone that extends to the limits of the contaminant plume and prohibits expansion of the plume.

- Development of a site management plan which will include the following institutional and engineering controls: (a) monitoring of bedrock groundwater; and (b) provisions for the continued proper operation and maintenance of the components of the remedy.

- The owner or the remedial party (IBM) will provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the owner or the remedial party (IBM) in writing that this certification is no longer needed. This submittal will: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that will impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.

- The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. If the Department determines that operation of the remedial system is no longer creating a capture zone that extends to the limits of the contaminant plume or no longer prohibits expansion of the plume, modification of the remedial system will be required.

- Since the remedy results in untreated hazardous wastes remaining at the site, a long-term monitoring program will be instituted. The monitoring program will include collection of potentiometric surface and chemical data from the bedrock monitoring wells identified on Figure 7, and will be performed under a monitoring plan approved by the Department. This program will allow the effectiveness of the bedrock groundwater remedy to be monitored and will be a component of the long-term management for the site. If, based on the monitoring data, the Department determines that enhancement of the bedrock groundwater remedy is necessary, a work plan to enhance the remedy will be submitted.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy selected for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

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Date

Dale A. Desnoyers, Director
Division of Environmental Remediation

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SECTION 1: SUMMARY AND PURPOSE OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for IBM Endicott Operable Unit No. 6, Plume Control in Bedrock Groundwater. As more fully described in Sections 3 and 5 of this document, historic releases of VOCs due to leaks and spills at the site resulted in the disposal of hazardous wastes, including volatile organic compounds (VOCs). These wastes contaminated the soil and groundwater at the site, and resulted in:

- a significant threat to human health associated with potential exposure to VOCs.
- a significant environmental threat associated with the current and potential impacts of contaminants to the on-site and off-site soil and groundwater.

During the course of the investigation certain actions, known as interim remedial measures (IRMs), were undertaken at IBM Endicott in response to the threats identified above. An IRM is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the remedial investigation/feasibility study (RI/FS). The IRMs undertaken at this site to address OU#6 included collection and treatment of contaminated bedrock groundwater.

Based on the implementation of the above IRMs, the findings of the investigation of this site indicate that the bedrock groundwater plume is under control and no longer poses a significant threat to human health or the environment: therefore, No Further Action other than continued operation and maintenance of the Plume Control in Bedrock Groundwater IRM was selected as the remedy for Operable Unit # 6 of this site.

The selected remedy, discussed in detail in Section 6, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

SECTION 2: SITE LOCATION AND DESCRIPTION

The former IBM Endicott Facility is a 135 acre industrial facility situated in Susquehanna River valley in the Village of Endicott, Broome County, NY(see Figure 1 and Figure 1A). It is the largest

of several hazardous substance sites which have been identified in the village. The other sites include: 312 Maple St, Schapiro's Fine Dry Cleaning, the former Canada Dry Plant, Union Forging Company, and Endicott-Johnson.

IBM is performing a remedial investigation on seven separate Operable Units: OU#1-Railroad Corridor Source Area; OU#2-North Street Area & Off-site Plume Reduction; OU#3-Southern Area Plume Reduction;OU#4-Ideal Cleaners Area; OU#5-Building57/57A;OU#6-Plume Control in Bedrock Groundwater; OU#7-Assessment of Sewers in Northwest Area.

As part of the overall approach to enhancing the historic groundwater remedial program, IBM has installed additional pumping wells in OUs 1,2,3,5 & 6. An interim remedial measure using thermal treatment is underway at OU#4. The investigatiaon of OU#7 is complete. Investigation of the remaining OUs is ongoing.

Site Geology

The geology of the Site is characterized by a sequence of unconsolidated glacial and post-glacial sediments overlying a buried bedrock valley. A generalized stratigraphic sequence from the surface downward is illustrated in Figure 2 and is described below:

1. Post-glacial alluvium: Present within or near the Site in only two localities - beneath a low terrace adjacent to the Susquehanna River and in a shallow late-deglacial channel near the north valley wall.

2. Outwash: Typically 25-30 feet thick but thicker where downwarped or collapsed in a few ice-block depressions. This outwash unit constitutes the Upper Aquifer, which is an unconfined, water table aquifer. This is the geologic unit where the vast majority of site related contamination exists. It is not used for water supply.

3. Lacustrine deposits: Fine-grained lake-bottom deposits, typically silt with pink clay seams. Where the lacustrine deposits are present, they form an effective barrier against downward migration of contaminated groundwater.

4. Ice contact deposits: Stratified drift deposited by sub-glacial meltwater. This stratified drift, where present and of proper texture and sorting, constitutes the Lower Aquifer. The Lower Aquifer is apparently confined to a thick sequence of ice contact deposits along the axis of the valley where it is used for both municipal and industrial water supply.

5. Glacial till: Dense, poorly sorted mixtures of clay, silt, sand and angular rock fragments deposited directly by glacial action. Where the till is absent in some areas near the axis of the valley, ice contact deposits lie directly over bedrock.

6. Bedrock: The bedrock beneath the site is comprised of the Devonian Age Catskill Formation, which is comprised primarily of gray siltstones and shales and, in some places, sandstone. The bedrock groundwater is not used as a source of drinking water. Plume control of the contaminated bedrock groundwater is the focus of this PRAP.

Operable Unit (OU) No. 6, which is the subject of this document, consists of bedrock groundwater VOC contamination (see Figure 1B and Figure 3). An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination.

The remaining operable units for this site identified in Figure 1B are not addressed by this PRAP/ROD but will be addressed in subsequent PRAPs/RODs. The areas that encompass those operable units were previously addressed as part of the RCRA Corrective Action program, but are now being reevaluated under an Order on Consent. The current elements of the groundwater remedial program for the on-site and off-site areas are also identified in Figure 1B. VOCs are detected in groundwater present in two geologic units beneath the Site, the bedrock and the glacial outwash units, the latter containing the Upper Aquifer. The VOC plume in the bedrock is contained by the operation of a single extraction well and the overall objective for OU#6 is to maintain that containment while addressing the source areas of the bedrock groundwater contamination that are located at Operable Unit No. 1 and Operable Unit No. 2.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

A detailed history of property ownership and site operations including the location of chemical storage and handling areas and a chronology of reported chemical spills is described in the Final Pre-characterization Technical Memorandum Operable Unit#1: Railroad Corridor Source Area and Operable Unit# 2: North Street Area (July 14, 2006) report . The following information was derived from that report.

The Site was first developed for manufacturing in 1901 by predecessors to the Endicott-Johnson Corporation (EJ). At that time the Site consisted of the railroad tracks owned by the Erie RR and rural farmland. Between 1901 and 1910 the company grew rapidly with Site operations primarily consisting of leather tanning, rubber cement manufacturing, shoe assembly, and lumber and box production. EJ shoe production continued to grow until about 1920, with the 1920s through the 1950s being the most active period for the facility. During this period EJ shoe manufacturing operations had expanded with the addition of the Everyday Shoe Company. This former factory building was located in the area currently occupied by the northern portion of Building 18 (B018). During the 1930s through 1960s the majority of EJ's properties within OU #1 and #2 were sold to IBM.

Through the 1930s, IBM manufacturing operations consisted of machining and assembling metal parts and finishing the parts by painting or plating. Construction and finishing of wood cabinetry was also apparently involved in these early operations. In the early 1940s, Buildings 41 and 46 (B041 and B046) were constructed and utilized for similar mechanical machine manufacturing operations. Chemical usage during this time period would be expected to include the use of cooling/cutting oils for machining, solvents to clean parts prior to plating or painting, plating operations, paint and associated solvents involved in clean-up, and materials used to finish wood. Machine maintenance activities would also be expected to have involved the use of petroleum hydrocarbons as lubricants and solvents, and halogenated hydrocarbons as solvents. During this time there was no apparent centralized chemical storage or waste storage facilities, other than areas convenient for logistical reasons, such as loading docks. In the 1950s and 1960s, IBM operations at the Site shifted to the manufacture of mid-range mainframe computers. This was an integrated operation involving many chemical and physical processes. Bulk storage and chemical handling evolved during this period of manufacturing. In the 1950s through late 1960s, chemicals primarily arrived on-Site in 55-gallon drums. On the basis of historical photographs, some of the drums were apparently stored proximate to loading dock areas and the south side of the railroad tracks in the central portion of the Site. Wastes were also apparently placed into 55-gallon drums for off-Site disposal and stored in the same general areas. During the late 1950s through late 1960s, bulk storage of virgin chemical and liquid wastes in above ground and underground storage tanks began to be utilized in areas proximate to the principal - manufacturing buildings. With the exception of some underground storage tank (UST) areas, the majority of chemical pipelines from these tanks and tank farms were above ground on pipe trestles and in building hallways and tunnels. By the

early 1970s, chemical storage also began to shift to centralized bulk storage areas with the construction of the B39 tank farm in the northwestern portion of OU#2. Above ground chemical pipe trestles between the major manufacturing buildings and chemical storage areas were also constructed during this time period.

On the basis of historical documents and prints, waste treatment operations also apparently shifted at the facility from localized or satellite on-Site treatment systems and off-Site disposal in the early 1950s to more centralized treatment by the mid-1970s. In the early 1950s through late 1950s, off-Site disposal in 55-gallon drums was typical. In the late 1950s through mid-1970s waste disposal operations included a combination of off-Site disposal of drums and localized wastewater treatment in B018 and B047. In the mid-1970s, waste disposal operations generally shifted to a combination of localized pretreatment in B018 and B047 and centralized treatment in the facility Wastewater Treatment Facility (B096), located in OU#7.

Starting in the early 1980s, primary operations at the facility shifted to manufacture of electronic components to support other IBM locations. Other operations during this time period included asset recovery (reconditioning of used computer equipment and recycling of used computer parts), chemical and physical laboratory research & development, warehousing of finished products, computer software research & development, and administration. During this period, manufacturing at the Site transitioned such that the principal operations that used chemicals and generated wastes consisted of the production of ceramic substrates and printed circuit boards and panels. The processes that were used in the manufacture of these products changed over time but remained similar with respect to chemical usage and waste generation. During the 1980s and 1990s, the use of solvents generally decreased and certain solvents, such as Freon 113, were eliminated from the production process.

Modifications to chemical storage and handling operations and waste storage and treatment operations also occurred between the early 1980s and early 1990s. Some examples include:

Expansion of the B039 Tank Farm and enhancement of spill containment systems.

Modifications to this tank farm were completed in the early 1980s. A portion of this tank farm was subsequently relocated and enclosed within B087 in 1990.

Construction of a new B047 Tank Farm with spill containment systems in 1981. This tank farm was subsequently enclosed within B273 in 1990.

Enhancement or addition of containment to other above ground storage tanks;

Removal of underground storage tanks;

Enhancements/modifications to localized waste treatment areas including B018; and

Installation of double-walled containment piping ("pipe-in-pipe") onto above ground chemical pipeline trestles.

Prior to the 1979 reported release of 1,1,1-TCA there were no reported releases of VOCs at the site. Given the disparity between the mass of VOCs that have been removed from the groundwater and the reported mass of that spill, it is apparent that most of the site contamination is associated with unknown or unreported historical releases.

3.2: Remedial History

In 1980, the Department listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

Remedial investigations at this site began in early 1979 as a voluntary action by IBM under its Corporate Groundwater Protection Program. Following the discovery of a VOC release in December 1979, IBM reported these conditions to the Department. Beginning in1980, IBM conducted additional investigations and initiated remedial actions under the oversight of the Department's Division of Water (DOW). DOW oversight continued for a period of approximately twelve years until 1992 when the remedial actions being performed at this site were incorporated into the site's 6 NYCRR Part 373 Resource Conservation and Recovery Act (RCRA) Permit (the Permit). At the time of issuance of the Permit, the site had been reclassified to a Class 4 (which means the site was properly remediated but requires continued management) and the Department determined that the remedial actions in effect at the time were protective of human health and the environment. In 2004, based on the Department's emerging recognition that vapor intrusion associated with on-site and off-site soil and groundwater contamination represented a previously unanticipated potential threat to human health, the site was reclassified to Class 2. Subsequently, IBM and the Department entered into Order on Consent that requires IBM to further evaluate and enhance the site remedial program. From January 1980 through December 2008, IBM removed approximately 800,000 pounds of VOCs from the groundwater in their system. Most of the contamination is 1,1,1-TCA, and most has been contained on-site as a result of the operation of the on-site remedial systems.

Historically, bedrock groundwater plume control was conducted via groundwater withdrawals from the EN-CAF bedrock extraction well located within the basement of cafeteria Building 42 (B042). The EN-CAF well is believed to have been installed in 1963 as a water supply well for a civil defense shelter. The EN-CAF well is approximately 250 feet deep and 8 inches in diameter with 100 feet of steel casing. EN-CAF originally served as a groundwater quality monitoring well. In 1991, EN-CAF was put online as an extraction well due to the detected presence of volatile organic compounds (VOCs). Groundwater withdrawals from EN-CAF were piped from the B042 basement to a transfer tank station in the basement
of B018 and then to the B096 wastewater treatment facility located in the northwestern portion of the Site

Although the IBM Endicott Facility was sold to Huron Real Estate Associates, LLC in 2002, IBM remains responsible for development and implementation of the site remedial program.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The Department and the International Business Machines Corporation (IBM) entered into a Consent Order on August 4, 2004. The Order obligates the responsible parties to implement a Site-Wide Source Area Evaluation, Supplemental Remedial Investigation(SRI), Focused Feasibility Study (FFS), and Interim Remedial Measure (IRM) as set forth below:

OPERABLE UNIT 1: Railroad Area Source Area Evaluation - Railroad Area North.: Perform SRI, FFS, and IRM.

OPERABLE UNIT 2: North Street Area: Perform SRI, FFS and IRM.

OPERABLE UNIT 3: Plume Reduction in Southern Area: Perform SRI, FFS, and IRM.

OPERABLE UNIT 4: Ideal Cleaners Area: Perform SRI and FFS.

OPERABLE UNIT 5: Building 57 Area: Perform SRI and FFS.

OPERABLE UNIT 6: Plume Control in Bedrock Groundwater: Perform SRI, FFS, if appropriate, and IRM.

Operable Unit 7: Assessment of On-Site Sewers: Perform SRI.

At such time as the Department determines that it is appropriate to choose a comprehensive remedy for the Site, an Operable Unit or any portion of the Site, the Department shall prepare and release for public comment a Proposed Remedial Action Plan ("PRAP") and, after soliciting public comment on the PRAP, select a Remedial Action for the Site, Operable Unit or portion of the Site in a Record of Decision ("ROD"). The ROD shall be appended to the Order.

After the remedy is selected, the Department will approach the PRPs to implement the selected remedy under an Order on Consent.

SECTION 5: SITE CONTAMINATION

A supplemental remedial investigation (SRI) has been conducted to evaluate the alternatives for addressing the significant threats to human health and the environment for Operable Unit No. 6.

5.1: Summary of the Supplemental Remedial Investigation

The purpose of the OU #6 SRI was to more clearly define the nature and extent of any bedrock contamination resulting from previous activities at the site. The SRI was conducted between October 2004 and December 2005. The field activities and findings of the investigation are described in the SRI report. (Bedrock Groundwater SRI Report for OU #6 December 19, 2005, Groundwater Sciences Corporation).

The SRI included the following tasks:

- Task 1 - Installation, development, and sampling (three rounds) of ten bedrock monitoring wells, designated EN-D39 through EN-D48;

- Task 2 - Performance of a shutdown and restart test of the EN-CAF well to assist in evaluating the effectiveness of the EN-CAF extraction well in controlling bedrock groundwater flow;

- Task 3 – Performance of a manmade structures evaluation to identify manmade structures that might provide the potential for vertical transport of VOCs from Upper Aquifer source areas into the underlying bedrock.

5.1.1: Standards, Criteria, and Guidance (SCGs)

To determine whether the bedrock groundwater contains contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.

Based on the SRI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site required remediation. These are summarized in Section 5.1.2. More complete information can be found in the SRI report.

5.1.2: Nature and Extent of Contamination

Bedrock Groundwater

This section describes the findings of the investigation for all environmental media that were investigated.

As described in the SRI report, bedrock groundwater samples were collected to characterize the nature and extent of contamination. As seen in Figure 3, 4A, 4B and 4C, the contaminants that exceed their SCGs are the volatile organic compounds (VOCs) TCE, and 1,1,1-TCA (and their degradation products). For comparison purposes, where applicable, SCGs are provided for each medium. Chemical concentrations are reported in parts per billion (ppb) for groundwater.

A comprehensive evaluation of existing on-site corrective action systems was performed in late 2003
and early 2004 (see Groundwater Sciences, P.C., April 30, 2004, Evaluation of Existing Corrective Measures Systems, Village of Endicott / Town of Union, Broome County, New York, prepared for IBM Corporation). Included in that evaluation were two items relating to the bedrock groundwater: 1) evaluating options to move the EN-CAF well from the basement of B042 to a more accessible location and 2) identifying the geologic unit from which VOCs dissolved in groundwater are entering the EN-CAF well. Addressing the first of these two items involved the examination of alternative locations for the extraction well outside the building along with alternatives for conveyance piping and treatment. The second item was addressed by the collection of data from two newly installed monitoring wells (EN-D33 and EN-D34), the former installed into the top of bedrock and the latter installed in the upper portion of the overlying till. This well cluster was installed on the north side of North Street in a position believed to be downgradient of potential VOC source areas and upgradient from the EN-CAF well.

The results from these two wells demonstrated that the predominant source of groundwater containing VOCs being extracted at the EN-CAF well was bedrock groundwater, not groundwater in the overlying till unit. Based on this conclusion, the report entitled, "Evaluation of Existing Corrective Measures Systems", dated April 30, 2004 (April 30th Report) recommended the installation and sampling of four additional bedrock monitoring wells (EN-D35 to EN-D38 on Figure 3) to better define the limits of VOCs in groundwater flowing in the bedrock and the associated requirements for an extraction well to replace the EN-CAF well. The installation of these four additional monitoring wells was completed in June 2004.

The results of groundwater sampling and analysis of the eleven bedrock monitoring wells at the Site during 2004 are posted on Figure 3 for each monitoring well. For the five bedrock wells installed in April 2004 (EN-D33) and June 2004 (EN-D35 to EN-D38), these results include two sampling rounds. For the six other wells, including the EN-CAF well, the posted results are from a single sampling round performed at the Site in January and February 2004. As depicted on Figure 3, water level and water quality data from these wells and other bedrock monitoring wells indicate an apparent capture zone associated with the operation of EN-CAF that extends from near the intersection of Monroe Street and McKinley Avenue to the northeast in the direction of the intersection of Adams Avenue and North Street and generally to the northwest beyond the

intersection of Grant Avenue and North Street. The bedrock groundwater elevation contours also reveal a closed depression in the potentiometric surface that encompasses the EN-CAF well and monitoring well EN-D11, located roughly 500 feet farther south.

Additional evaluation of OU No. 6 was conducted under the October 7, 2004, "Bedrock Groundwater Supplemental Remedial Investigation Work Plan" and the results presented in the December 19, 2005, "Bedrock Groundwater Supplemental Remedial Investigation Report"(SRI Report). The analysis presented in Section 3 of the SRI Report provides a compelling basis for concluding that the operation of the EN-CAF extraction well captures the plume of VOCs in bedrock groundwater and prevents migration of this plume beyond the location of this extraction well. The following lines of evidence all support this conclusion;

- The pattern of water level recovery and drawdown observed during the shutdown and restart test,
- The pattern of groundwater elevation contours during operation of the extraction well and,
- The distribution of TCA- and TCE-series constituents in groundwater.

These lines of evidence also point clearly to the existence of a zone of high hydraulic conductivity between the EN-CAF extraction well and monitoring well EN-D11 that suggests the location of the existing extraction well in this likely fracture zone is key to its observed effectiveness. These observations were followed by the recommendation in the SRI Report that the replacement well for the current EN-CAF extraction well should be installed immediately outside the southwest corner of Building 42 along the apparent structural discontinuity in the bedrock that extends from the EN-CAF well to EN-D11.

The source of the bedrock contamination is the plant site area north of North Street in the vicinity of Building 18 and Building 41. It is assumed that man-made penetrations (foundation pilings, elevator shafts) of the lacustrine silt/clay unit that typically forms a barrier to downward contaminant movement has allowed contaminants to migrate into the bedrock. Figure 5A and 5B depict the distribution of TCE and 1,1,1-TCA series VOCs in the Upper Aquifer source area groundwater, and manmade structures that could serve as conduits for the migration of the VOCs. Ongoing dye studies confirm that a hydraulic connection between those units exist in the vicinity of the Building 18 elevator shafts. Remediation of the source areas is being addressed under the OU#1 and OU#2 Operable Unit SRI/FFS process and will be the subject of future Proposed Remedial Action Plans.

Groundwater contamination identified during the SRI was addressed during the bedrock groundwater IRM described in Section 5.2.

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

As described in the December 12, 2007 "Bedrock Groundwater Interim Remedial Measures Report, EN-D49 Installation & Testing", the EN-D49 pumping well was installed as an interim remedial measure in June 2006 to replace the EN-CAF pumping well. EN-D49 was installed approximately 75 feet southwest of the EN-CAF well in the direction of bedrock monitoring well EN-D11 (Figure 6). Figure 7 is a bedrock potentiometric surface contour map for October 29, 2008, that shows the pumping effects of well EN-D49 after five weeks of modified extraction operations. A comparison of Figure 7 and Figure 3 indicates similar apparent limits of hydraulic capture. The area of

influence for EN-D49 observed on October 29, 2008 is similar but broader than the area of influence observed during EN-CAF extraction operations. In particular, pumping effects appear to extend farther to the west toward wells EN-D45 and EN-D39 with pumping at EN-D49.

The IRM includes treatment of the extracted groundwater at the IBM Adams Avenue Groundwater Treatment facility, and an ongoing groundwater monitoring program (quarterly monitoring of water levels and chemistry in the bedrock monitoring wells and monthly sampling of extraction well EN-D49) to ensure that the remedy remains effective.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

There are no completed exposure pathways associated with OU#6 because the bedrock groundwater plume is deep beneath the ground surface and bedrock groundwater is not used for potable or process purposes.

Potential exposure pathways associated with the bedrock groundwater plume are limited to ingestion of or direct contact with contaminated bedrock groundwater. This is unlikely because bedrock groundwater is not easily accessible and is not a viable aquifer. A potential exposure pathway exists for workers who may come into contact with bedrock groundwater while drilling.

Additional exposure pathways are associated with the IBM Endicott site as a whole. However, any immediate exposure concerns have been addressed by actions taken as part of other operable units. Included in these actions are the installation of mitigation systems at 450 properties in the Village of Endicott to address exposures related to soil vapor intrusion. Additionally, IBM has a comprehensive groundwater extraction, treatment, and monitoring plan in place to ensure that the quality of the shallow groundwater is improving, thus reducing the exposure potential. Exposure to site-related contaminants via drinking water is not a concern because the public water supply wells do not draw from the bedrock groundwater. Additionally, the Village of Endicott is served by a public water supply which is frequently tested to ensure that the water distributed to consumers complies with drinking water standards.

5.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site prior to the IRM. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

Site contamination has impacted the groundwater resource in the bedrock.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS AND SELECTED REMEDY

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous wastes disposed at the site through the proper application of scientific and engineering principles.

Prior to the completion of the IRM described in Section 5.2, the remediation goals for Operable Unit #6 was to eliminate or reduce to the extent practicable: expansion of the bedrock groundwater contaminant plume, and ultimately, to reduce the concentration of VOCs in the bedrock groundwater to the point that they meet groundwater quality standards.

The main SCGs applicable to this project are ambient groundwater quality standards as follows:

CAS	Contaminant	Standard (ppb)
71-55-6	1,1,1-Trichloroethane	5
156-59-2	cis-1,2-Dichloroethene	5
156-60-5	trans-1,2-Dichloroethene	5
79-01-6	Trichloroethene	5
127-18-4	Tetrachloroethene	5
75-01-4	Vinyl chloride	2

The Department believes that the IRM has accomplished the remediation containment goals and has the potential to achieve the SCGs for the site provided that it continues to be operated and maintained in a manner consistent with the design.

Based on the results of the investigations at the site, the IRM that has been performed, and the evaluation presented here, the Department has selected No Further Action with continued operation of the Bedrock Groundwater Recovery Well and Treatment System as the preferred alternative for the Operable Unit ~~site~~. The Department believes that this alternative will be protective of human health and the environment and will satisfy all SCGs as described above. Overall protectiveness is achieved through meeting the remediation goals listed above.

Therefore, the Department concludes that No Further Action is needed other than operation, maintenance, monitoring, and institutional and engineering controls. The elements of the IRM already completed and engineering controls are listed below:

- A bedrock groundwater recovery well will be operated on a continuing basis to contain, and ultimately reduce concentrations of the plume of VOCs that have been found in the bedrock groundwater. Collected groundwater will be treated at an IBM Groundwater Treatment System. As illustrated in Figures 4C and 7, operation of the recovery well creates a capture zone that extends to the limits of the contaminant plume and prohibits expansion of the plume.

- Development of a site management plan which will include the following institutional and engineering controls: (a) monitoring of bedrock groundwater; and (b) provisions for the continued proper operation and maintenance of the components of the remedy.

- The owner or the remedial party (IBM) will provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the owner or the remedial party (IBM) in writing that this certification is no longer needed. This submittal will: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that will impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.

- The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. If the Department determines that operation of the remedial system is no longer creating a capture zone that extends to the limits of the contaminant plume or no longer prohibits expansion of the plume, modification of the remedial system will be required.

- Since the remedy results in untreated hazardous wastes remaining at the site, a long-term monitoring program will be instituted. The monitoring program will include collection of potentiometric surface and chemical data from the bedrock monitoring wells identified on Figure 7, and will be performed under a monitoring plan approved by the Department. This program will allow the effectiveness of the bedrock groundwater remedy to be monitored and will be a component of the long-term management for the site. If, based on the monitoring data, the Department determines that enhancement of the bedrock groundwater remedy is necessary, a work plan to enhance the remedy will be submitted.

SECTION 7: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- Repositories for documents pertaining to the site were established.

- A public contact list, which included nearby property owners, elected officials, local media and other interested parties, was established.

- A public meeting was held on {February 25, 2009} to present and receive comment on the PRAP.

- A responsiveness summary (Appendix A) was prepared to address the comments received during the public comment period for the PRAP.

No significant public comments on the remedy were received, but during the February 25, 2009 public meeting to discuss the PRAP, members of the community, and the local press, expressed the concern that the bedrock groundwater contamination could impact the Village of Endicott drinking water supply wells. In response, Department staff presented and discussed Figures from the PRAP that illustrate the fact that the bedrock groundwater contamination has been contained as a result of the IRM and that it was hydraulically isolated from the aquifer that serves as a source for the public water supply wells.

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Former IBM Endicott
Operable Unit No. 6
Endicott, Broome, New York
Site No. 704014

The Proposed Remedial Action Plan (PRAP) for the Former IBM Endicott site, was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on February 1, 2009. The PRAP outlined the remedial measure proposed for the contaminated bedrock groundwater at the Former IBM Endicott site.

The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on February 25, 2009, which included a presentation of the Remedial Investigation (RI) and the Feasibility Study (FS) as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the PRAP ended on March 10, 2009.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

COMMENT 1: During the February 25, 2009 public meeting to discuss the PRAP, members of the community expressed the concern that site-related bedrock groundwater contamination was impacting the Village of Endicott drinking water supply wells (i.e. the South Street Well Field).

RESPONSE 1:
Department staff presented and discussed Figures from the PRAP to illustrate the fact that the bedrock groundwater contamination has been contained as a result of the IRM and that it was hydraulically isolated from the aquifer that serves as a source for the public water supply wells. Staff used a modified version of Figure 2 (geologic cross-section) to depict the geographic and stratigraphic relationships between the area of bedrock contamination and the lower aquifer which serves as the source of the Village or Endicott drinking water. Staff used the figure to point out that the lower aquifer does not exist in the area where bedrock contamination has been observed. Staff used bedrock groundwater potentiometric surface maps and chemical concentration plots (Figures 3, 4A, 4B, 4C and 7) to depict the nature and extent of bedrock groundwater contamination. Using those figures, staff explained how the historic pumping from the EN-CAF bedrock well and continued pumping from bedrock well EN-D49, which was installed as an IRM, had contained the bedrock groundwater contamination to the area north of Monroe Avenue and that, consequently, the bedrock contamination did not extend far enough into the Susquehanna River valley to discharge to the lower aquifer. Staff also discussed the fact that the South Street water supply system had been sampled on a regular basis and that although a few volatile organic compounds (VOCs) had been regularly detected in samples from those wells, the concentrations were below the drinking water standards. Staff noted that as a precautionary measure, the Village of Endicott had installed a treatment system on the water supply to remove those VOCs from the water supply. Staff also pointed out that if the bedrock groundwater contamination was the source of the South Street well contamination, the concentrations of VOCs in the South Street well samples should have decreased through time in response to observed decreases in the concentration of the bedrock groundwater VOCs. Such a trend has not been observed.

By the end of the meeting, most in attendance understood that the bedrock groundwater contamination was not impacting the Lower Aquifer.

COMMENT 2: Mr. Mitchell E. Meyers, IBM corporation, verbally commented that since IBM sold the Endicott facility in 2002, the site name referenced in the PRAP and other formal Department documents should be changed to “Former IBM Endicott” site.

RESPONSE 2:
The Department has changed the site name in the registry to “Former IBM Endicott” site.

Mr. Paul Speranza, P.E. , Huron Real Estate Associates, LLC submitted a letter (dated March 5,) which included the following comments:

COMMENT 3:
Huron has concerns with the phrase "property owner" as used in Section 6.3 of the PRAP which states; "The property owner would provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner that this certification is no longer needed". As written the words "property owner" could be misconstrued to mean the current owner, Huron. To avoid such confusion, and to be consistent with the remainder of the document and the underlying Order on Consent, we believe the words property owner should be replaced by "IBM Corporation" or by the term "Responsible Party".

RESPONSE 3: The term “property owner” has been changed to “the owner or the remedial party (IBM)” to indicate the fact that IBM has accepted responsibility for the remedial program. This revised description is consistent with Part 375-1.8(h)(3) of the regulations.

APPENDIX B

Administrative Record

Administrative Record

Former IBM Endicott
Operable Unit No. 6
Site No. 704014

1. Proposed Remedial Action Plan for the Former IBM Endicott site, Operable Unit No.6, dated February 2009, prepared by the Department.

2. Order on Consent, Index No. A7-0502-0104, between the Department and International Buisness Machine Corporation (IBM), executed on August 4, 2004.

3. "Evaluation of Existing Corrective Measures Systems, Village of Endicott / Town of Union, Broome County, New York", Groundwater Sciences, P.C., April 30, 2004, prepared for IBM Corporation.

4. "Supplemental Groundwater Assessment Final Report, Village of Endicott / Town of Union, Broome County, New York", Groundwater Sciences, P.C., May 17, 2004,, prepared for IBM Corporation.

5. "Bedrock Groundwater Supplemental Remedial Investigation Work Plan, Order on Consent Index #A7-0502-0104, Site #704014, Operable Unit #6: Plume Control in Bedrock Groundwater", Groundwater Sciences Corporation, October 7, 2004, prepared for IBM Corporation.

6. "Bedrock Groundwater Supplemental Remedial Investigation Report, Order on Consent Index #A7-0502-0104, Site #704014, Operable Unit #6: Plume Control in Bedrock Groundwater", Groundwater Sciences Corporation, December 19, 2005, prepared for IBM Corporation.

7. "OU#6 Interim Remedial Measures Work Plan: EN-D49 Installation and Testing, Order on Consent Index #A7-0502-0104, Site #704014, Operable Unit #6: Plume Control in Bedrock Groundwater", Groundwater Sciences Corporation, April 17,2006, prepared for IBM Corporation.

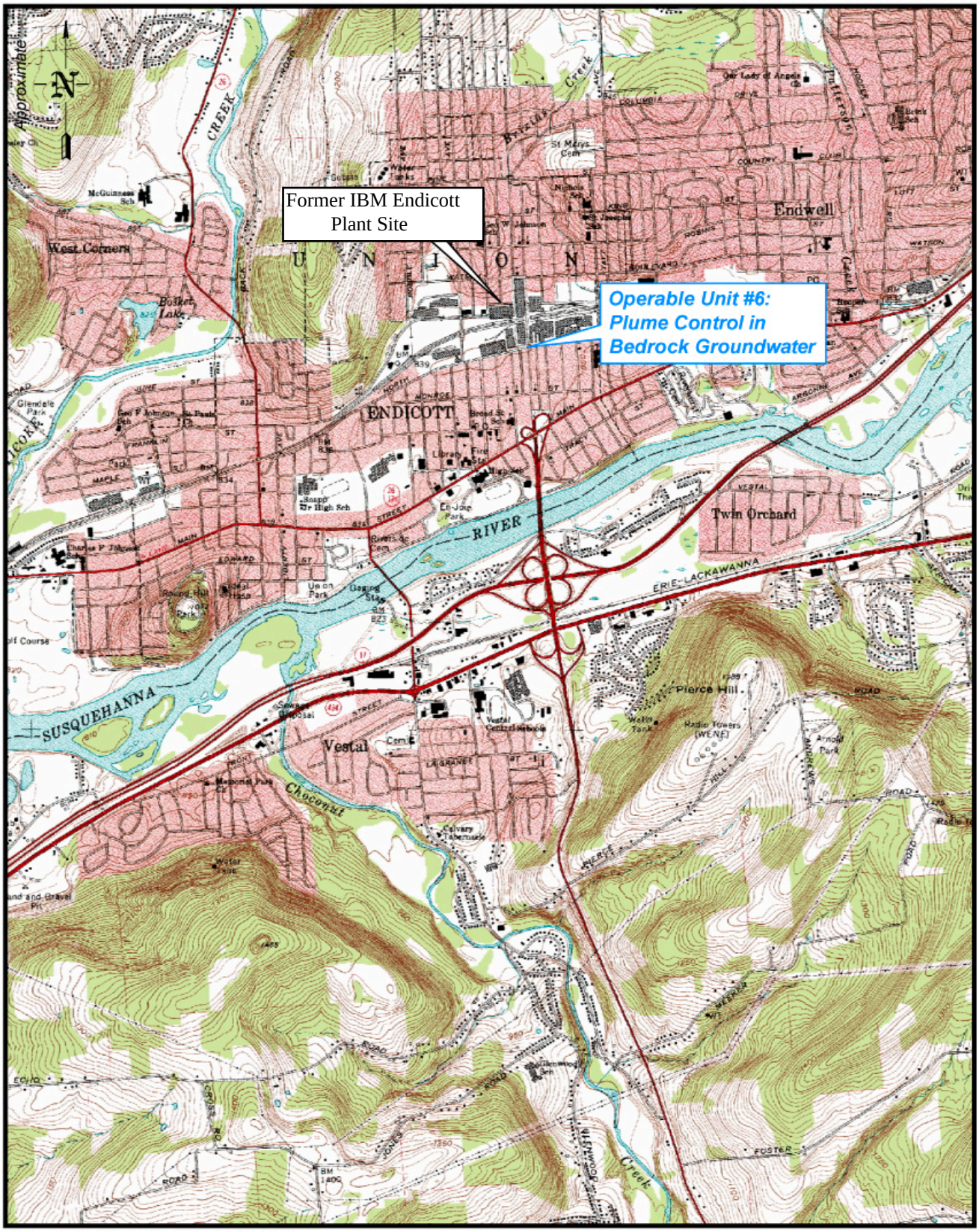
8. "OU#6 Interim Remedial Measures Report: END49 Installation and Testing, Order on Consent Index #A7-0502-0104, Site #704014, Operable Unit #6: Plume Control in Bedrock Groundwater", Groundwater Sciences, P.C., December 12, 2007, prepared for IBM Corporation.

9. "Comprehensive Operation, Maintenance & Monitoring Plan Modification Work Plan for Bedrock Extraction Well EN-D49, Order on Consent Index #A7-0502-0104, Site #704014, Operable Unit #6: Plume Control in Bedrock Groundwater and Miscellaneous Activity C: Operation, Maintenance & Monitoring, Groundwater Sciences, P.C., June 20, 2008," prepared for IBM Corporation.

10. February 1, 2009, Fact Sheet and Meeting Notice " Remedy Proposed for Operable Unit No. 6 Plume Control in Bedrock Groundwater, IBM Endicott Site."

11. February 16, 2009, phone conversation with Mitchell Myers, IBM Corporation requesting change in site name to "Former IBM Endicott" site based on IBM review of OU No. 6 PRAP.

12. Letter dated March 5, 2009 from Mr. Paul Speranza, P.E. , Huron Real Estate Associates, LLC.



Portion of the Endicott, New York
7.5-minute USGS Quadrangle
(1969; Photoinspected 1976)

Broome County

Scale
0 1500' 3000'

Modified by WEW (NYSDEC)

Figure 1

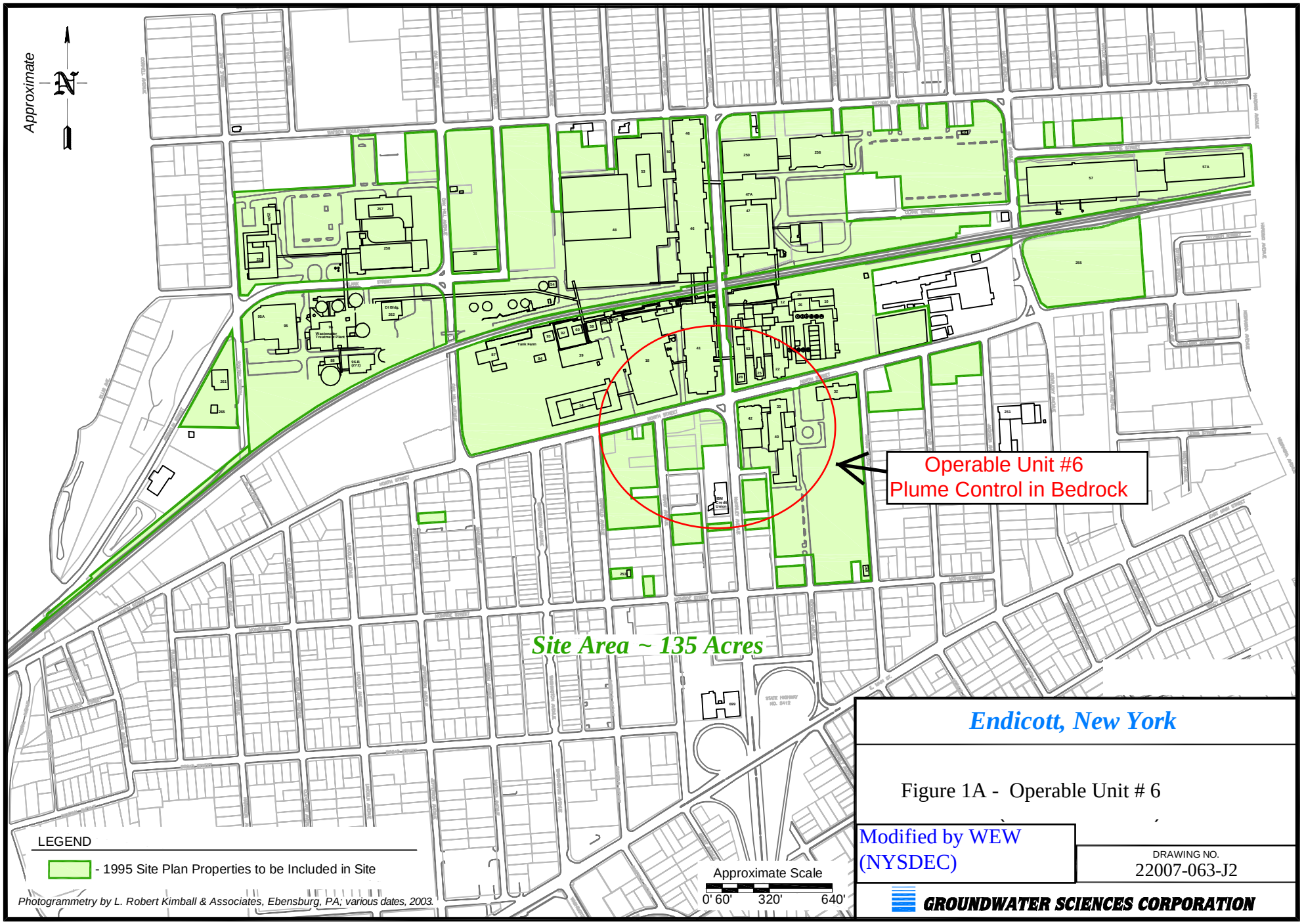
Former IBM Endicott Site
Site #704014

Site Location Map

GROUNDWATER SCIENCES CORPORATION

22007-008-D3 / 11-28-05

IBM Endicott OU#6 Plume Control in Bedrock



Endicott, New York

Figure 1A - Operable Unit # 6

Modified by WEW (NYSDEC)

DRAWING NO.
22007-063-J2

GROUNDWATER SCIENCES CORPORATION

N

On-Site Capture Zone

CLARK GTF

OU#5 BUILDING 57 AREA

HAYES AVENUE TRANSFER STATION

EN-89R
EN-89
EN-624
EN-623

Discharge to Storm Sewer

D006

D005

EN-218

B046S

EN-428P
EN-253
EN-219
EN-219R

EN-107

OU#1 RAILROAD CORRIDOR SOURCE AREA

OU#7 ASSESSMENT OF SEWERS IN THE NORTHWESTERN AREA

OU#4 IDEAL CLEANERS AREA

TOWN OF UNION
VILLAGE OF ENDICOTT

ROBBLE GTF

EN-154R
EN-154

EN-276

OU#2 NORTH STREET AREA

OU#6 PLUME CONTROL IN BEDROCK GROUNDWATER

Off-Site Capture Zone A

EN-284P

EN-D49

EN-78T

Off-Site Capture Zone B

D001

JEFFERSON GTF

EN-451P

EN-133

EN-91T

GARFIELD GTF

EN-92T

ADAMS GTF

EN-491T

D003

EN-120
EN-160

EN-195

EN-222

EN-185
EN-492T

EN-510T

D002

EN-194

EN-215T

EN-499T

EN-161T

MISCELLANEOUS ACTIVITY 'A' PLUME REDUCTION IN OFF-SITE CAPTURE ZONE A

EN-447T

EN-501T

OU#3 PLUME REDUCTION IN SOUTHERN AREA

LEGEND

- IBM Groundwater Treatment Facility (GTF)
- Pipeline Connected to IBM GTF (Above Ground)
- Pipeline Connected to IBM GTF (Below Ground)
- Extraction Well
- Injection Test Well
- Area Designations
- Town/Village Boundary
- D005 - Outfall Location & Designation

Approximate Scale
0 200' 400'

Modified by WEW NYSDEC

Figure 1-B

Former IBM Endicott Site
Site #704014

Elements of Current Extraction Well Systems (May 2008)

DRAWN BY: JPB/MHM	DATE: 5/19/08	DRAWING NO. 22007-249-G4
CHECKED & APPROVED BY: MTL		

GROUNDWATER SCIENCES CORPORATION

Figure 2 Geologic Cross-Section IBM Endicott

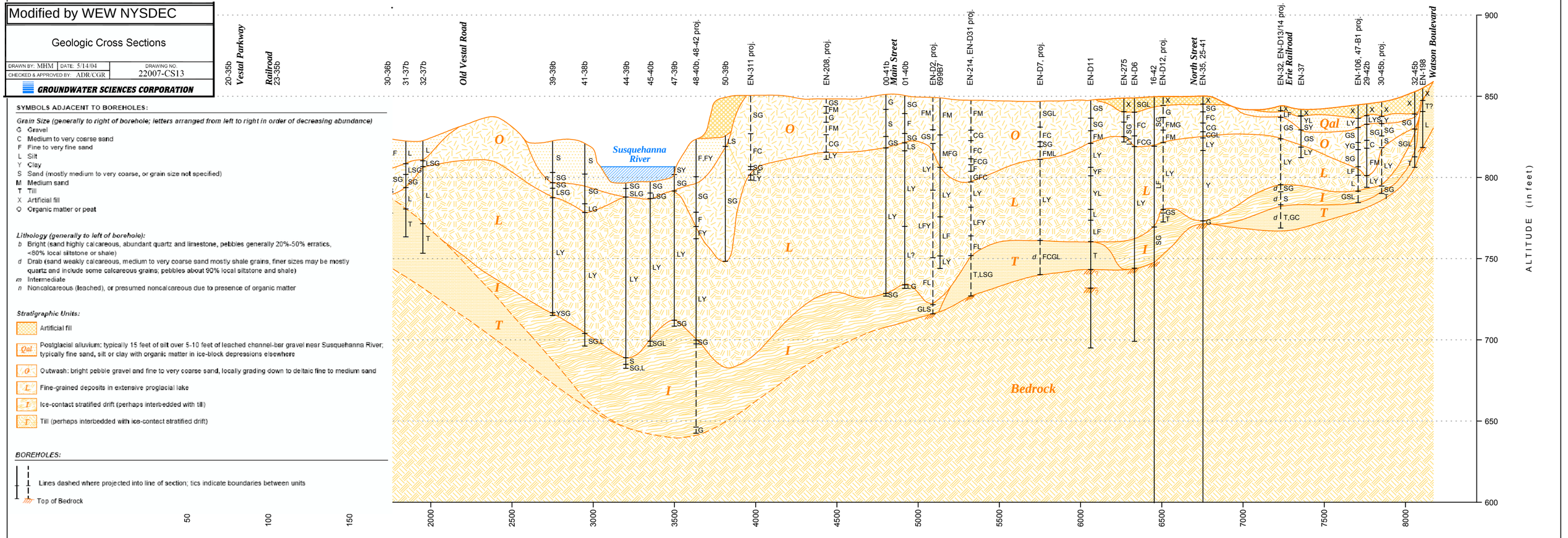
South **North**

Modified by WEW NYSDEC

Geologic Cross Sections

DRAWN BY: MHM	DATE: 5/14/04	DRAWING NO.
CHECKED & APPROVED BY: ADR/CGR		22007-CS13

GROUNDWATER SCIENCES CORPORATION



SYMBOLS ADJACENT TO BOREHOLES:

Grain Size (generally to right of borehole; letters arranged from left to right in order of decreasing abundance)

- G Gravel
- C Medium to very coarse sand
- F Fine to very fine sand
- L Silt
- Y Clay
- S Sand (mostly medium to very coarse, or grain size not specified)
- M Medium sand
- T Till
- X Artificial fill
- O Organic matter or peat

Lithology (generally to left of borehole):

- *b* Bright (sand highly calcareous, abundant quartz and limestone, pebbles generally 20%-50% erratics, <80% local siltstone or shale)
- *d* Drab (sand weakly calcareous, medium to very coarse sand mostly shale grains, finer sizes may be mostly quartz and include some calcareous grains; pebbles about 90% local siltstone and shale)
- *m* Intermediate
- *n* Noncalcareous (leached), or presumed noncalcareous due to presence of organic matter

Stratigraphic Units:

- Artificial fill
- Qal: Postglacial alluvium: typically 15 feet of silt over 5-10 feet of leached channel-bar gravel near Susquehanna River; typically fine sand, silt or clay with organic matter in ice-block depressions elsewhere
- O: Outwash: bright pebble gravel and fine to very coarse sand, locally grading down to deltaic fine to medium sand
- L: Fine-grained deposits in extensive proglacial lake
- I: Ice-contact stratified drift (perhaps interbedded with till)
- T: Till (perhaps interbedded with ice-contact stratified drift)

BOREHOLES:

Lines dashed where projected into line of section; tics indicate boundaries between units

Top of Bedrock

Cross Section A-A': Along McKinley / Route 26

Groundwater Quality Standards

CAS	Contaminant	703 Std (ppb)
71-55-6	1,1,1-Trichloroethane	5
156-59-2	cis-1,2-Dichloroethene	5
156-60-5	trans-1,2-Dichloroethene	5
79-01-6	Trichloroethene	5
75-01-4	Vinyl chloride	2

Inferred EN-CAF Capture Zone

EN-D13	1/28/04
TCE	39 (30)
CIS	1.1 (1.0)
VC	ND (ND)
TCA	ND (0.6J)
DCA	13 (13)
DCE	ND (0.5J)

EN-D33	4/13/04	5/18/04
TCE	1700	90
CIS	160	1100
VC	52	55
TCA	180	190
DCA	190	170
DCE	26J	20J

EN-CAF	2/3/04
TCE	230
CIS	57
VC	4.6J
TCA	34
DCA	49
DCE	ND@10

EN-D38	6/9/04	7/15/04
TCE	6	40
CIS	2	21
VC	ND	5.8
TCA	4	22
DCA	5	47
DCE	ND@1	1.9

EN-D35	6/22/04	7/14/04
TCE	ND@1	ND@1
CIS	ND@1	ND@1
VC	ND@1	ND@1
TCA	ND@1	ND@1
DCA	ND@1	ND@1
DCE	ND@1	ND@1

EN-D37	6/10/04	7/14/04
TCE	2	110
CIS	0.4J	14
VC	ND@1	6.4
TCA	ND@1	6.6
DCA	ND@1	18
DCE	ND@1	2.6

EN-D9	2/4/04
TCE	ND@1
CIS	ND@1
VC	ND@1
TCA	ND@1
DCA	ND@1
DCE	ND@1

EN-D11	2/4/04
TCE	ND@1
CIS	ND@1
VC	ND@1
TCA	ND@1
DCA	ND@1
DCE	ND@1

EN-D10	2/4/04
TCE	ND@1
CIS	ND@1
VC	ND@1
TCA	ND@1
DCA	ND@1
DCE	ND@1

EN-D36	6/23/04	7/14/04
TCE	ND@1	ND@1
CIS	ND@1	ND@1
VC	ND@1	ND@1
TCA	ND@1	ND@1
DCA	ND@1	ND@1
DCE	ND@1	ND@1

EN-D1	2/4/04
TCE	ND@1
CIS	ND@1
VC	0.26J
TCA	ND@1
DCA	ND@1
DCE	ND@1

LEGEND

- 825 / 826.2 - Groundwater Elevation Contour (feet) / Groundwater Elevation (feet)
- Bedrock Monitoring Well
- Bedrock Extraction Well
- Proposed Bedrock Monitoring Well
- VOC Concentrations (µg/l)
  (J - Estimated Value)
  (ND@X - Not Detected at Detection Limit "X")

EN-CAF	2/3/04
TCE	230
CIS	57
VC	4.6J
TCA	34
DCA	49
DCE	ND@10

VOC Abbreviations:

TCE - Trichloroethene
CIS - cis-1,2-Dichloroethene
VC - Vinyl Chloride
TCA - 1,1,1-Trichloroethane
DCA - 1,1-Dichloroethane
DCE - 1,1-Dichloroethene

Scale 0 150' 300'

Figure 3

Former IBM Endicott Site
Site #704014

Modified by WEW NYSDEC

Bedrock Potentiometric Surface Well and Boring Location Map, with VOC Concentrations
July 7, 2004

DRAWN BY: JPB | DATE: 12/13/05 | DRAWING NO. 22007-010-Q4
CHECKED & APPROVED BY: RCW/CAR/CGR

GROUNDWATER SCIENCES CORPORATION

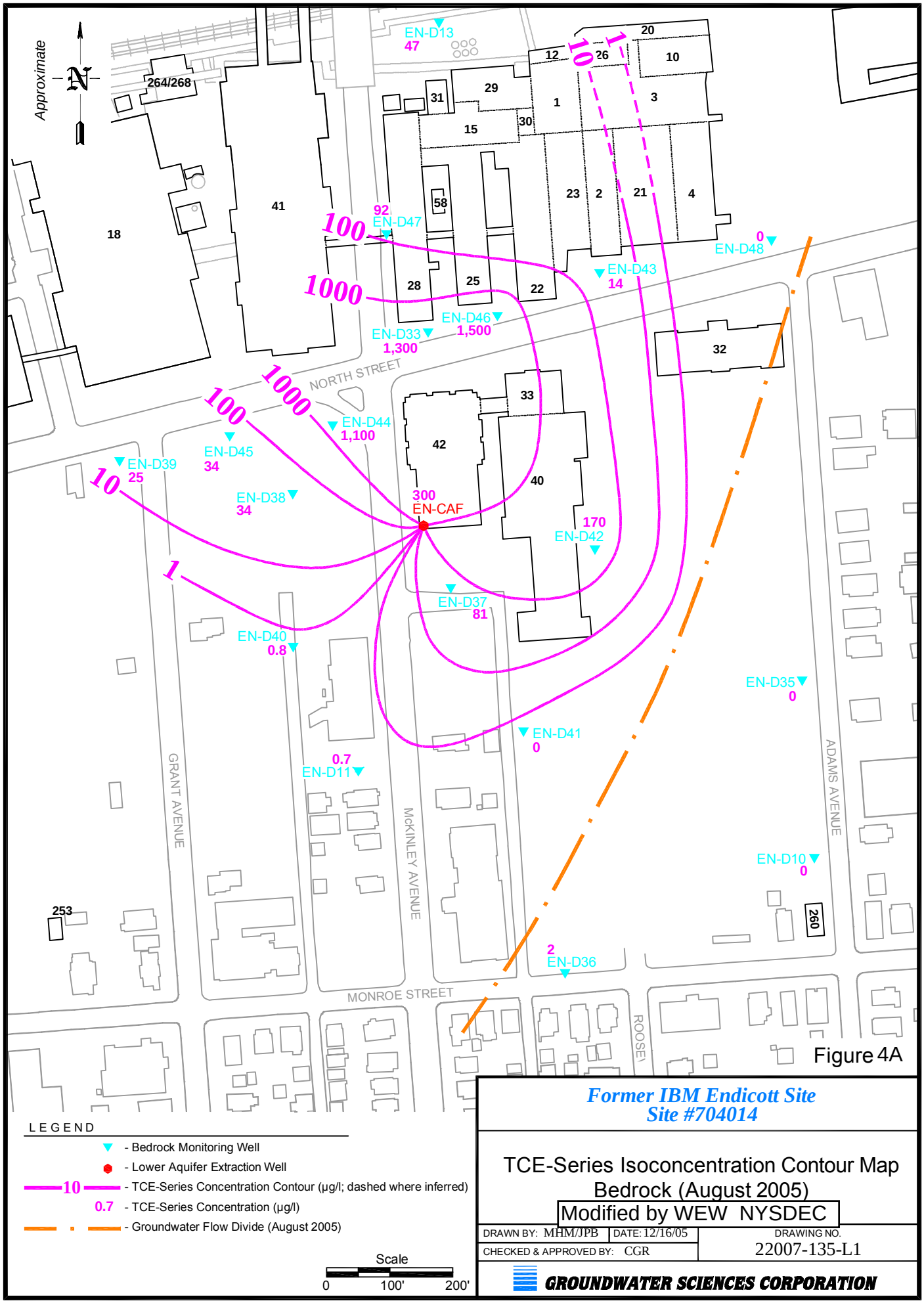


Figure 4A

Former IBM Endicott Site
Site #704014

TCE-Series Isoconcentration Contour Map
Bedrock (August 2005)
Modified by WEW NYSDEC

DRAWN BY: MHM/JPB	DATE: 12/16/05	DRAWING NO. 22007-135-L1
CHECKED & APPROVED BY: CGR		

GROUNDWATER SCIENCES CORPORATION

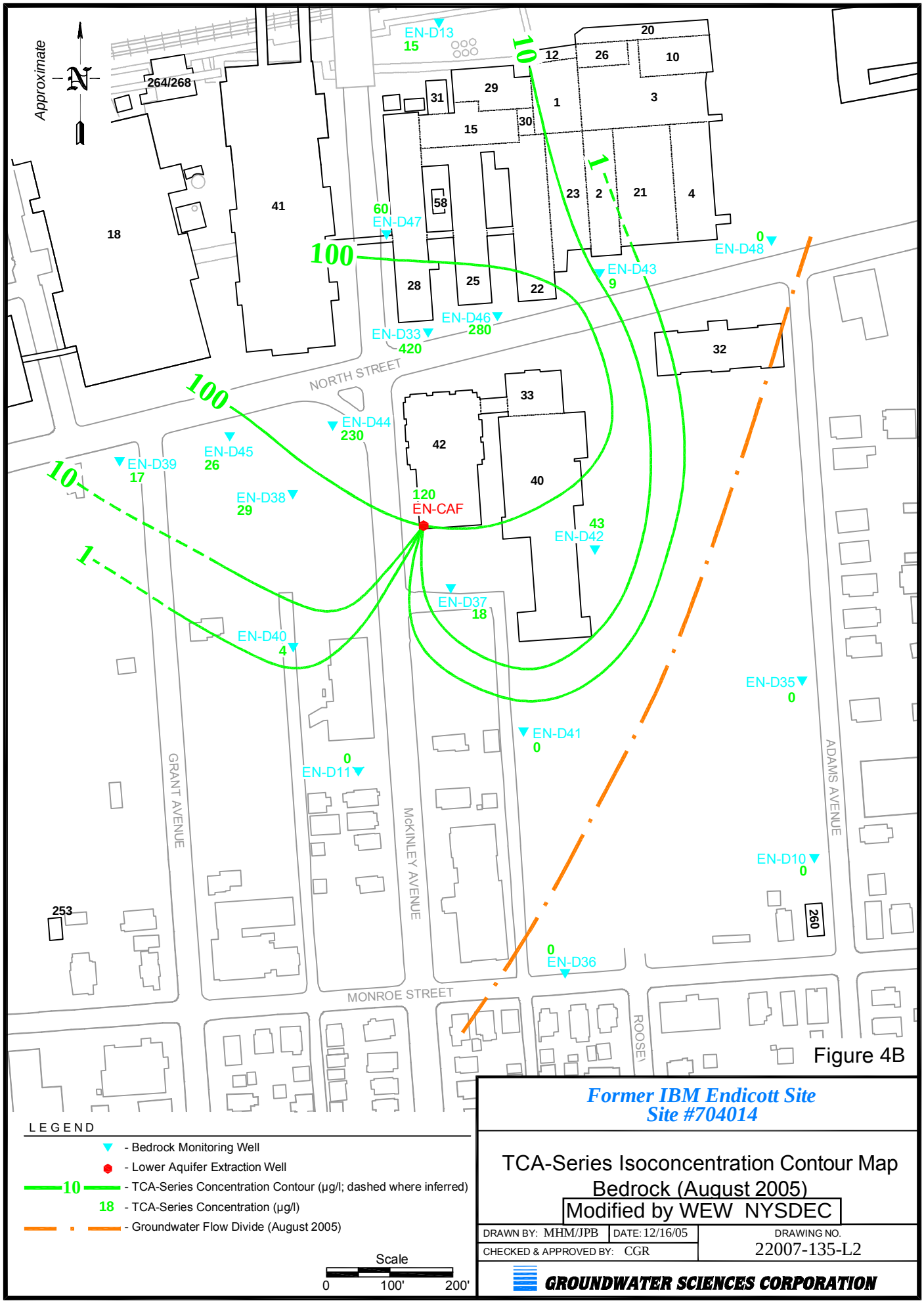


Figure 4B

LEGEND

- ▼ - Bedrock Monitoring Well
- ● - Lower Aquifer Extraction Well
- 10 - TCA-Series Concentration Contour (µg/l; dashed where inferred)
- 18 - TCA-Series Concentration (µg/l)
- - Groundwater Flow Divide (August 2005)

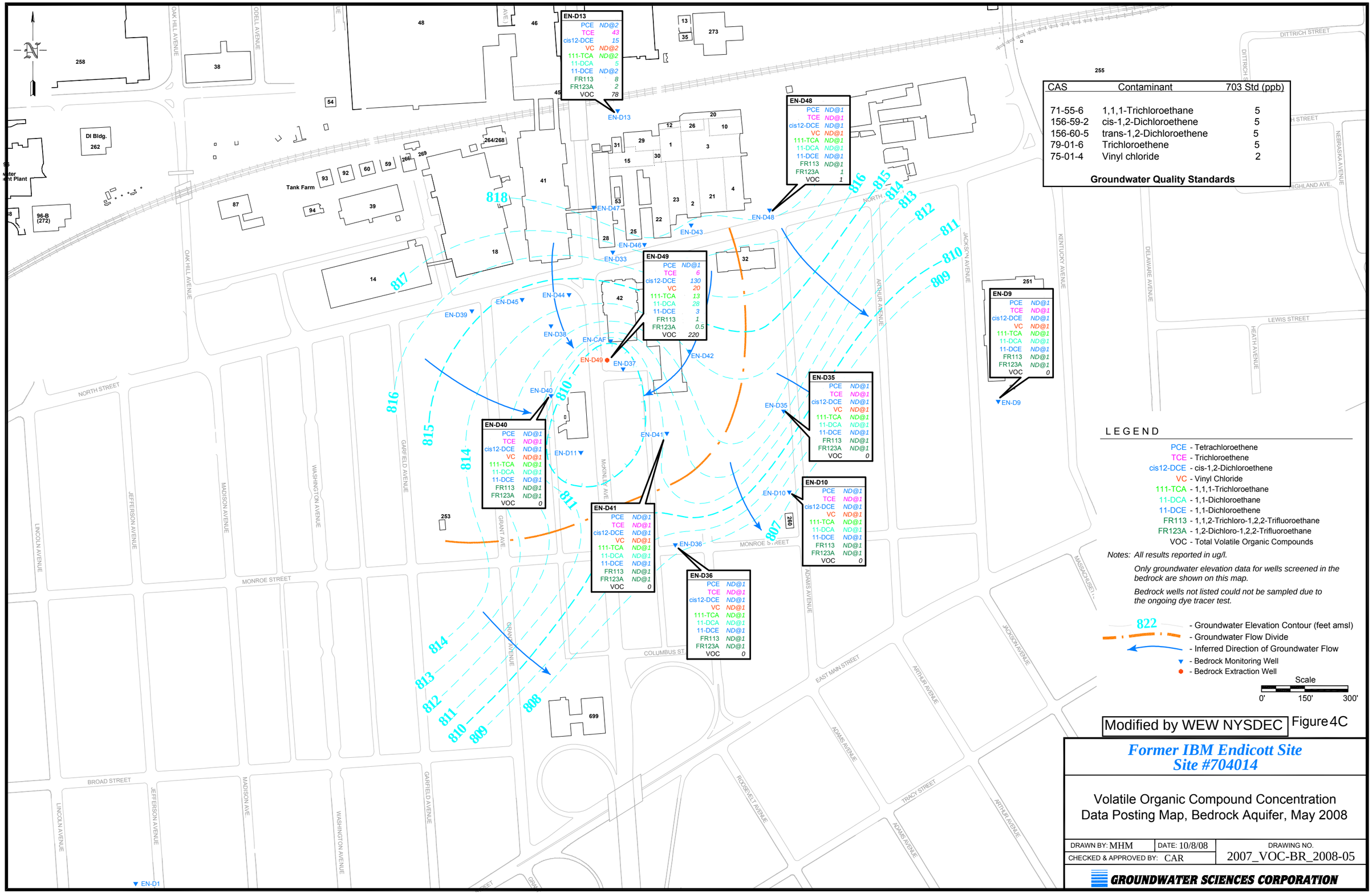
Scale
0 100' 200'

Former IBM Endicott Site
Site #704014

TCA-Series Isoconcentration Contour Map
Bedrock (August 2005)
Modified by WEW NYSDEC

DRAWN BY: MHM/JPB	DATE: 12/16/05	DRAWING NO. 22007-135-L2
CHECKED & APPROVED BY: CGR		

GROUNDWATER SCIENCES CORPORATION



CAS	Contaminant	703 Std (ppb)
71-55-6	1,1,1-Trichloroethane	5
156-59-2	cis-1,2-Dichloroethene	5
156-60-5	trans-1,2-Dichloroethene	5
79-01-6	Trichloroethene	5
75-01-4	Vinyl chloride	2

Groundwater Quality Standards

LEGEND

PCE - Tetrachloroethene
TCE - Trichloroethene
cis12-DCE - cis-1,2-Dichloroethene
VC - Vinyl Chloride
111-TCA - 1,1,1-Trichloroethane
11-DCA - 1,1-Dichloroethane
11-DCE - 1,1-Dichloroethene
FR113 - 1,1,2-Trichloro-1,2,2-Trifluoroethane
FR123A - 1,2-Dichloro-1,2,2-Trifluoroethane
VOC - Total Volatile Organic Compounds

Notes: All results reported in ug/l.

Only groundwater elevation data for wells screened in the bedrock are shown on this map.

Bedrock wells not listed could not be sampled due to the ongoing dye tracer test.

822 - Groundwater Elevation Contour (feet amsl)
- Groundwater Flow Divide
- Inferred Direction of Groundwater Flow
- Bedrock Monitoring Well
- Bedrock Extraction Well

Scale
0' 150' 300'

Modified by WEW NYSDEC

Figure 4C

Former IBM Endicott Site
Site #704014

Volatile Organic Compound Concentration
Data Posting Map, Bedrock Aquifer, May 2008

DRAWN BY: MHM	DATE: 10/8/08	DRAWING NO.
CHECKED & APPROVED BY: CAR		2007_VOC-BR_2008-05

GROUNDWATER SCIENCES CORPORATION

Approximate

N

#40
#32
#33
#24
#23
#25
#26

HILL AVENUE
(ROGERS AVE.)
McKINLEY AVENUE
NORTH STREET
GARFIELD AVENUE
GRANT AVE
WASHINGTON AVENUE

Building 47 foundation supported by 595 pilings that appear to extend through the lacustrine silt unit.

7B

WATER TANK
54 PUMP HOUSE
93 COOLING TOWER NO.4
92 COOLING TOWER NO.3
60 COOLING TOWER NO.2
59 COOLING TOWER NO.1

EN-D13 47
EN-D47 92
EN-D48 0
EN-D33 1,300
EN-D46 1,500
EN-D44 1,100
EN-D39 25
EN-D45 34
EN-D38 34
EN-CAF 300
EN-D42 170
EN-D37 81
EN-D40 0.8
EN-D41 0
EN-D11 0.7

100
1000
10
1

NOTES:

1. This figure is intended to compare TCE series concentrations in bedrock relative to manmade structures and areas of elevated TCE series concentrations in the Upper Aquifer.
2. The TCE series concentrations posted for each of the bedrock wells are based on VOC analysis of groundwater samples collected in August 2005. The TCE series VOCs include trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), and vinyl chloride (VC). The series concentrations were calculated by adding the values of each constituent that had been normalized to the parent constituent TCE.
3. The shaded circles on the figure represent the TCE series concentration in Upper Aquifer groundwater samples, graphically depicted as a percent of the TCE solubility in water of 1,400 milligrams per liter. The shaded circle centered on Elevator #24 is based upon analyses of grab samples for the elevator shaft. All other shaded circles are based upon groundwater samples from Upper Aquifer monitoring wells.

Upper Aquifer Groundwater
TCE-Series Concentration as a Percent of Constituent Solubility in Water

0.1% - 0.9%

1.0% - 9.9%

>10%

LEGEND

- Existing Building or Structure with Building Number (Where Known)
- Existing Railroad Siding
- TCE - Trichloroethene
- 10 - TCE-Series Concentration Contour (ug/l; dashed where inferred)
- 14 - TCE-Series Concentration (ug/l; August 2005)
- ▼ - Bedrock Monitoring Well
- ⬢ - Bedrock Extraction Well
- ● - Soil Boring Advanced Through Lacustrine Silt Unit
- #32 ■ - Hydraulic Elevator with Caisson/Shaft That is Estimated to Penetrate the Lacustrine Silt Unit or Terminate Near its Base

Modified by WEW NYSDEC

Scale
0 100' 200'

Figure5A

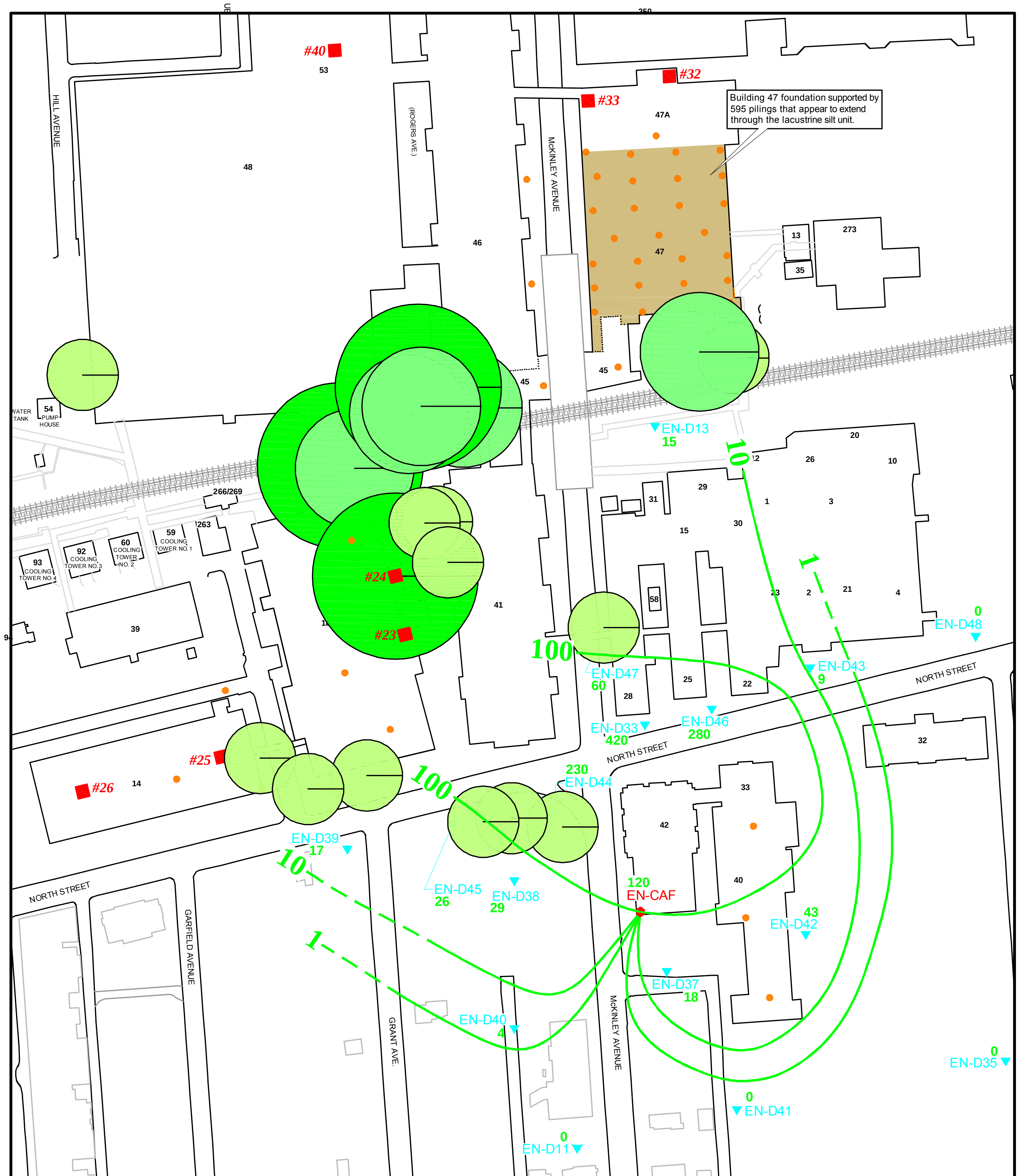
Former IBM Endicott Site
Site #704014

Potential Sources and Pathways of TCE-Series Constituents

DRAWN BY: JPB/MHM	DATE: 12/16/05	DRAWING NO.
CHECKED & APPROVED BY: CR/RW/CGR		22007-195-A1

GROUNDWATER SCIENCES CORPORATION

Approximate N



Upper Aquifer Groundwater 1,1,1-TCA-Series Concentration as a Percent of Constituent Solubility in Water

- 0.1% - 0.9%
- 1.0% - 9.9%
- >10%

NOTES:

1. This figure is intended to compare TCA series concentrations in bedrock relative to manmade structures and areas of elevated TCA series concentrations in the Upper Aquifer.
2. The TCA series concentrations posted for each of the bedrock wells are based on VOC analysis of groundwater samples collected in August 2005. The TCA series VOCs include 1,1,1-trichloroethane (TCA), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), and chloroethane (CA). The series concentrations were calculated by adding the values of each constituent that had been normalized to the parent constituent TCA.
3. The shaded circles on the figure represent the TCA series concentration in Upper Aquifer groundwater samples, graphically depicted as a percent of the TCA solubility in water of 1,250 milligrams per liter. The shaded circle centered on Elevator #24 is based upon analyses of grab samples for the elevator shaft. All other shaded circles are based upon groundwater samples from Upper Aquifer monitoring wells.

LEGEND

- Existing Building or Structure with Building Number (Where Known)
- Existing Railroad Siding
- 1,1,1-TCA - 1,1,1-Tricholoroethane
- 10 - 1,1,1-TCA-Series Concentration Contour (ug/l; dashed where inferred)
- 9 - 1,1,1-TCA-Series Concentration (ug/l; August 2005)
- Bedrock Monitoring Well
- Bedrock Extraction Well
- Soil Boring Advanced Through Lacustrine Silt Unit
- #32 Hydraulic Elevator with Caisson/Shaft That is Estimated to Penetrate the Lacustrine Silt Unit or Terminate Near its Base

Modified by WEW NYSDEC

Scale: 0 100' 200'

Figure 5B

Former IBM Endicott Site
Site #704014

Potential Sources and Pathways of 1,1,1-TCA-Series Constituents

DRAWN BY: JPB/MHM	DATE: 12/16/05	DRAWING NO.
CHECKED & APPROVED BY: CR/RW/CGR		22007-195-A2

GROUNDWATER SCIENCES CORPORATION

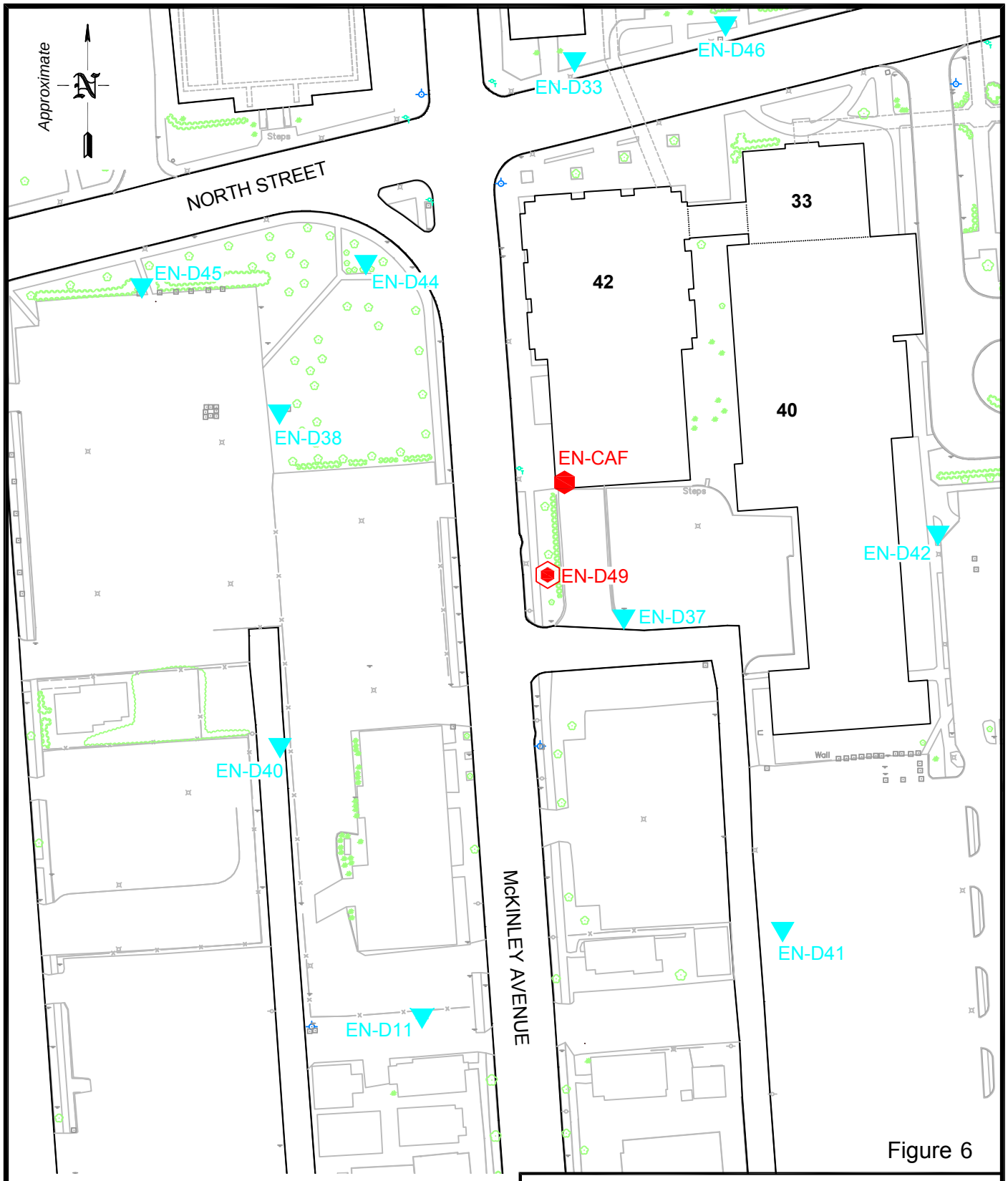


Figure 6

LEGEND

- ▼ - Bedrock Monitoring Well
- ⬢ - Bedrock Extraction Well
- ⬢ - Replacement Bedrock Extraction Well

Modified by WEW NYSDEC

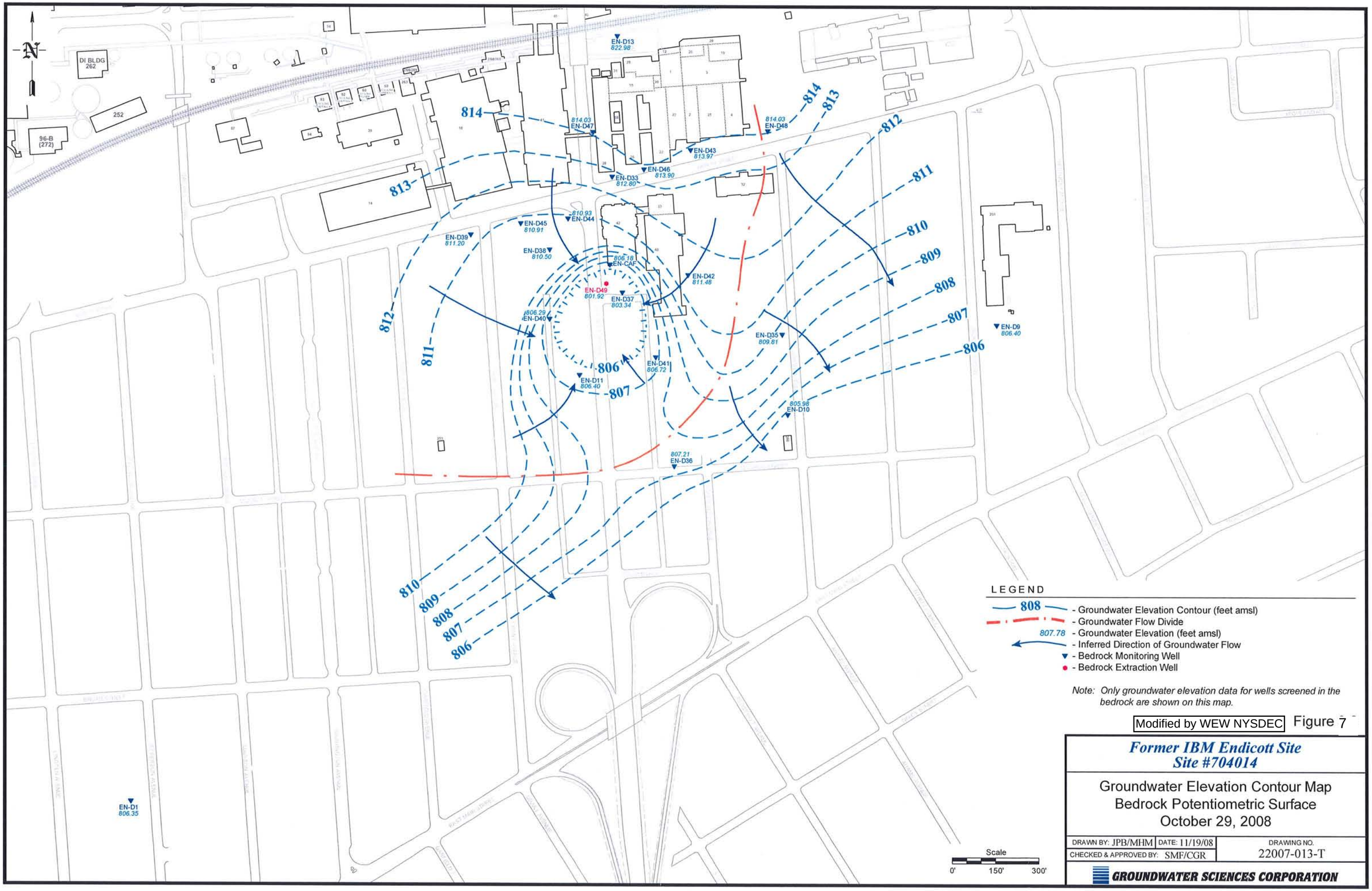
Scale
0 50' 100'

Former IBM Endicott Site
Site #704014

Location of EN-CAF
Replacement Well EN-D49

DRAWN BY: JPB/MHM	DATE: 6/14/06	DRAWING NO.
CHECKED & APPROVED BY: RCW/CAR		22007-194-B2

GROUNDWATER SCIENCES CORPORATION


N
DI BLDG 262
252
96-B (272)
EN-D13 822.98
814.03 EN-D47
814.03 EN-D48
EN-D43 813.97
EN-D46 813.90
EN-D33 812.80
810.93 EN-D44
EN-D45 810.91
EN-D39 811.20
EN-D38 810.50
806.18 EN-CAF
EN-D49 801.92
EN-D37 803.34
EN-D42 811.48
806.29 EN-D40
EN-D41 806.72
EN-D11 806.40
EN-D35 809.81
EN-D9 806.40
805.98 EN-D10
807.21 EN-D36
EN-D1 806.35
814
813
812
811
810
809
808
807
806
LEGEND
808 - Groundwater Elevation Contour (feet amsl)
- Groundwater Flow Divide
807.78 - Groundwater Elevation (feet amsl)
- Inferred Direction of Groundwater Flow
- Bedrock Monitoring Well
- Bedrock Extraction Well
Note: Only groundwater elevation data for wells screened in the bedrock are shown on this map.
Modified by WEW NYSDEC
Figure 7
Former IBM Endicott Site
Site #704014
Groundwater Elevation Contour Map
Bedrock Potentiometric Surface
October 29, 2008
DRAWN BY: JPB/MHM
DATE: 11/19/08
CHECKED & APPROVED BY: SMF/CGR
DRAWING NO. 22007-013-T
GROUNDWATER SCIENCES CORPORATION
Scale
0'
150'
300'