IBM

8976 Wellington Road
Manassas, VA 20109

February 23, 2015

Alex Czuhanich
Engineering Geologist
New York State Department of Environmental Conservation
Division of Environmental Remediation Bureau E
625 Broadway, 12th Floor
Albany, NY 12233-7017

Re: Transmittal of Documentation
Focused Feasibility Report of Findings
Operable Unit #5 (OU#5)
Order on Consent Index # A7-0502-0104, Site # 704014, Endicott, New York

Dear Mr. Czuhanich:

The attached Focused Feasibility Study report was prepared as required by the referenced Order on Consent and is intended to support NYSDEC's preparation of a Proposed Remedial Action Plan (PRAP) and Record of Decision (ROD).

Should you have any questions, please contact Kevin Whalen at 703-257-2582.

Sincerely,

M. E. Meyers

Mitchell E. Meyers
Manager, Environmental Remediation
IBM Corporate Environmental Affairs

cc: B. Boyd, NYSDOH - Troy
K. Lynch, NYSDEC Region 7
D. Tuohy, NYSDEC – Albany, w/out enclosure
C. Edwards, Broome County Health Department
C. Pelto, EIT

Encl. OU#5 Focused Feasibility Study Report

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Building Trust. Engineering Success.

FOCUSED FEASIBILITY STUDY

OPERABLE UNIT #5/BUILDING 57 AREA

Union and Endicott, New York

Prepared for IBM Corporation
File No. 2466.02
February 2015

Mr. Mitchell Meyers
IBM Corporate Environmental Affairs
8976 Wellington Road
Manassas, VA 20110

February 23, 2015
File No. 2466.03

Re: Focused Feasibility Study
OU#5/Building 57 Area
Union and Endicott, New York

Dear Mr. Meyers:

Enclosed please find the Focused Feasibility Study Report for the OU#5/Building 57 Area. This report was prepared for submission to the New York State Department of Environmental Conservation and the New York State Department of Health, for their review and approval.

We appreciate the opportunity to serve IBM on this project. Please contact us with any questions.

Very truly your
SANBORN, HEAD

David Shea

Dave Shea, P.E.
President

Jonathan Ordway, P.E.
Senior Project Director

JO:jo

Encl. Focused Feasibility Study Report

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1.0 INTRODUCTION

This Focused Feasibility Study report (study) presents the basis and scope of limited hydraulic containment and groundwater monitoring as the recommended remedy for Operable Unit No. 5 (OU#5), also known as the Building 57 site (the site). The site was part of the former IBM Endicott facility. On behalf of the IBM Corporation (IBM), the study was conducted and completed by Sanborn, Head Engineering, P.C., with assistance from Sanborn, Head & Associates, Inc., and prepared pursuant to Administrative Order on Consent Index # A7-0502-0104 (AOC) between the New York State Department of Environmental Conservation (NYSDEC) and IBM, executed on August 4, 2004 and effective on August 14, 2004. This study was prepared as required by the consent order and is intended to support NYSDEC's preparation of a Proposed Remedial Action Plan (PRAP) and Record of Decision (ROD).

This study follows the completion of a Supplemental Remedial Investigation[1] (SRI). When the SRI was initiated in 2004, IBM was operating a small groundwater treatment facility (GTF) to contain an area where volatile organic compounds (VOCs) were found to be present in soil and groundwater. The SRI identified evidence that the distribution of VOCs was broader than previously understood and that additional extraction wells were required to contain the newly identified source areas (described in Section 2.2). Although VOCs were identified in groundwater along the downgradient property boundary, the rate of VOC migration off-site was limited due to low groundwater flow rates. The only impacts noted were to on-site soil, groundwater (on-site and to a limited degree downgradient of the site) and on-site soil vapor.

After characterizing the newly identified VOC source areas and associated groundwater conditions, IBM expanded the existing hydraulic containment system to further limit potential off-site VOC migration in groundwater. The New York State Department of Health (NYSDOH), the site owner, and one of the site tenants conducted indoor air sampling and concluded no mitigation of indoor air was necessary. Further, no connection was evident between conditions at OU#5 and the areas to the south and southeast that were already being mitigated for VOC vapor intrusion.

To remove VOC mass from the source zones, IBM implemented two Interim Remedial Measures (IRMs) within five residual source zones identified in the SRI. One source zone was remediated through removal of VOC-impacted soil that was accessible to excavation, followed by hydraulic containment of this area to limit potential impacts from the remaining residual VOC source mass. Four source zones were remediated with in situ thermal treatment (ISTT).

Based on the results of the SRI, and the post IRM soil assessment, the site does not pose a significant threat to human health or the environment; therefore, no further action other than continued operation, maintenance, and monitoring of the remaining groundwater extraction well (EN-709), is proposed as the remedy for this site.

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[1] March 11, 2010, "Report of Findings, Supplemental Remedial Investigation, Operable Unit #5/Building 57 Area, Union and Endicott, New York." Prepared by Sanborn, Head Engineering, P.C. for IBM Corporation.

This report is subject to the standard limitations for this type of work presented as Appendix A.

1.1 Site Location and Description

OU#5 (shown on Figure 1) is located in the Town of Union in Broome County, New York, and is part of the former IBM campus. As shown on Figure 2, OU#5 comprises multiple parcels, including the approximate eight-acre property containing Buildings 57 and 57A, an approximate five-acre lot south of the Conrail railroad tracks (former Huron Lot 26), and two parcels located north of Building 57 (2107 and 2203 Wayne Street). The site properties were formerly owned by IBM. At the time of the SRI, the properties were owned by Huron Real Estate Associates, LLC. Lot 26 was subsequently sold and redeveloped as Gault Toyota. The former IBM buildings are currently used for light manufacturing and warehousing.

The site is located near the northern floodplain of the Susquehanna River, which is approximately 2,500 feet to the south. The Building 57/57A property is bounded to the north and east by Brixius Creek, which flows east beyond the site then turns south to discharge approximately 0.7 miles southeast to the Susquehanna River. According to review of historical topographic maps and aerial photos, the course of Brixius Creek has been substantially altered over time to its current alignment. According to review of historical mapping (as well as anecdotal information from site personnel and neighbors), drainage features associated with Brixius Creek were present below portions of Building 57A. The land beneath the current footprint of the buildings was filled to its current elevation when the parcels were developed.

As the ground surface elevation contours on Figure 2 indicate, topography of Buildings 57/57A property is relatively flat, at about 842 to 845 feet above mean sea level. The ground surface rises steeply to the north, and localized steep slopes border Brixius Creek. Surface drainage from the Building 57/57A property is collected in a storm sewer system and discharged to Brixius Creek at the northeast corner of the property.

Buildings 57 and 57A are "high bay"-type warehouse structures connected by an enclosed loading dock. The remainder of the Building 57/57A property is mostly paved, with narrow areas of vegetation along the south, east, and north property boundaries.

1.2 Operational History

Building 57 was constructed in the early- to mid-1950s, and was used for manufacturing. Building 57A was constructed in the late 1970s or early 1980s for warehousing, before which time the building footprint and surroundings were paved parking areas. Both buildings have been used for light manufacturing and warehousing/storage since IBM sold the property to Huron. The Source Area Evaluation (SAE) report[2] documents our current

[2] Sanborn, Head Engineering, P.C., September 9, 2005, "Source Area Evaluation, OU#5: Building 57 Area, Union and Endicott, New York, AOC Index # A7-0502-0104, Site # 704014, Endicott, New York."

understanding of the historical use and storage of various substances, including VOCs, on the Building 57/57A property. These uses included:

- Storage of 1,1,1-trichloroethane (TCA) and chlorofluorocarbons (CFCs), including Freon®-113 (CFC-113), in ASTs located near the current loading dock (CFC Area) and south of the current Building 57A (TCA Area);
- Storage and incineration of waste solvents adjacent to the southeast corner of Building 57A (Waste Solvent Area), which pre-dates the building construction; and
- A vapor degreasing operation in Building 57 (B57 Area).

The inferred locations of ASTs and other site features associated with chemical use and storage are shown on Figure 2. Additional details, including sources of historical information, are provided in the SAE report.

1.3 Remedial History

Groundwater extraction and treatment was initiated at OU#5 in 1997 after the discovery of CFC-113 in groundwater samples near the loading dock area. The groundwater extraction and treatment system was expanded following the discovery of additional areas of contamination during the SRI. The ISTT IRM eliminated the need for groundwater extraction and treatment on the main Building 57/57A property, but hydraulic containment remains the strategy for managing groundwater conditions at Lot 26.

1.3.1 Groundwater Extraction and Treatment

A brief summary of groundwater extraction and treatment at OU#5 is provided below.

- Groundwater was extracted from well EN-89R from 1997 to 2011 to address CFCs found in nearby groundwater wells. In 2010, well EN-89R was replaced by well EN-710 (Figure 3), which allowed for higher extraction rates and an expanded capture zone.
- Starting in 1997, groundwater was treated on-site in the temporary Hayes Avenue Groundwater Treatment Facility (GTF). In 2008, a transmission line was installed to convey groundwater extracted from OU#5 to IBM's Clark Street GTF. The Hayes Avenue GTF was converted to a transfer pumping station with capabilities to add sequestrant agents for operational preventive maintenance as required.
- Based on initial SRI findings, extraction wells EN-623 and EN-624 were installed, and the Hayes Ave GTF was upgraded to accommodate extraction and treatment testing from the two new wells. The testing indicated the wells were capable of providing hydraulic containment of the inferred source zones; therefore, pumping from these wells continued until October 2011, when construction activities for the ISST began.
- Extraction well EN-709, located on the current Gault Toyota property, was connected to the Clark Street GTF and has been providing hydraulic containment of the former Lot 26 area since June 2013. In October 2014 IBM performed an expanded capture zone

assessment to better assess the estimated limits of hydraulic capture for well EN-709. Based on the results of this assessment, IBM established the target pumping rate for EN-709 as 9 gallons per minute (gpm).

1.3.2 Interim Remedial Measures (IRMs)

This study was conducted after completing two IRMs, which included:

- Targeted excavation of approximately 135 cubic yards (cy) of soil from the former Lot 26 parking area (currently developed as the Gault Toyota dealership) documented in the July 12, 2011 IRM Completion Report[3] (note that zones of VOC impacted soils that were clearly identified and accessible were targeted for excavation, residual source mass likely remains below the surface, which is the reason for ongoing groundwater extraction from well EN-709); and

- In situ thermal treatment (ISTT) of four identified source zones (approximately 27,000 cy of soil) and installation of a sheet pile groundwater cutoff wall documented in the November 30, 2012 IRM Completion Report[4].

The Remedial Action Objectives (RAOs) for these IRMs were to remove or treat soils with concentrations of volatile organic compounds (VOCs) that exceeded the Soil Cleanup Objectives (SCOs) for restricted commercial use. The RAOs were met for both IRMs.

- Confirmatory sampling from the sidewalls and bottom of the excavation in Lot 26 (19 samples) indicated VOC concentrations were below the Restricted Residential SCOs.

- Confirmatory sampling from 39 borings within the four ISTT treatment zones (180 samples in total during three separate sampling rounds) indicated post ISTT VOC in soil concentrations are below the Unrestricted SCOs (results of pre and post-ISTT soil sample concentrations are plotted with depth for each source zone and presented in Appendix B).

Based on the documented success of these two IRMs, no additional actions are necessary to address site soils.

1.4 Regulatory Enforcement Status

NYSDEC and IBM entered into a Consent Order on August 4, 2004. The Order obligated 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 for each of seven "Operable Units." For OU#5, the Order required performance of an SRI and FFS. The SRI report was submitted to the Agencies on March 11, 2010 and approved on April 13, 2010. Several addenda to the SRI report have since been prepared and submitted to the agencies as identified herein.

[3] July 12, 2011 "IRM Completion Report – Lot #26 Excavation, Operable Unit #5/Lot 26 Area" prepared by Sanborn, Head Engineering P.C. for IBM Corporation.

[4] November 30, 2012 "Building 57 Interim Remedial Measure (IRM) Completion Report, Operable Unit #5/Building 57 Area" prepared by Sanborn, Head & Associates, Inc. for IBM Corporation.

Targeted excavation of soil from the Lot 26 source zone and ISTT of four additional source zones were proposed as IRMs based on interim findings of the SRI.

- The IRM Completion Report for the Lot 26 excavation was submitted to the Agencies on July 12, 2011 and approved on April 26, 2012.

- The IRM Completion Report for ISTT was submitted to the Agencies on November 30, 2012 and approved on January 31, 2013.

2.0 SUMMARY OF SUPPLEMENTAL REMEDIAL INVESTIGATION

The SRI was conducted with the following objectives:

- To identify and characterize the nature and extent of potential on-site sources of VOCs, in particular chlorinated VOCs (CVOCs), that appear to be responsible for the presence of CVOCs detected in groundwater and subsurface vapor in the vicinity;

- To assess the hydrogeology of the OU#5 area relative to the potential transport and fate of VOCs; and

- To provide a preliminary screening of source mass removal technologies and strategies.

Multiple phases of the SRI were conducted between 2004 and 2011. In addition to the assessment of soil, soil gas, and groundwater quality, the SRI included: groundwater extraction and treatment testing; preliminary assessment of potential remedial technologies; dual phase groundwater and soil vapor extraction pilot testing; a field and laboratory bioattenuation study; and a bench scale thermal treatability study. The SRI activities are documented in the March 2010 SRI report (previously referenced). Additional exploration and testing was performed to support design of ISTT. These activities are documented in the June 2011 IRM Work Plan[5] and in the October 2011 WSA Excavation Report[6].

A post-ISTT IRM assessment of bedrock groundwater quality below the CFC Area was conducted in the spring and summer of 2013. A report[7] conveying the results of the bedrock groundwater assessment was submitted to NYSDEC in November 2013 and approved in April 2014. The assessment identified the presence of CFCs in bedrock groundwater below the CFC area, and below the zone of thermal treatment, at concentrations as high as 13,000 μg/l. The report concluded that residual CFCs discovered in bedrock groundwater below the CFC Area are not migrating beyond North Street (the

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5 Sanborn, Head Engineering, P.C., June 24, 2011, "In Situ Thermal Treatment IRM Work Plan – Operable Unit #5, Building 57, Former IBM Facility, Endicott, New York, AOC Index No. A7-0502-0104, NYSDEC Site No. 7-04-014".

6 Sanborn, Head Engineering, P.C., October 14, 2011, "Building 57 Waste Solvent Area Excavation – Operable Unit #5, Building 57, Former IBM Facility, Union and Endicott, New York, 7-04-014."

7 Sanborn, Head Engineering, P.C., November 15, 2013, "Bedrock Groundwater Assessment Report of Findings, Supplemental Remedial Investigation Addendum, Operable Unit #5/Building 57 Area, Union and Endicott, New York."

downgradient boundary of OU#5) and that impacted groundwater is within the capture zone of extraction well EN-709.

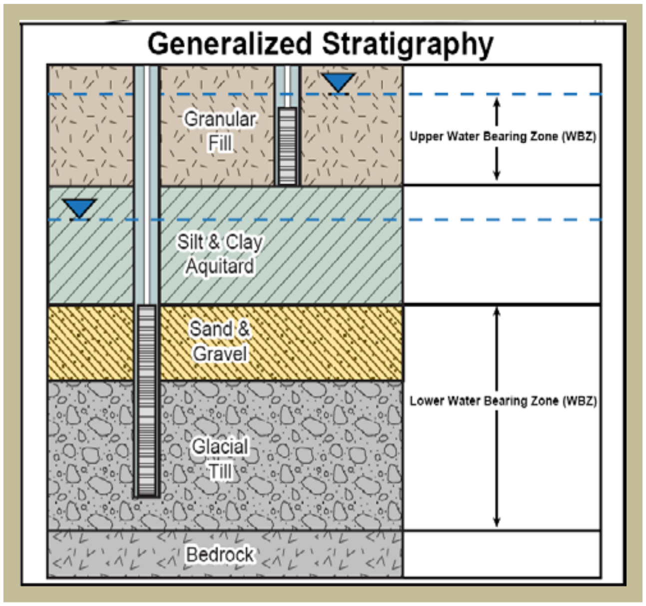
Following review of the August 2014 routine groundwater monitoring data, IBM noted a rising trend in CFC concentrations at monitoring well EN-700 and in the influent water quality for extraction well EN-709. These observations prompted an expanded capture zone assessment for well EN-709. A report[8] conveying the results of the expanded capture zone assessment was submitted to NYSDEC on January 12, 2015 and approved February 18, 2015. The assessment confirmed the findings of the bedrock groundwater quality assessment that CFCs present in bedrock below the CFC Area appear to migrate into the overburden and are captured by extraction well EN-709. As noted above, the assessment also led to establishing a target extraction rate for EN-709 of 9 gpm.

2.1 OU#5 Geology and Hydrogeology

A brief summary of the site geology and hydrogeology is provided below. More detailed descriptions are provided in the SRI Report.

2.1.1 Site Geology

OU#5 is located near the northern boundary of the "Valley Aquifer System." Although there are variations, the generalized stratigraphy beneath the site consists of bedrock overlain by glacial till, overlain by alluvial deposits of silt, sand, and gravel, overlain by a local silt and clay aquitard, overlain by granular fill. For monitoring and assessment purposes, the groundwater present above the local aquitard has been designated as the "Upper Water Bearing Zone" (WBZ) and groundwater present below the local aquitard has been designated as the "Lower WBZ."



The local silt and clay aquitard appears to be related to the alluvial history of Brixius Creek. Although the aquitard appears contiguous within the vicinity of the Building 57/57A property, it tapers out to the north and south. The approximate northern and southern limits of the local silt and clay aquitard are shown on Figure 4. In the southern portion of Lot 26 and at off-site properties to the south and southeast of Building 57A, the stratigraphy appears to transition toward a regional "valley aquifer system." The regional valley aquifer system is described as an upper and lower aquifer separated by a regionally-present lacustrine silt and clay aquitard. Groundwater from the Upper and Lower WBZs discharge into the regional upper aquifer.

[8] Sanborn, Head & Associates, Inc. January 12, 2015, "Expanded Capture Zone Assessment Report of Findings, Supplemental Remedial Investigation Addendum, Operable Unit #5/Building 57 Area, Union and Endicott, New York."

2.1.2 Site Hydrogeology

The upper WBZ is in hydraulic communication with Brixius Creek and has a saturated thickness ranging from approximately 0 to 7 feet. Groundwater elevation contours and inferred horizontal flow directions in the upper WBZ based on monitoring in 2009 are shown on Figure 4. Depending on the surface water level, which varies significantly during periods of high runoff, the upper WBZ either discharges to, or receives water from, Brixius Creek. The upper WBZ also discharges to the lower WBZ. Due to the limited thickness, the upper WBZ is not considered a significant groundwater migration pathway.

Within the Building 57/57A property, the effective thickness of the lower WBZ is generally limited to 2 to 5 feet, comprising varying proportions of silt, sand, and gravel, and (in some cases) the upper portion of the glacial till. Groundwater elevation contours and inferred horizontal flow directions in the Lower WBZ, based on monitoring in August 2014, are shown on Figure 5. There is evidence to suggest groundwater from the lower WBZ migrates downgradient of the site (particularly to the east). Due to the combined effect of fine-grained, low-permeability material (low hydraulic conductivity) and limited saturated thickness, the off-site migration of groundwater is estimated at about 3 gallons per minute or less.

2.2 Contaminant Constituents and Source Zones

As concluded by the SRI, CVOCs are the primary contaminants of interest at OU#5 and no remedial measures were needed to address non-CVOC contamination. CVOCs, including trichloroethene (TCE), 1,1,1-trichloroethane (TCA), and CFC-113 and their associated biochemical degradation products, are the principal VOCs of interest, based on the concentrations detected and the potential for migration. These compounds (chlorinated ethenes, chlorinated ethanes, and CFCs) are referred to hereinafter as “Principal Site VOCs.” As shown on Figure 3, and outlined below, six separate source zones were identified and assessed at OU #5.

- **Building 57A Area (B57A Area)**: Located beneath the central portion of Building 57A where sampling indicated the presence of VOCs and petroleum compounds, although no historical processes, uses, or releases were identified to explain the observed conditions. We believe the identified contaminants were present in this area prior to construction of Building 57A in the mid-1980s. This area was remediated as part of the ISTT IRM.

- **Former Waste Solvent Area (Waste Solvent Area)**: Located east-southeast of Building 57A where a former approximately 500-gallon waste solvent tank and a former solvent incinerator were apparently situated (the identification of these features is based on review of historical mapping). This area was remediated as part of the ISTT IRM.

- **Former 1,1,1-Trichloroethane (TCA) Aboveground Storage Tank (AST) Area (TCA Area)**: Located south of Building 57A where it appears that two approximately 35,000-gallon TCA ASTs were located (according to historical mapping and aerial photographs). This area was remediated as part of the ISTT IRM.

- **Former Chlorofluorocarbon-113 (CFC-113) AST Area (CFC Area)**: Located to the south of the loading dock between Buildings 57 and 57A where a former CFC-113 AST was located (according to historical mapping). This area was remediated as part of the ISTT IRM.

- **Building 57 Area (B57 Area)**: Located beneath Building 57 where historical mapping identifies a vapor degreasing and oil quenching operation, and soil vapor survey data suggested an area of subsurface VOC presence. The available data indicated this area to be a *de minimis* source and the Agencies agreed that no remediation of this area was necessary.

- **Huron Lot 26, also referred to as Hayes Avenue Parking Area (Lot 26)**: Located on the south side of the Conrail railroad tracks, south of Building 57 and southwest of Building 57A. Although not likely to be the entire source of VOCs detected in groundwater below Lot 26, TCE and cDCE were detected in relatively shallow soils within a definable area. These soils were excavated as an IRM prior to turning the property over for redevelopment. A groundwater extraction well (EN-709) was installed in the parking area and pumping from this location provides ongoing hydraulic containment of the former parking area and areas upgradient.

Details of the specific soil sampling locations and associated concentrations are provided in the SRI report and in the IRM Completion reports. Post IRM confirmatory sampling indicated that the concentrations of Principal Site VOCs are below the restricted residential SCOs in Lot 26 and below the Unrestricted SCOs within the four ISTT treatment zones. By achieving the SCOs agreed upon with NYSDEC, no further source zone remediation is necessary.

2.3 Pre-IRM Distribution of Principal Site VOCs in Lower WBZ Groundwater

Based on the SRI data, the primary pathway for VOC migration in groundwater was within the lower WBZ. Principal Site VOCs found in the source zones were also found in downgradient groundwater, as indicated in Figure 6, which was developed using pre-IRM groundwater concentration data. The off-site VOC concentrations were relatively low compared with concentrations found on-site, except in the monitoring well MW-DEC-34D located on the east side of Brixius Creek, not far from the WSA.

2.4 Post-IRM Distribution of Principal Site VOCs in Groundwater

A summary of post IRM groundwater quality data (August 2014) is provided in Table 1. The Post-IRM concentrations of Principal Site VOCs in lower WBZ groundwater are also shown on Figure 7. Comparison of pre-IRM to post IRM distribution of Principal Site VOCs demonstrates a significant reduction of groundwater VOC concentrations. Time series concentration data presented in Figures 8, 9, and 10 for ethenes, ethanes, and CFCs indicate significant reductions in groundwater VOC concentrations that correlate with the implementation of ISTT. The time series data also indicate that the concentrations of certain Principal Site VOCs within and downgradient of the ISTT IRM treatment areas are continuing to decline.

Although there are some variations, groundwater quality in the former Lot 26 area is similar to the pre-IRM condition. Groundwater quality in this area may be influenced by multiple factors including: excavation of TCE-impacted soil, mobilization of CFCs from bedrock groundwater below the CFC Area, and dilution caused by pumping from well EN-709.

3.0 RECOMMENDED REMEDY

3.1 Remedial Action Objectives

NYSDEC has established Generic Remedial Action Objectives (RAOs) for groundwater, soil, surface water, sediment, and soil vapor (http://www.dec.ny.gov/regulations/67560.html). Based on the results of the SRI and the post IRM soil and groundwater sampling, there are no public health or environmental exposure pathways associated with soil, surface water, sediment, or soil vapor. Although the concentrations are relatively low, certain Principal Site VOCs are present in site groundwater at concentrations that exceed the 6NYCRR Part 703.5 Water Quality Standards for Surface Waters and Groundwater. The Generic RAOs for Groundwater are summarized below:

RAOs for public health protection

- **Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standard**. *Not applicable because the affected area is supplied by public water.*

- **Prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater.** *Not applicable, groundwater vapor intrusion assessments in the vicinity and downgradient of the site indicate no vapor intrusion impacts associated with OU#5.*

RAOs for Environmental Protection

- **Restore groundwater aquifer, to the extent practicable, to pre-disposal/pre-release conditions**. *As indicated on Figures 7 through 10, groundwater quality conditions have been significantly improved by the IRMs. With the noted exception of groundwater directly downgradient of the bedrock below the CFC area, which is captured by Well EN-709, there appears to be a continuing trend of improvement with time toward meeting the Standards.*

- **Prevent the discharge of contaminants to surface water**. *The combination of the ISTT IRM and the installation of a groundwater cutoff wall have reduced the potential discharge of contaminants to Brixius Creek. Groundwater extraction from Well EN-709 limits the potential for VOC mass to migrate south of North Street (i.e., toward the Susquehanna River).*

- **Remove the source of groundwater or surface water contamination**. *Meeting the unrestricted use SCOs in the four most contaminated source zones has effectively removed the source of groundwater contamination within the ISTT treatment zones. Post ISTT groundwater quality monitoring indicates continuing trends of decreasing VOC* *concentrations within and downgradient of the four ISTT treatment zones. Continued groundwater extraction and treatment is proposed to prevent off site mass migration associated with residual VOCs present below the former Lot 26, and CFCs that appear to be migrating from bedrock below the CFC Area.*

The overall goal of the groundwater remedial measures program is to attain New York State 6NYCRR Part 703.5 groundwater standards to the extent practicable. For the Principal Site VOCs, these remedial action goals are as follows:

TCE	5 µg/L
cis12DCE	5 µg/L
VC	2 µg/L
1,1,1-TCA	5 µg/L
1,2-DCA	5 µg/L
1,1,-DCE	5 µg/L
CFC113	5 µg/L

3.2 Hydraulic Containment of Lot 26

Groundwater extraction will continue from well EN-709 until the applicable groundwater quality standards are met, or until an alternate remedial strategy is identified, proposed to NYSDEC, and accepted.

3.3 Continued Groundwater Monitoring

The current program of groundwater monitoring will continue until groundwater quality standards are met for the Principal Site VOCs. The monitoring wells that are currently included in the monitoring program are tabulated below; all wells listed are sampled in August; highlighted wells are also sampled in May.

EN-030	EN-304	EN-409	EN-606	EN-616
EN-617	EN-623	EN-624	EN-632	EN-638
EN-641	EN-642	EN-651	EN-652	EN-653
EN-655	EN-679	EN-684A	EN-687	EN-692
EN-694	EN-696	EN-698	EN-700	EN-701
EN-702	EN-704	EN-705	EN-710	EN-711
EN-712	EN-713	EN-714	EN-715	EN-716
EN-717	EN-718	EN-719	EN-720	EN-721
EN-722	EN-723	EN-724	EN-725	EN-726
EN-727	MW-34-D			

Groundwater data for Principal Site VOCs will be reviewed and analyzed after each round. As groundwater quality trends develop (e.g., concentrations routinely below standards for several rounds of sampling), IBM may petition to modify the sampling program to eliminate wells or reduce the frequency of monitoring.

TABLE

Table 1
August 2014 Summary of VOCs in Groundwater
Operable Unit # 5/Building 57 Area
Union and Endicott, NY

Analyte Name	NYSDEC GW Part 703	EN-725	DEC-MW-34D	EN-030	EN-304	EN-409	EN-606	EN-616	EN-617	EN-623	EN-624	EN-632	EN-638
		S	S	S	S	S	S	S	S	S	S	S	S
		8/5/2014	8/7/2014	8/7/2014	8/7/2014	8/7/2014	8/5/2014	8/5/2014	8/5/2014	8/7/2014	8/5/2014	8/5/2014	8/5/2014
VOCs													
AVOCs													
Ethylbenzene	5	<20	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	<0.1	**0.5**	<0.1
Toluene	5	<20	**0.1 J**	<0.1	<0.1	<0.1	<0.2	<0.1	<0.5	**0.1 J**	**0.6**	<0.1	<0.1
Xylenes	5	<20	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	**0.2 J**	**0.6**	<0.1
CVOCs													
Chloroethane	5	<20	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	**0.9 J**	**1.8**	**4.1**	<0.1	<0.1
Dichloroethane (1,1-)	5	<20	**10**	<0.1	<0.1	<0.1	**1.8**	**0.2 J**	**6.5**	**1.5**	**0.6**	**2.1**	<0.1
Dichloroethane (1,2-)	0.6	<20	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Dichloroethene (1,1-)	5	<20	**0.2 J**	<0.1	<0.1	<0.1	**0.3 J**	<0.1	**0.5 J**	**0.1 J**	<0.1	**2.9**	<0.1
Dichloroethene (cis-1,2-)	5	<20	**44**	**0.2 J**	<0.1	<0.1	**4.2**	**0.4 J**	**270**	**0.6**	**0.8**	**2.3**	<0.1
Dichloroethene (trans-1,2-)	5	<20	**0.7**	<0.1	<0.1	<0.1	<0.2	<0.1	**2.1 J**	<0.1	**0.7**	**0.6**	<0.1
Methylene Chloride (Dichloromethane)	5	<40	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2	<1.0	<0.2	<0.2	<0.2	<0.2
Tetrachloroethene (PCE)	5	<20	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Trichloroethane (1,1,1-)	5	<20	<0.1	<0.1	**0.1 J**	<0.1	<0.2	<0.1	<0.5	<0.1	<0.1	**1.8**	<0.1
Trichloroethene (TCE)	5	<20	**0.2 J**	**0.2 J**	**4.3**	<0.1	**1.6**	**1.7**	**6.5**	<0.1	**0.2 J**	**1.7**	<0.1
Vinyl chloride	2	<20	**60**	<0.1	<0.1	<0.1	**0.5 J**	<0.1	**41**	**0.6**	**0.6**	**0.2 J**	<0.1
Other VOCs													
Ethane, 1,1,2-trichloro-1,2,2-trifluoro- (CFC113)	5	**7,000**	<0.2	**22**	<0.2	<0.2	**67**	**6.6**	<1.0	<0.2	<0.2	**450**	<0.2
Ethane, 1,2-dichloro-1,1,2-trifluoro- (CFC123a)	-	**400**	**4.0**	**11**	<0.2	<0.2	**17**	**12**	**1.9 J**	**1.9**	**1.3**	**46**	**1.1**

Analyte Name	NYSDEC GW Part 703	EN-641	EN-642	EN-651	EN-652	EN-653	EN-655	EN-679	EN-684A	EN-687	EN-692	EN-694	EN-696
		S	S	S	S	S	S	S	S	S	S	S	S
		8/7/2014	8/5/2014	8/7/2014	8/7/2014	8/7/2014	8/7/2014	8/7/2014	8/7/2014	8/7/2014	8/5/2014	8/7/2014	8/7/2014
VOCs													
AVOCs													
Ethylbenzene	5	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	5	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylenes	5	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CVOCs													
Chloroethane	5	<0.1	<0.5	<0.1	<0.1	<0.1	**0.1 J**	<0.1	<0.1	<0.1	**1.0**	<0.1	<0.1
Dichloroethane (1,1-)	5	**1.1**	**1.0 J**	**0.4 J**	<0.1	<0.1	**0.5**	<0.1	<0.1	**0.7**	**4.6**	**0.4 J**	**24**
Dichloroethane (1,2-)	0.6	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2 J**
Dichloroethene (1,1-)	5	<0.1	**0.6 J**	**0.4 J**	<0.1	<0.1	**0.1 J**	<0.1	**0.3 J**	**0.1 J**	**0.2 J**	<0.1	**1.5**
Dichloroethene (cis-1,2-)	5	**52**	**42**	**14**	<0.1	**0.3 J**	**0.3 J**	<0.1	**41**	**0.6**	**1.1**	**0.2 J**	**1.4**
Dichloroethene (trans-1,2-)	5	**2.9**	<0.5	**0.2 J**	<0.1	<0.1	<0.1	<0.1	**0.3 J**	<0.1	<0.1	<0.1	<0.1
Methylene Chloride (Dichloromethane)	5	<0.2	<1.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetrachloroethene (PCE)	5	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Trichloroethane (1,1,1-)	5	<0.1	**0.6 J**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.4 J**	<0.1	<0.1	<0.1
Trichloroethene (TCE)	5	**5.5**	**120**	**18**	<0.1	**0.6**	**2.5**	**1.0**	**1.7**	**0.6**	**1.2**	**1.6**	<0.1
Vinyl chloride	2	<0.1	**2.6**	**0.2 J**	**0.2 J**	<0.1	**0.1 J**	<0.1	**0.2 J**	**0.2 J**	**0.1 J**	<0.1	**0.1 J**
Other VOCs													
Ethane, 1,1,2-trichloro-1,2,2-trifluoro- (CFC113)	5	<0.2	<1.0	**0.3 J**	<0.2	<0.2	**0.9**	<0.2	**7.5**	**0.4 J**	**1.2**	**0.5 J**	**27**
Ethane, 1,2-dichloro-1,1,2-trifluoro- (CFC123a)	-	**1.1**	<1.0	**0.9**	**7.9**	**0.3 J**	**1.3**	<0.2	**2.7**	**0.3 J**	**23**	**0.7**	**13**

Table 1
August 2014 Summary of VOCs in Groundwater
Operable Unit # 5/Building 57 Area
Union and Endicott, NY

Analyte Name	NYSDEC GW Part 703	EN-698 S 8/7/2014	EN-698 S 9/9/2014	EN-700 S 8/7/2014	EN-700 S 9/9/2014	EN-701 S 9/9/2014	EN-702 S 8/7/2014	EN-704 S 8/7/2014	EN-710 S 8/5/2014	EN-711 S 8/7/2014	EN-712 S 8/7/2014	EN-714 S 8/7/2014	EN-715 S 8/7/2014
VOCs													
AVOCs													
Ethylbenzene	5	<0.1	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	5	<0.1	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Xylenes	5	<0.1	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CVOCs													
Chloroethane	5	<0.1	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloroethane (1,1-)	5	**1.0**	**0.5 J**	**2.4 J**	**2.8**	<0.1	<0.1	<0.1	**0.6**	**0.3 J**	**2.0**	<0.1	<0.1
Dichloroethane (1,2-)	0.6	<0.1	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloroethene (1,1-)	5	**0.4 J**	**0.2 J**	**40**	<0.1	<0.1	<0.1	**0.3 J**	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloroethene (cis-1,2-)	5	**1.5**	**0.5**	**3.9 J**	**4.6**	<0.1	<0.1	**1.3**	**0.4 J**	**1.2**	**12**	<0.1	**0.6**
Dichloroethene (trans-1,2-)	5	<0.1	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	**0.4 J**	**1.6**	<0.1	<0.1
Methylene Chloride (Dichloromethane)	5	<0.2	<0.2	<2.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetrachloroethene (PCE)	5	<0.1	<0.1	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Trichloroethane (1,1,1-)	5	**0.5 J**	**0.3 J**	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Trichloroethene (TCE)	5	**3.4**	**2.6**	**6.9**	**9.2**	**1.0**	<0.1	**6.2**	**0.2 J**	**0.4 J**	**1.5**	<0.1	**7.8**
Vinyl chloride	2	<0.1	<0.1	<1.0	**0.5 J**	<0.1	<0.1	**0.1 J**	<0.1	**0.5**	**7.8**	<0.1	<0.1
Other VOCs													
Ethane, 1,1,2-trichloro-1,2,2-trifluoro- (CFC113)	5	**46**	**20**	**13,000**	**8,700**	<0.2	**1.1**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethane, 1,2-dichloro-1,1,2-trifluoro- (CFC123a)	-	**8.6**	**3.3**	**1,400**	**1,000**	<0.2	<0.2	<0.2	**11**	<0.2	**2.0**	<0.2	<0.2

Analyte Name	NYSDEC GW Part 703	EN-716 S 8/7/2014	EN-717 S 8/7/2014	EN-718 S 8/7/2014	EN-719 S 8/7/2014	EN-720 S 8/7/2014	EN-721 S 8/5/2014	EN-722 S 8/5/2014	EN-723 S 8/5/2014	EN-724 S 8/5/2014	EN-726 S 8/7/2014	EN-727 S 8/7/2014
VOCs												
AVOCs												
Ethylbenzene	5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	**2.2**	**0.1 J**	**0.2 J**	<0.1	<0.1
Xylenes	5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CVOCs												
Chloroethane	5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloroethane (1,1-)	5	<0.1	**0.3 J**	<0.1	<0.1	**0.8 J**	<0.1	**0.5**	**8.3**	**5.3**	<0.1	<0.1
Dichloroethane (1,2-)	0.6	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dichloroethene (1,1-)	5	<0.1	**0.7**	<0.1	<0.1	**1.8 J**	<0.1	<0.1	**2.9**	<0.1	<0.1	<0.1
Dichloroethene (cis-1,2-)	5	**1.7**	**9.7**	**0.2 J**	<0.1	**13**	**2.7**	**0.5 J**	**49**	**0.4 J**	<0.1	<0.1
Dichloroethene (trans-1,2-)	5	**0.1 J**	**0.4 J**	<0.1	<0.1	**0.6 J**	**0.2 J**	**0.5**	**2.0**	<0.1	<0.1	<0.1
Methylene Chloride (Dichloromethane)	5	<0.2	<0.2	<0.2	<0.2	<1.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetrachloroethene (PCE)	5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Trichloroethane (1,1,1-)	5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Trichloroethene (TCE)	5	**7.2**	**70**	**2.1**	**3.4**	**58**	**1.3**	**0.1 J**	**12**	**0.1 J**	<0.1	<0.1
Vinyl chloride	2	<0.1	**0.4 J**	<0.1	<0.1	<0.5	**2.2**	**0.3 J**	**21**	<0.1	<0.1	<0.1
Other VOCs												
Ethane, 1,1,2-trichloro-1,2,2-trifluoro- (CFC113)	5	<0.2	**53**	<0.2	**0.6**	**380**	<0.2	<0.2	**0.2 J**	<0.2	<0.2	<0.2
Ethane, 1,2-dichloro-1,1,2-trifluoro- (CFC123a)	-	<0.2	**9.8**	<0.2	<0.2	**15**	**0.2 J**	<0.2	**18**	**3.7**	<0.2	<0.2

Notes:

1) Samples were collected and reported by Groundwater Sciences Corporation (GSC) of Vestal, New York on the dates indicated. See GSC 2014 Annual Groundwater Report for details.

2) Samples were analyzed by Lancaster laboratories of Lancaster, Pennsylvania for analysis of volatile organic compounds (VOCs) by U.S Environmental Protection Agency (USEPA) method 8260B.

3) Embolded results are detected above laboratory reporting limits

4) Results highlighted in gray exceed 6NYCRR Part 703.5 Water Quality Standards for Groundwater.

FIGURES

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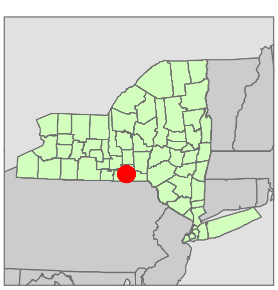

OU#5 Site Boundary

Town/Village Boundary

Drawn By: C. LaVack
Designed By: J. Prelwitz
Reviewed By: J. Ordway
Project No: 2466.03
Date: February 2015

400 200 0 400 800
Feet

SANBORN HEAD

Figure 1

Location Plan

Downgradient Assessment Report
OU#5 / Building 57 Area

IBM - OU#5
Union and Endicott, New York

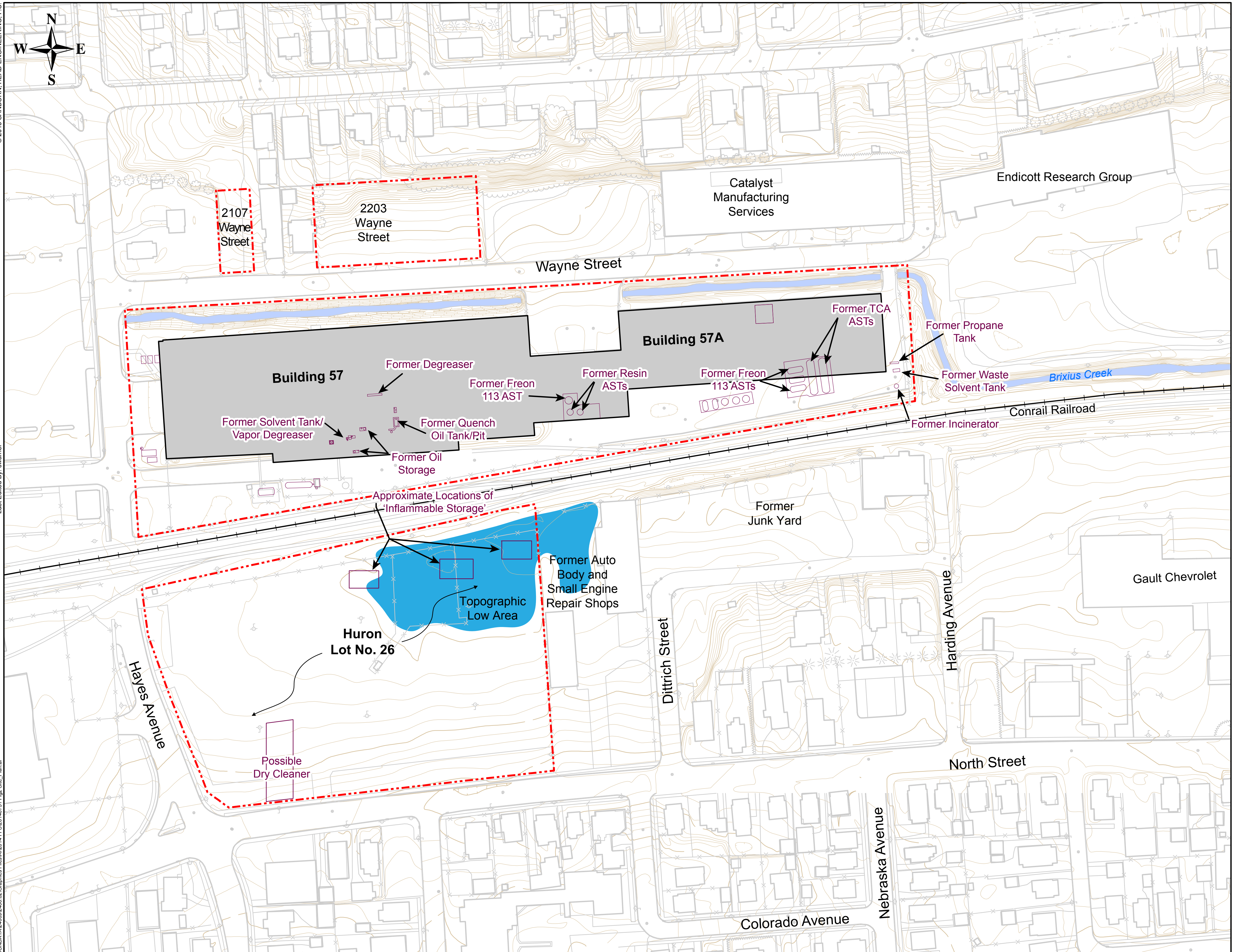

Figure 2

Site Plan

Focused Feasibility Study Report

OU#5 / Building 57 Area

Union and Endicott, New York

Drawn By: C. LaVack
Designed By: S. Warner
Reviewed By: J. Ordway
Project No: 2466.03
Date: February 2015

Figure Narrative:

This figure shows site boundaries in the context of area topography (based on an autocad drawing provided by Groundwater Sciences Corporation [GSC] in September 2003), as well as the inferred locations of former site features. Refer to the Source Area Evaluation Report (SHPC, 2005) for further information about site features, as well as information sources.

Huron Lot 26 has been redeveloped as a car dealership. The topography shown on this figure represents pre-development conditions.

Legend

- Site Boundary
- Former Site Features Identified in Source Area Evaluation Report
- Topographic Contour Line (1 foot contour intervals)
- Topographic Low Area (Intermittently covered with standing water)

70 35 0 70 140 210 Feet

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Last Edited By: swarner

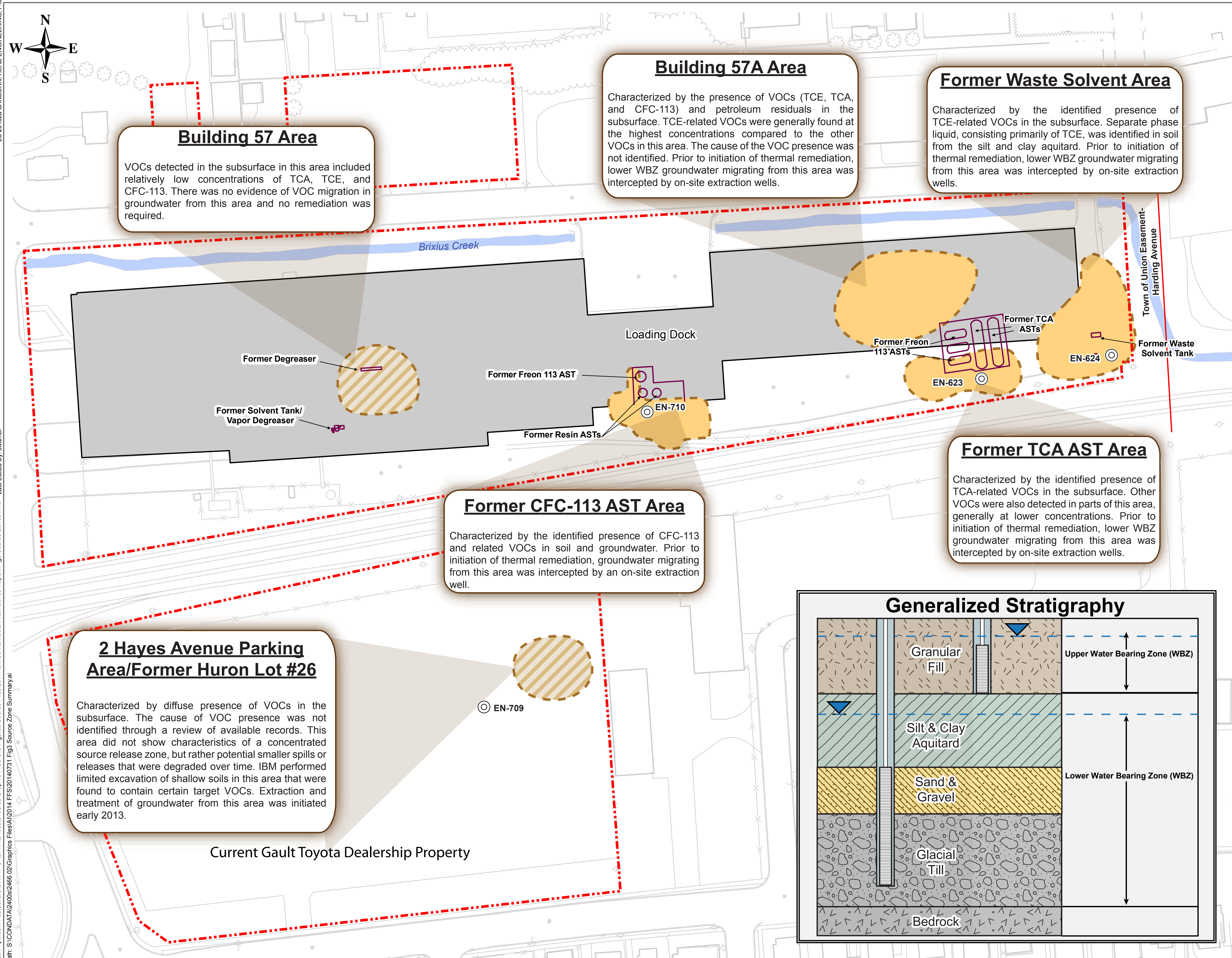

Figure 3

Source Zone Summary

Focused Feasibility Study Report

OU#5/Building 57 Area

Union and Endicott, New York

Drawn By: C. LaVack
Designed By: S. Warner
Reviewed By: J. Ordway
Project No: 2466.03
Date: February 2015

Figure Narrative

This map is intended to provide general information regarding source zones at the Building 57 (OU#5) site. The source zones were identified through a review of historical documents (see September 2005 Source Area Evaluation report prepared by Sanborn, Head Engineering, P.C.), and subsequent exploration and testing.

Please refer to the IRM Completion Report text, tables, and appendices for additional details.

Legend

Source Zone

Source Zone (no further assessment or mitigation is required)

Groundwater Extraction Well

Feet
50 25 0 50 100

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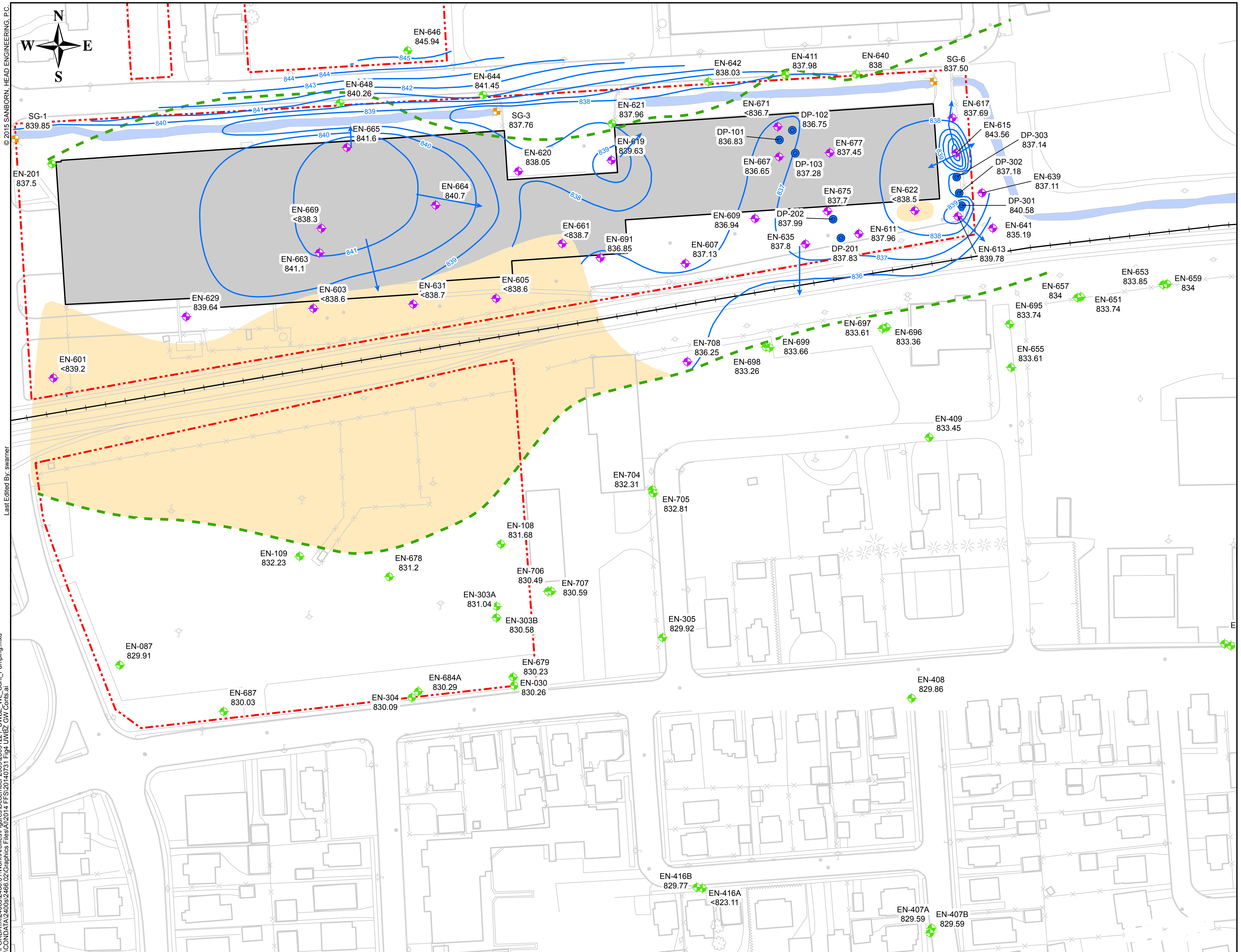

Figure 4

Upper Water-Bearing Zone Groundwater Contours

Focused Feasibility Study Report

OU#5/Building 57 Area

Union and Endicott, New York

Drawn By:	C. LaVack
Designed By:	S. Warner
Reviewed By:	J. Ordway
Project No:	2466.03
Date:	February 2015

Figure Narrative

This figure shows groundwater elevation contours inferred from water level measurements from selected upper water-bearing zone (WBZ) wells on October 19th & 20th, 2009. Groundwater levels were measured during pumping OU#5 area extraction wells.

The contours were developed using generally accepted hydrogeologic practices, involving interpolation between monitoring wells. Fluctuations in water levels and groundwater flow directions are likely to occur due to seasonal trends and climatic events. Other interpreations are possible.

Note that the monitoring wells used for this map represent the network prior to the ISTT IRM and the redevelopment of Lot 26. Monitoring wells have since been closed and select wells have been replaced to suit the needs of ongoing monitoring.

Legend

Inferred Extent of Site Silt and Clay Aquitard

833 Upper WBZ Water Table Surface Elevation based on Pumping Conditions from October 19 & 20, 2009 (ft amsl)

Inferred Seasonally/Intermittently Dry Area

Inferred Groundwater Flow Direction

Refer to Figure 3 for additional legend information.

60 30 0 60 120 180 Feet

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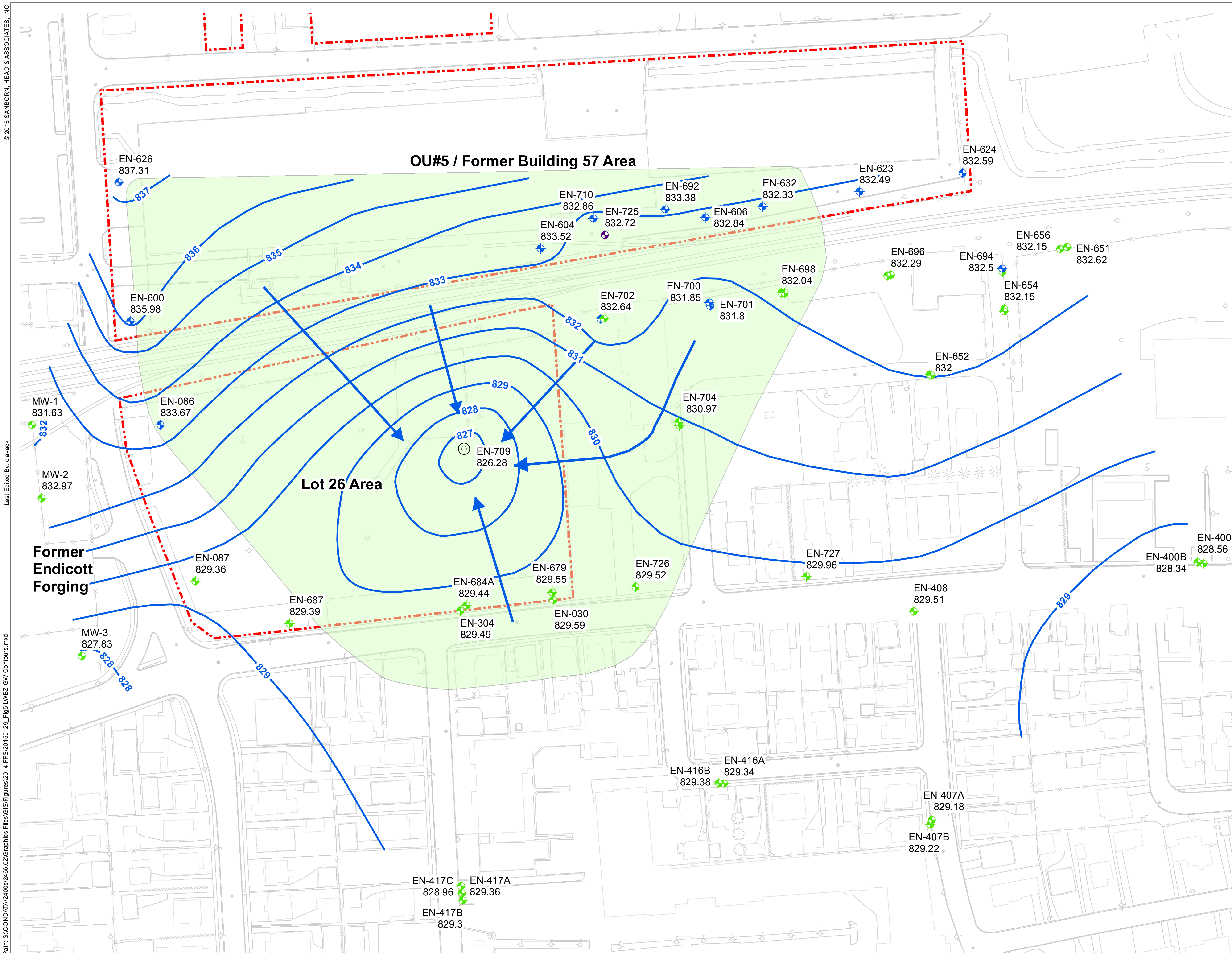

Figure 5

Lower Water-Bearing Zone Groundwater Contours

Focused Feasibility Study Report

OU#5 / Building 57 Area

Union and Endicott, New York

Drawn By: C. LaVack
Designed By: J. Prelwitz
Reviewed By: J. Ordway
Project No: 2466.03
Date: February 2015

Figure Narrative

This figure is intended to depict groundwater elevation measurements in monitoring wells down-gradient of the OU#5/Building 57 Area, collected on October 9, 2014. Contours depicted here are approximating conditions under current the pumping rate of 9 gallons per minute (gpm) at extraction well EN-709, located in the Lot 26 Area.

Legend

- Lower WBZ Monitoring Well
- Monitoring Well
- Bedrock Monitoring Well
- Extraction Well
- 830 Groundwater Elevation Contour
- Inferred Grounwater Flow Direction
- Approximate Groundwater Capture Zone

N W E S

62.5 31.25 0 62.5 125 Feet

SANBORN | HEAD

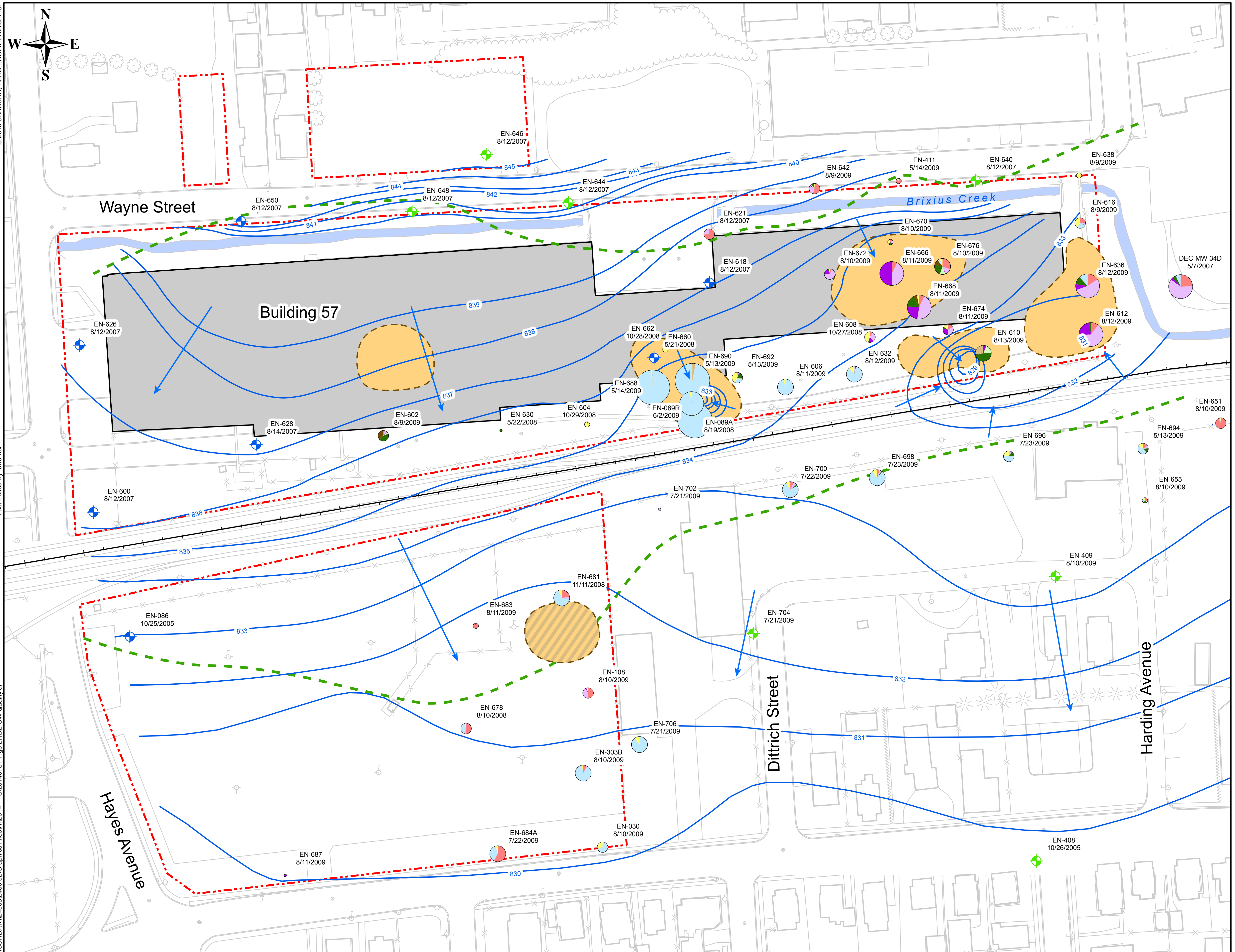

Figure 6

Summary of Pre-ISTT IRM Groundwater Quality

Focused Feasibility Study Report

OU#5/Building 57 Area

Union and Endicott, New York

Drawn By: C. LaVack
Designed By: S. Warner
Reviewed By: J. Ordway
Project No: 2466.03
Date: February 2015

Figure Narrative

This figure is intended to summarize the spatial distribution of Principal Site VOCs detected in groundwater samples and the inferred groundwater potentiometric surface of the lower WBZ during the interim groundwater extraction and treatment program. Groundwater samples were collected from monitoring locations screened in the lower WBZ, or locations where the site silt and clay aquitard was not observed in the shallow subsurface. The VOC data used for this figure represent multiple monitoring rounds between October 2005 and August 2009. Sampling dates are shown for each monitoring well. Pie size represents the total mass of selected key VOCs (in ug/L) while pie slice represents the relative percent of individual parent and breakdown daughter products (in umoles/L). Lower WBZ groundwater elevation contours are based on measurements recorded in October 2009.

Legend

Lower WBZ Groundwater Elevation Contours (ft amsl)
Inferred Groundwater Flow Direction
Inferred Boundary of Site Silt/Clay Aquitard

Principal Site VOCs Not Detected (ND)

Lower WBZ Monitoring Well
Monitoring Well

Total Key Chlorinated VOCs in Groundwater

- <1 ug/l
- 1 to <10 ug/l
- 10 to <100 ug/l
- 100 to <1,000 ug/l
- 1,000 to <10,000 ug/l
- 10,000 to <100,000 ug/l
- 100,000 to <1,000,000 ug/l

- PCE
- TCE
- cis 1,2-DCE
- Vinyl Chloride
- 1,1,1-TCA
- 1,1-DCE
- 1,1-DCA
- Chloroethane
- CFC-113
- CFC-123a

Refer to Figure 3 for additional Legend information.

60 30 0 60 120 180 Feet

SANBORN | HEAD ENGINEERING

Last Edited By: swarner

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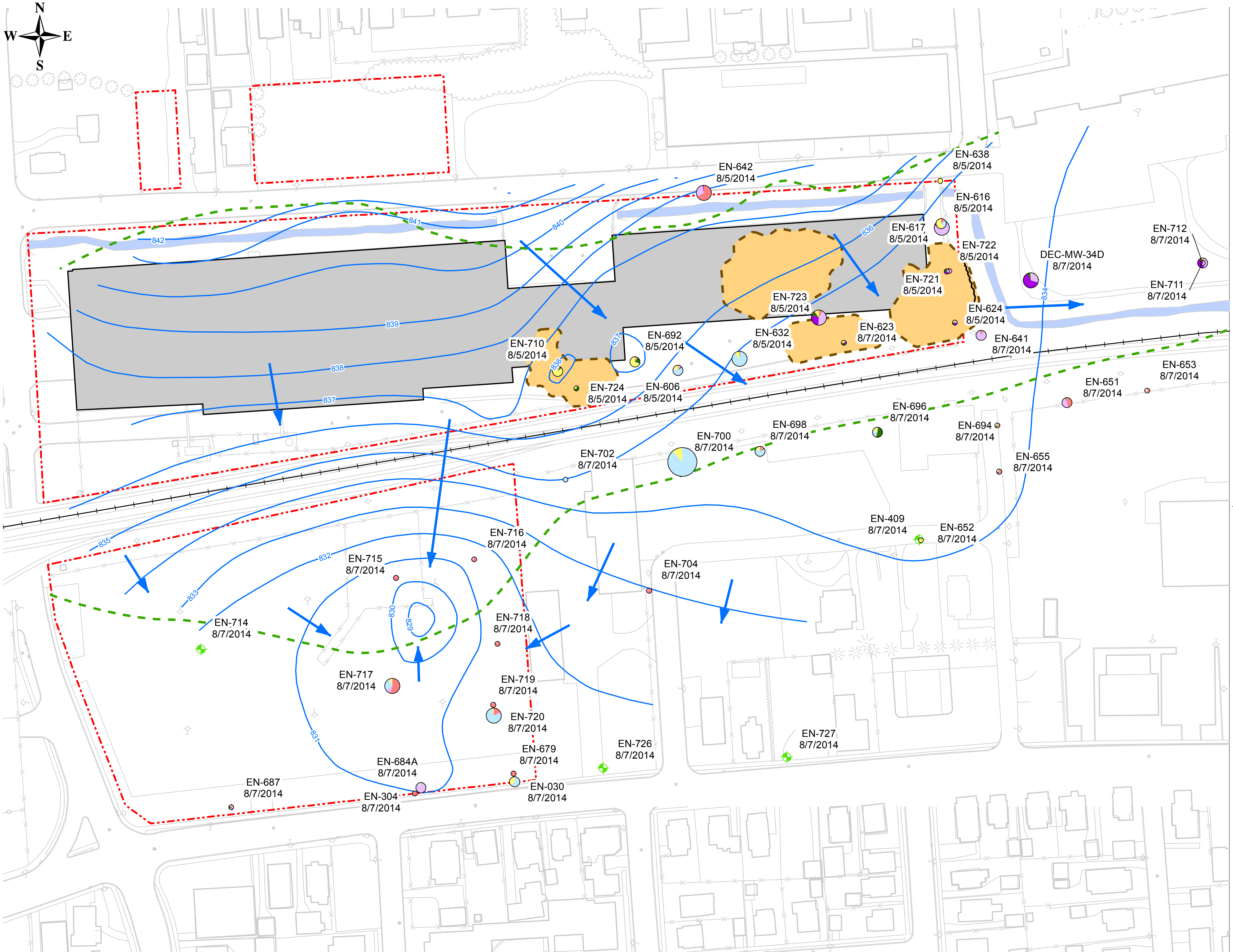

Figure 7

Summary of Groundwater Quality Post-ISTT IRM

Focused Feasibility Study

OU#5 / Building 57 Area

Union and Endicott, New York

Drawn By:	C. LaVack
Designed By:	S. Warner
Reviewed By:	J. Ordway
Project No:	2466.03
Date:	February 2015

Figure Narrative

This figure is intended to summarize the spatial distribution of principal site VOCs detected in groundwater samples and the inferred groundwater potentiometric surface of the lower WBZ in August 2013. Groundwater samples were collected from monitoring locations screened in the lower WBZ, or locations where the site silt and clay aquitard was not observed in the shallow subsurface. The VOC data used for this figure represent the August 2013 annual sampling round conducted by Groundwater Science Corporation (GSC). Pie size represents the total mass of principal site VOCs (in ug/L) while pie slice represents the relative percent of individual parent and breakdown daughter products (in umoles/L). Lower WBZ groundwater elevation contours are based on measurement recorded in August 2013.

Legend

Lower WBZ Groundwater Elevation Contours (ft amsl)

Inferred Groundwater Flow Direction

Inferred Boundary of Site Silt/Clay Aquitard

Key Chloronated VOCs Not Detected (ND)

Lower WBZ Monitoring Well

Monitoring Well

Total Key Chlorinated VOCs in Groundwater

PCE	<1 ug/l
TCE	1 to <10 ug/l
cis 1,2-DCE	10 to <100 ug/l
Vinyl Chloride	100 to <1,000 ug/l
1,1,1-TCA	1,000 to <10,000 ug/l
1,1-DCE	10,000 to <100,000 ug/l
1,1-DCA	100,000 to <1,000,000 ug/l
Chloroethane	
CFC-113	
CFC-123a	

Refer to Figure 3 for additional Legend information.

55 27.5 0 55 110 Feet

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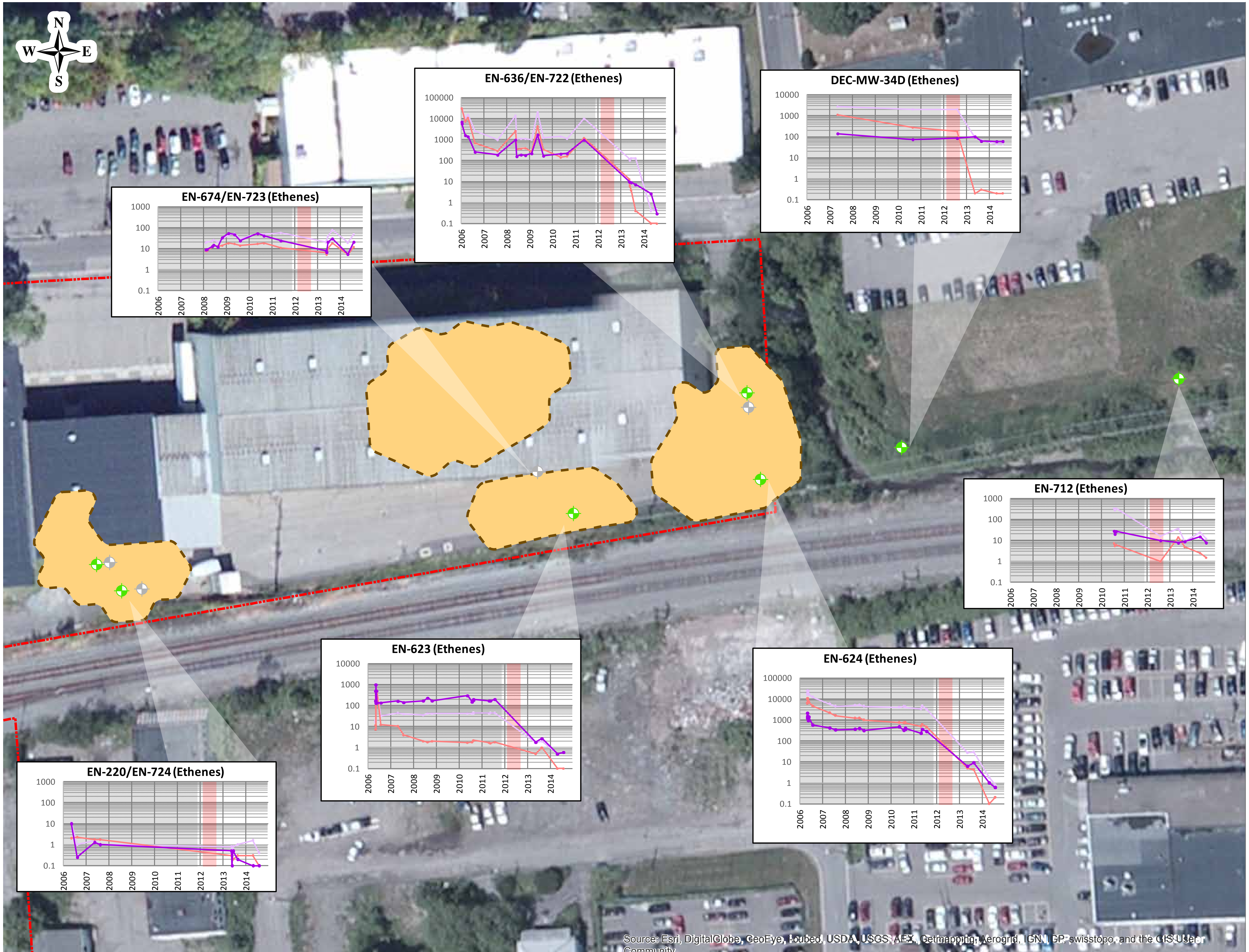

Figure 8

Time Series Plots - Ethenes

Focused Feasibility Study Report

OU#5/Building 57 Area

Union and Endicott, New York

Drawn By:	C. LaVack
Designed By:	S. Warner
Reviewed By:	J. Ordway
Project No:	2466.03
Date:	February 2015

Figure Narrative

This figure presents concentrations "Principal Site VOCs" in groundwater over time in select monitoring wells associated with OU#5. The declining concentrations demonstrate the effectiveness of the in situ thermal treatmeant (ISST) Interim Response Measure (IRM) that was completed in 2012 (the treatment period is highlighted in red on each plot).

Concentrations are presented in micrograms per liter (ug/L).

This figure is one of a series of three figures that present VOC concentrations grouped by type: ethenes, ethanes, and CFCs. The laboratory detection limit was used when constituent concentrations were below the laboratory detection limit. The source data have been transmitted to the New York State Department of Environmental Conservation in the form of analytical summary reports, and more recently, as NYSDEC required electronic data deliverables (EDDs).

Legend

Treatment Areas

Active Monitoring Well

Decommissioned Monitoring Well

2012 Thermal Treatment

Pumping from EN-623/EN-624

TCE

cis-1,2 DCE

Vinyl Chloride

Groundwater Concentrations in micrograms per liter (µg/L)

30 15 0 30 60

Feet

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Last Edited By: swarner

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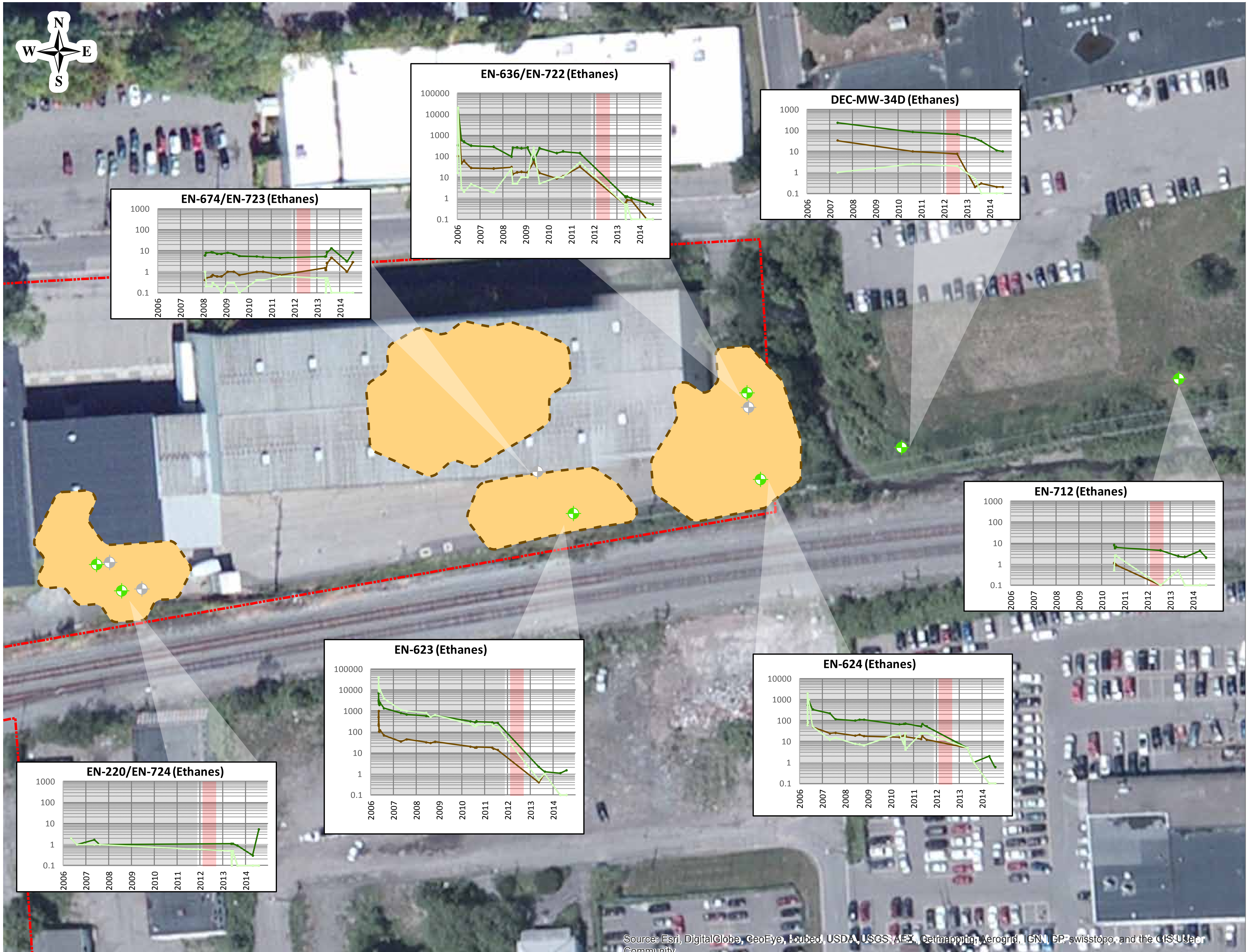

Figure 9

Time Series Plots - Ethanes

Focused Feasibility Study Report

OU#5/Building 57 Area

Union and Endicott, New York

Drawn By: C. LaVack
Designed By: S. Warner
Reviewed By: J. Ordway
Project No: 2466.03
Date: February 2015

Figure Narrative

This figure presents concentrations "Principal Site VOCs" in groundwater over time in select monitoring wells associated with OU#5. The declining concentrations demonstrate the effectiveness of the in situ thermal treatment (ISST) Interim Response Measure (IRM) that was completed in 2012 (the treatment period is highlighted in red on each plot).

Concentrations are presented in micrograms per liter (ug/L).

This figure is one of a series of three figures that present VOC concentrations grouped by type: ethenes, ethanes, and CFCs. The laboratory detection limit was used when constituent concentrations were below the laboratory detection limit. The source data have been transmitted to the New York State Department of Environmental Conservation in the form of analytical summary reports, and more recently, as NYSDEC required electronic data deliverables (EDDs).

Legend

Treatment Areas
Active Monitoring Well
Decommissioned Monitoring Well
2012 Thermal Treatment
Pumping from EN-623/EN-624

1,1,1 - TCA
1,1 - DCE
1,1 - DCA

Groundwater Concentrations in micrograms per liter (µg/L)

30 15 0 30 60
Feet

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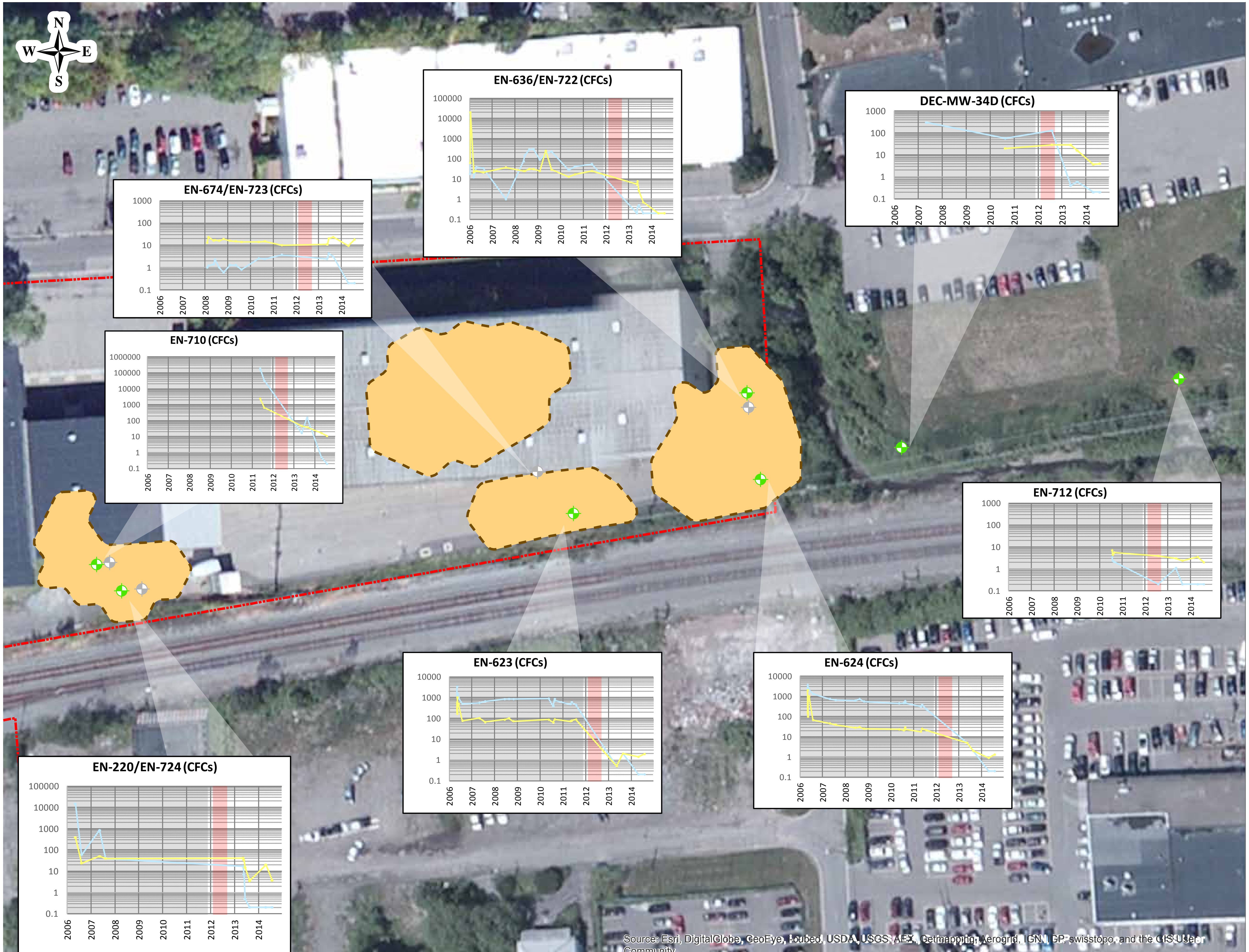

Figure 10

Time Series Plots - CFCs

Focused Feasibility Study Report

OU#5/Building 57 Area

Union and Endicott, New York

Drawn By:	C. LaVack
Designed By:	S. Warner
Reviewed By:	J. Ordway
Project No:	2466.03
Date:	February 2015

Figure Narrative

This figure presents concentrations “Principal Site VOCs” in groundwater over time in select monitoring wells associated with OU#5. The declining concentrations demonstrate the effectiveness of the in situ thermal treatment (ISST) Interim Response Measure (IRM) that was completed in 2012 (the treatment period is highlighted in red on each plot).

Concentrations are presented in micrograms per liter (ug/L).

This figure is one of a series of three figures that present VOC concentrations grouped by type: ethenes, ethanes, and CFCs. The laboratory detection limit was used when constituent concentrations were below the laboratory detection limit. The source data have been transmitted to the New York State Department of Environmental Conservation in the form of analytical summary reports, and more recently, as NYSDEC required electronic data deliverables (EDDs).

Legend

Treatment Areas

Active Monitoring Well

Decommissioned Monitoring Well

2012 Thermal Treatment

Pumping from EN-623/EN-624

CFC 123a

CFC 113

Groundwater Concentrations in micrograms per liter (µg/L)

30 15 0 30 60

Feet

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Last Edited By: swarner

APPENDIX A

LIMITATIONS

APPENDIX A
LIMITATIONS

1. The findings presented in this report were based solely upon the services described herein, and not on scientific tasks or procedures beyond the scope of described services.

2. Quantitative laboratory analyses were performed during IRM implementation and monitoring, as noted in the report. The analyses were performed for specific constituents of interest that were selected during the course of this study.

3. Quantitative laboratory testing was performed by others as part of the investigation as noted within the report. Where such analyses have been conducted by an outside laboratory, unless otherwise stated in the report, Sanborn Head has relied upon the data provided, and the opinion and findings of third party validation by qualified laboratory professional. The conclusions and recommendations contained in this report are based in part upon various types of chemical data. While Sanborn Head has reviewed the data and information as stated in this report, any of Sanborn Head's interpretations, conclusions, and recommendations that have relied on that information will be contingent on its validity. Should additional chemical data, historical information, or hydrogeologic information become available in the future, such information should be reviewed by Sanborn Head and the interpretations, conclusions and recommendations presented herein should be modified accordingly.

4. This report is prepared for, and is intended for the exclusive use of, the IBM Corporation for specific application to the Operable Unit #5/Building 57 Area in accordance with generally accepted professional practice. The contents of this report shall not be relied upon by any party other than IBM without the express written consent of IBM and Sanborn Head. No other warranty, express or implied, is made.

5. In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by Sanborn Head. Sanborn Head is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or re-use of the subsurface data or engineering analyses without the express written authorization of Sanborn Head.

6. Sanborn Head is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or re-use of the subsurface data or engineering analyses without the express written authorization of Sanborn Head.

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APPENDIX B

Pre and Post ISTT Soil Concentration Plots

Figure B1
Building 57A Area

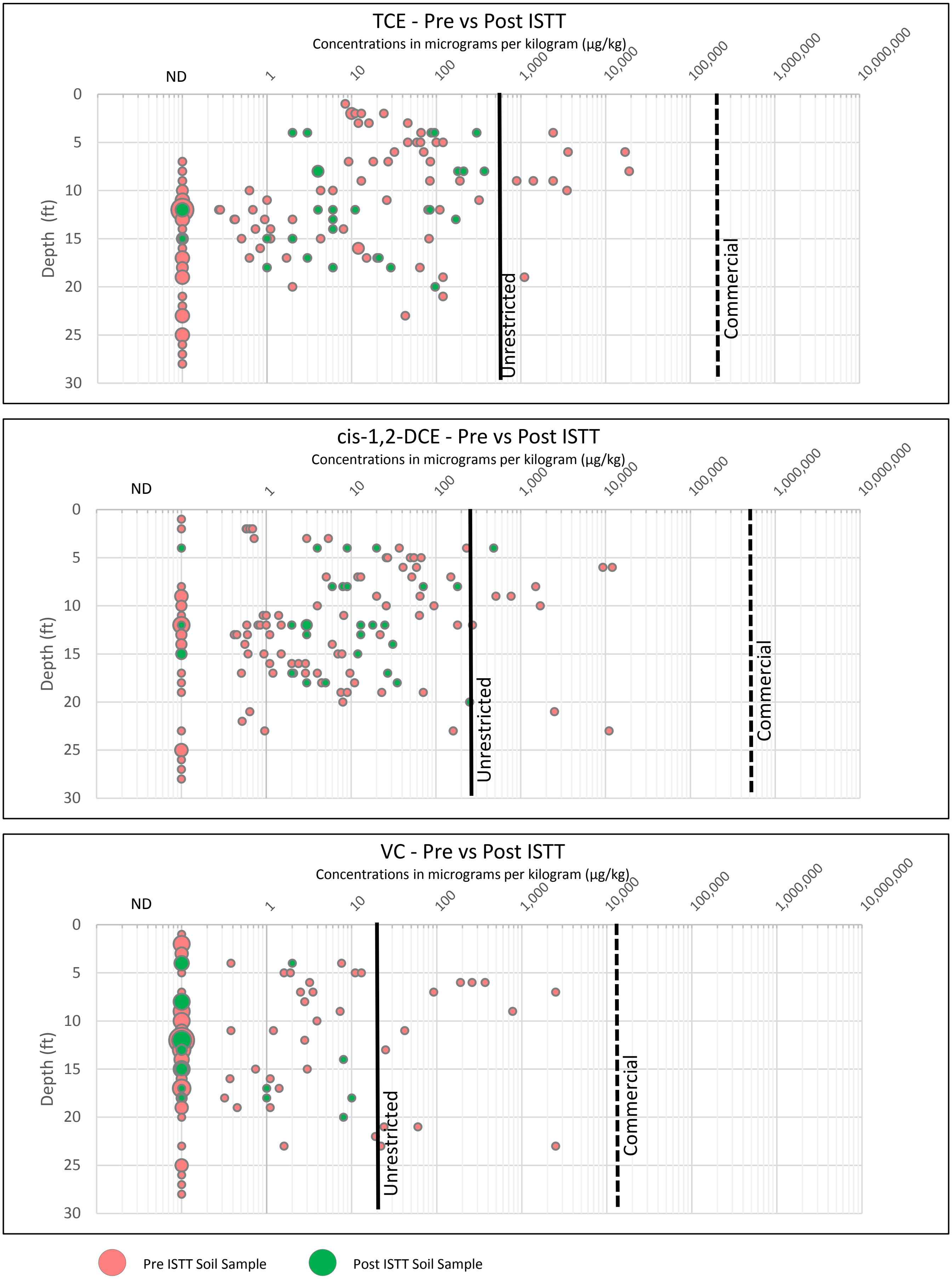
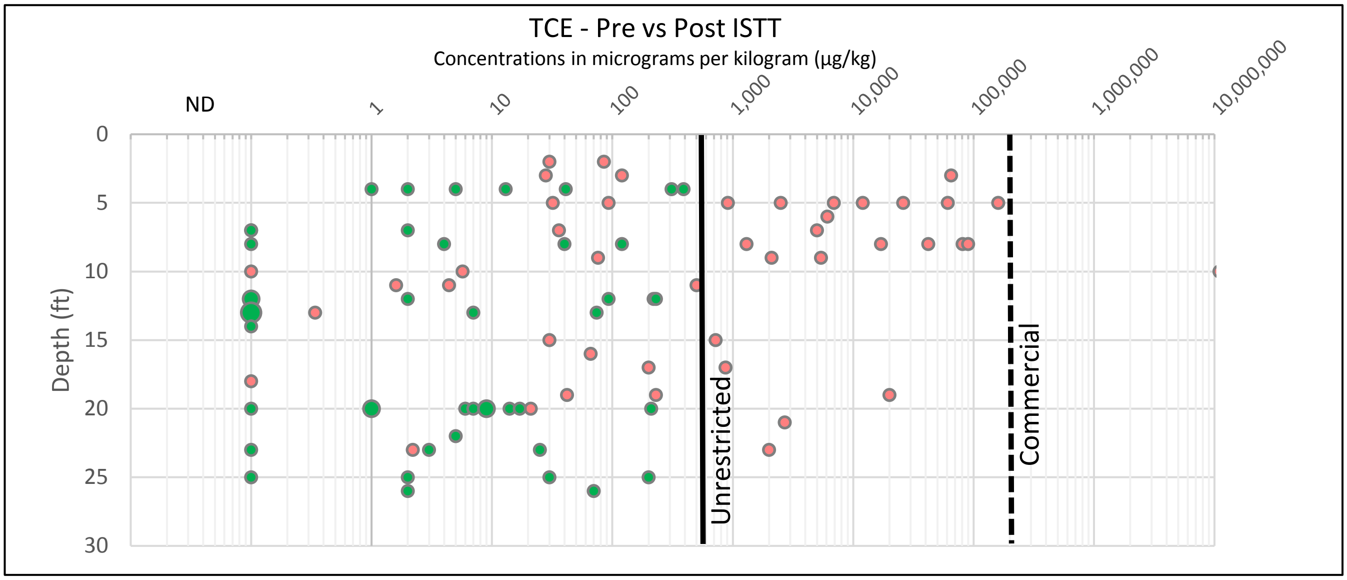
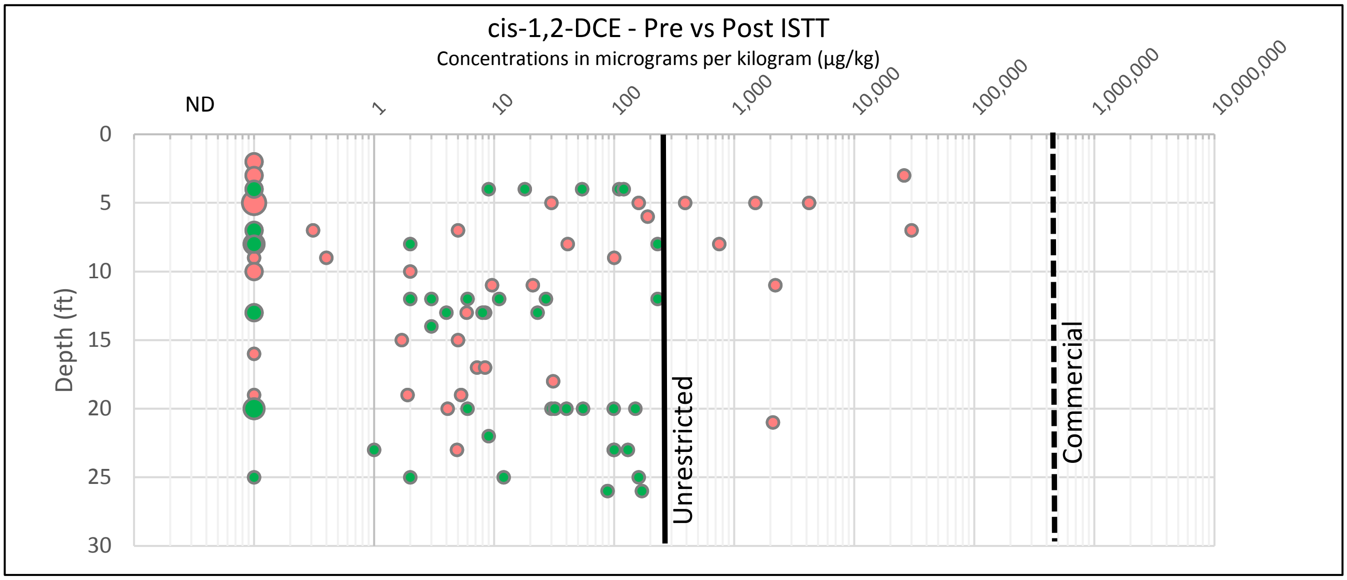
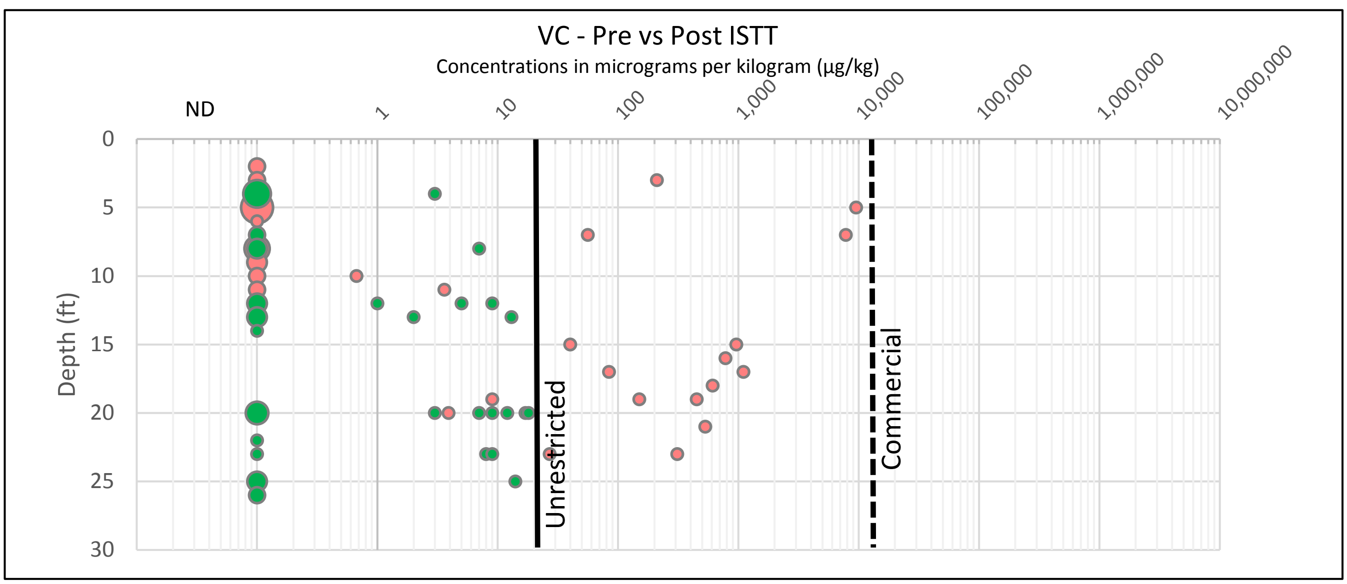


Figure B2

Waste Solvent Area







Pre ISTT Soil Sample Post ISTT Soil Sample

Figure B3

CFC and TCA Areas