INVENTUM ENGINEERING, PC

Pre-Design Investigation Work Plan

Brownfield Cleanup Program Site #C915196B

1001 East Delavan Avenue

Buffalo, New York

August 31, 2023

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Engineering Certification

I, John. P. Black certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Pre-Design Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Respectfully Submitted,

Inventum Engineering, P.C.

Date: 8.31.2025

John P. Black, P.E.

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LICENSED PROFESSIONAL ENGINEER

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1 Introduction

On behalf of East Delavan Property, LLC, Inventum Engineering, P.C. (Inventum) has prepared this Pre-Design Investigation Work Plan (PDIWP) for the 1001 East Delavan Property Brownfield Cleanup Program Site (BCP Site #C915196B) located at 1001 East Delavan Avenue (property) in Buffalo, Erie County, New York (Figure 1). East Delavan Property, LLC (EDP) acquired the property from American Axle and Manufacturing. At the time of the acquisition, General Motors (GM), prior to GMs 2009 bankruptcy, was implementing an interim remedial action and conducting a remedial investigation. Following the GM bankruptcy, EDP voluntarily continued to address legacy environmental issues resulting from GM and American Axle & Manufacturing's, Inc. (AAM) tenure at the property. EDP entered the site into the Brownfield Cleanup Program (BCP) March 1, 2019 and is a Volunteer under the BCP.

The 1001 East Delevan Avenue tax property is subdivided into two separate New York State Department of Environmental Conservation (NYSDEC) sites for the purpose of addressing legacy environmental conditions as shown on Figure 2:

- BCP Site No. C915196B encompasses approximately 32.88 acres and is the subject of this PDIWP;
- 250 Colorado Street Site (Site No. 915196) is approximately 2.65 acres and is surrounded by the BCP Site. The NYSDEC Division of Environmental Remediation (DER) directs the investigation and remediation on that portion of the property through the Inactive Hazardous Waste Site Program[1] (IHWS also known as the State Superfund Program).

This PDIWP has been prepared in accordance with NYSDEC Technical Guidance for Site Investigation and Remediation, DER-10, dated May 2010 and discussions between EDP and the NYSDEC.

1.1 Work Plan Objectives

EDP has completed a Remedial Investigation (RI) on the BCP Site in accordance with the BCP agreement with the NYSDEC dated March 1, 2018. Drafts of the Remedial Investigation Report (RIR) were submitted to the NYSDEC in March 2022 and September 2022. A draft Alternatives Analysis Report was submitted on September 14, 2023. EDP has proposed this PDI to address comments received from the NYSDEC on the Draft RIR. The primary objectives of this PDI are as follows:

- Resolve data gaps identified during the RI;
- Gather data to support final remedy selection during the Alternatives Analysis (AA) process; and
- Gather data to support the design of the final remedy.

1.2 Data Gap Identification

The Draft RIR contains a Conceptual Site Model (CSM) that was developed incorporating the results of investigations, source removal actions, and an Interim Remedial Measure (IRM) that have been conducted on the BCP Site and 250 Colorado Street Site. Several components of the CSM (bulleted below) contain data gaps (italics) that require additional investigation and data collection:

- Historical and ongoing removal/treatment activities have been successful in reducing/limiting the extent and mobility of Light Non-Aqueous Phase Liquid (LNAPL) in the subsurface.

[1] EDP's responsibility with respect to the investigation/remediation being conducted on the 250 Colorado Street Site was defined in the 2018 Order on Consent [Index No. B9-0681-04-12(B)].

- *LNAPL was not identified in the RI outside of the previously identified areas. LNAPL identified in the BCP Site RI borings was of limited extent and occurred in thin and discontinuous lenses. LNAPL is not present at the BCP Site perimeter.*
- *Additional investigation is proposed to understand the recoverability, mobility and migration potential, or limitations thereof, of the LNAPL in the vicinity of the 5x9 Sewer.*

- The cessation of GM/AAM manufacturing operations has eliminated the potential for future releases from identified historic source areas; however, remaining LNAPL may be mobile and partitioning of Contaminants of Concern (COCs) in environmental media and the transport of those COCs remains possible.
  - *Paint chips with lead at concentrations above the characteristic toxicity threshold of 5 milligrams per liter (5 mg/L) have been identified on the concrete surface of the BCP Site.*
  - *Additional investigation is proposed to evaluate the direct exposure potential to polychlorinated biphenyls (PCBs) potentially on surficial hardscape on the BCP Site.*
  - *One soil vapor sample contained concentrations of volatile organic compounds (VOCs) above New York State Department of Health (NYSDOH) guidance levels. Additional investigation is proposed to evaluate the direct exposure potential to VOCs in indoor air on the BCP Site.*
  - *No additional sampling is needed for the lead-based paint as this will be addressed by either an IRM, during the remedial action, or in accordance with an SMP.*

2 Site Description and History

Specific descriptions and features of the BCP Site relevant to the proposed PDI scope of work are provided in this section.

2.1 Site Location and Description

The BCP Site is located at 1001 East Delavan Avenue in the City of Buffalo, Erie County, New York and occupies an area of approximately 32.88 acres (Figures 1 and 2). The BCP site currently consists of several existing buildings, exterior impermeable surfaces, and to a lesser extent, grass, and other pervious surfaces outside of the former manufacturing areas around three sides of the BCP Site. EDP has redeveloped/repurposed several of the existing structures and there are two industrial/manufacturing tenants, several commercial tenants, and two non-profit occupants who lease space from EDP (Figure 8).

The BCP Site is bisected by an underground combined sewer trunk owned and operated by the Buffalo Sewer Authority (BSA). The BSA sewer is a brick-and-mortar tunnel that measures approximately 5 feet high by 9 feet wide (5x9 Sewer) and is approximately 7 feet below ground surface (bgs) at the top of the crrown across the BCP Site. The sewer slopes from north to south across the BCP Site with the base of the sewer near the top of the bedrock[2] on the north end of the BCP Site and in the clay unit at the south end of the BCP Site (CRA 2006). Inventum has not surveyed the depth of the sewer across the BCP Site. A BSA schematic of the 5x9 Sewer through the BCP Site showing peak storage elevations and other sewer structural features is referenced to a BSA/GM datum[3].

The Scajaquada Creek Interceptor Sewer traverses east to west across the southern portion of the BCP Site. The 5x9 Sewer drains into the Scajaquada Creek Interceptor Sewer which conveys flow to the BSA Publicly Owned Treatment Works (POTW) for treatment. Scajaquada Creek flows through an aboveground channel from its source approximately 7 miles east of the BCP Site, to a location on Pine Ridge Road, where the creek channel flows into an underground conduit (Scajaquada Creek Drain). The Scajaquada Creek Drain measures approximately 33 feet wide by 14 feet high. The Scajaquada Creek Drain is located just south of the BCP Site and Scajaquada Creek Sewer. Immediately to the south of the BCP Site there is a BSA emergency overflow device where the 5x9 Sewer can overflow into the Scajaquada Creek Drain during periods of high storm water flow.

2.2 Geology

The BCP Site is covered by pavement, buildings, and building slabs over all but approximately 2.25 acres (7 percent of the property) along the north, southwest, and southern sides of the facility.

The general composition of each of the three distinct overburden layers (Fill, Clay, and Bedrock) are described in more detail below. The geology of the BCP Site is well documented from historical site investigations and the BCP Site RI. A generalized geologic cross section of the BCP Site through the proposed PDI work area is provided in Figures 3. The cross-section profile location is shown on Figure 2.

2.2.1 Fill

The fill is composed of reworked soil, crushed concrete, gravel, stone, crushed brick, slag, wood, and to a lesser extent pieces of metal and glass fragments. The 2006 RI Report produced by Conestoga-Rovers &

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[2] The bottom of the 5x9 Sewer is several feet thick, so the invert of the sewer itself is interpreted to be above the bedrock.

[3] The 2009 Draft Remedial Investigation Report (CRA 2009) references a conversion factor of adding 575.45 feet to the BSA datum-based elevation to obtain the corresponding elevation in feet above mean sea level.

Associates (CRA 2006) on behalf of GM notes that a municipal “dump” site was reportedly present on the property in the early 1900s and that some material they encountered in the fill was consistent with municipal refuse. Inventum has not observed any fill consistent with municipal refuse on the BCP Site. Bedding material and reworked native clay is anticipated to be encountered close the 5x9 Sewer resulting.

The depth and thickness of fill observed in borings completed by Inventum during the RI ranged from 1 to 12.5 ft. bgs across the BCP Site. The depth of the fill in the proposed PDI work areas extends to approximately 4 to 5 feet bgs with 1 to 2-feet of concrete at the surface.

2.2.2 Clay

A clay unit is generally continuous across the property. The clay lies immediately beneath the fill layer and is characterized as a black silt/clay or red-blown clay. The looser silt/clay layer is gray to black in color, dry to very moist, with low to medium plasticity. The gray to black coloration in the silt/clay layer appears to be naturally occurring and not the result of contaminant staining. The red-brown clay is typical of the lower portion of the clay unit and is described as a silty-clay with some microfractures, dry to slightly moist, and with a medium to high plasticity. The observed fill/clay interface ranged from 1 to 12.5 ft. bgs during the RI and the observed thickness ranged from approximately 5- to 20-feet across the BCP Site.

The clay layer in the vicinity of the proposed PDI work area is approximately 8 to 10-feet thick extending from approximately 5- to 15-feet bgs. There is a laterally discontinuous till layer between the red-brown clay and bedrock across much of the BCP Site. The till is generally present in the vicinity of the proposed PDI work area and is approximately 1 to 4 feet thick and extending from approximately 12 to 15 feet bgs. The till is characterized as a dark reddish-brown clay with fine sand and fine to medium rounded gravel.

2.2.3 Bedrock

The depth to bedrock is shallower on the north side of the BCP Site along East Delavan Avenue (approximately 8.4 feet bgs) and dips to the south where the bedrock interface in the grassy area abutting Scajaquada Street is between 15 to 20 feet bgs.

The bedrock is described as a light to dark gray cherty limestone (Onondaga Limestone). Regionally, the Onondaga Limestone formation is a massive, cherty, and argillaceous limestone approximately 140 feet thick.

2.3 Groundwater Hydrogeology

2.3.1 Fill

The buildings and concrete cover across the majority of the BCP Site limits infiltration and limits the occurrence of groundwater in the fill. The 5x9 Sewer is likely to have the largest influence on groundwater flow within the fill layer. Historically, in the immediate vicinity of the 5x9 Sewer, the hydraulic gradient in the fill layer is inward toward the sewer or sewer backfill except at times of high flow in the sewer when the pressure within the sewer would reverse the gradient. The groundwater and LNAPL recovery system operated by the NYSDEC on the 250 Colorado Street Site is likely having a localized influence on groundwater flow in the fill layer when it is operating. Absent these influences the overall general flow in the fill unit would be to the south and southeast across the BCP Site. Similarly, other major sewer utilities on the BCP Site (Figure 4) may have some localized influence on groundwater flow as would variability in the geology resulting from historical operations (ex. foundations, pit walls, and the former filled in Scajaquada Creek Channel).

Groundwater elevations in the fill ranged from 632 to 639 feet AMSL (4 to 8 feet bgs) during the RI. The gradient is relatively low across the BCP Site.

2.3.2 Clay

Groundwater flow in the clay unit is also potentially affected by the presence of the 5x9 Sewer and other major sewers on the BCP Site. Historical documentation suggests that groundwater levels in relation to the 5 x 9 sewer invert can fluctuate over time and across the property. Groundwater data from monitoring conducted during the RI showed groundwater elevations were generally more than 2-feet above the invert of the 5x9 Sewer (~628.45 feet AMSL) at the time of the monitoring in the proposed PDI work area (Figure 5). The depth of flow in the 5 x 9 sewer varies greatly but is normally 1 to 2 feet deep, indicating the gradient to the sewer during normal flow is low. The groundwater and LNAPL recovery system on the 250 Colorado Street Site also appears to show influence on the localized hydraulic gradient.

Groundwater elevations in the clay ranged from 628 to 639 feet AMSL during the RI. The gradient is relatively low except in the immediate vicinity of the 5x9 Sewer along its length across the property. Groundwater sampling conducted during the RI show that well yield is very low in monitoring wells screened in the clay, and many monitoring wells were purged dry even at low (<100 milliliters per minute mL) flow rates.

2.3.3 Bedrock

Bedrock groundwater monitoring wells on the BCP Site typically extend approximately 5 to 10 feet into the bedrock and are below the base elevation of the 5x9 Sewer. The shallow bedrock is likely hydraulically connected to the overlying clay/fill units based on observations of lithology and unit thickness. The groundwater and bedrock LNAPL recovery system operated by the NYSDEC on the 250 Colorado Street Site shows localized influence on the hydraulic gradient in the superfund area. The overall general gradient in the bedrock is to the south and southeast across the BCP Site.

Groundwater elevations in the bedrock ranged from 624 to 635 feet AMSL at locations measured during the RI (Figure 6). The gradient is relatively low except in the immediate vicinity of the 5x9 Sewer on the 250 Colorado Street Site where an active external gradient is induced when the system is operating.

2.4 Nature and Extent of Contamination Summary

A summary of the nature and extent of contamination identified on the BCP Site relevant to the proposed PDI scope of work is provided in subsections below.

2.4.1 LNAPL

LNAPL has historically and consistently been identified in fill, clay, and bedrock wells in the vicinity of the former machining area (Figure 2).

In the former machining area east of the 5x9 Sewer LNAPL was visually identified in the clay unit in borings SB-BCP-31 and SB-BCP-32 completed during the RI. The LNAPL was present in the recovered soil cores as a spotty sheen and was not continuous across the vertical length of the core. Additionally, there was no staining or smearing observed on the outside of the direct-push tooling or on the Macro-Core liners. Aliquots of the impacted soil from these cores were placed in 4-oz glass jars with deionized water and allowed to sit undisturbed for over 24 hours. There was no separation of a separate phase liquid observed in the jars over that time. Step-out borings from SB-BCP-31 were completed west (SB-BCP-31A) and north (SB-BCP-30) in response to the visual detection of LNAPL. No LNAPL was identified in either of these step-out borings.

West of the 5x9 Sewer, LNAPL was visually identified in the clay unit in samples from two borings (SB-BCP-25 and SB-BCP-25A). The LNAPL was present in the recovered soil cores as a discontinuous and spotty sheen and did not appear to be as prevalent in the soil column as the borings east of the 5x9 Sewer. Similar to the borings on the east side of the sewer, there was no staining or smearing observed on the outside of the tooling or on the Macro-Core liners.

The PDI scope of work in Section 3 is intended to gather further data on the mobility and migration potential of the LNAPL identified in this area.

2.4.2 Soil Vapor

Sub-slab vapor samples were collected during the RI at two (2) locations based on detections of VOCs in groundwater samples (Figure 2). The sub-slab sampling locations were adjacent to monitoring wells (MW-BCP-07B and MW-205) where concentrations of VOCs above Class GA standards were detected in bedrock (MW-BCP-07B) and overburden (MW-205) groundwater samples. Both locations are in areas covered with existing slabs with concrete thickness of 1 to 2 feet and outside buildings and open to the atmosphere.

Trichloroethene (TCE) was detected at a concentration above NYSDOH guidance values in sample from the open courtyard area adjacent to MW-BCP-07B. TCE was detected at a concentration of 12.5 micrograms per cubic meter ($\mu g/m^3$) above the NYSDOH Matrix A criteria of 6 $\mu g/m^3$. No compounds were detected above the NYSDOH guidance criteria in the soil vapor sample collected adjacent to MW-205.

The PDI scope of work in Section 3 is intended to gather further data on the potential exposure risk to indoor air in the office occupied spaces on the BCP Site.

2.4.3 Surficial Material

Five (5) paint chip samples were collected during the RI from material that had sloughed off of exterior walls and support columns (Figure 2). Lead was detected in all paint chip samples at concentrations exceeding the Industrial Use Soil Cleanup Objectives (SCOs). Other metals (Arsenic, Barium, Cadmium, Chromium, Copper, and Zinc) were also detected above either Commercial or Industrial Use SCOs. Each sample was also analyzed for lead utilizing the Toxicity Characteristic Leaching Procedure (TCLP). Three of the samples contained estimated concentrations of lead above the characteristic toxicity threshold of 5 mg/L.

The PDI scope of work in Section 3 is intended to collect further data on the potential exposure risk to surficial materials on the BCP Site. Specifically, stained areas of concrete are present in several areas of the BCP Site. Wipe samples and pulverized concrete samples to estimate the potential concentrations of PCBs are proposed.

3 Pre-Design Investigation Scope of Work

3.1 LNAPL Mobility

Additional data is proposed to determine the recoverability, mobility, and migration potential of the LNAPL identified on the BCP Site near the 5x9 Sewer within the Former Machining Area (Figure 7). This data will be used to refine the CSM, support remedial technology selection, and support the design of the final remedy.

3.1.1 Well Installation

3.1.1.1 Recovery wells

Two (2) recovery wells are proposed in the area immediately adjacent to the 5x9 Sewer within the Former Machining Area (Figure 7). The proposed locations of the recovery wells are situated to provide the highest likelihood of encountering LNAPL and mobilizing LNAPL through an applied gradient. Limited occurrence or absence of LNAPL in the recovery wells either at the time of installation or during active recovery testing provides beneficial information regarding LNAPL mobility at the BCP Site.

The proposed recovery well on the west side of the sewer is located in (1) the area where LNAPL was positively identified in borings completed during the RI (SB-BCP-25 and 25A); (2) the area where LNAPL has been historically present in the clay unit (MW-805A); (3) the area where LNAPL seepage into the sewer had been documented in the past (CRA 2009); and (4) near trenches cleaned and filled by EDP as part of their pre-BCP voluntary source removal activities.

The proposed recovery well on the east side of the sewer is located (1) between the sewer and monitoring wells where LNAPL has been historically detected (MW-BCP-09A, MW-403R, and CP-3B); and (2) between trenches and pits cleaned and filled by EDP as part of their pre-BCP voluntary source removal activities.

Photo documentation of trenches and pits cleaned and filled by EDP are provided for reference in Appendix A. The relative scale of the personnel and equipment in the photo supports an assessment that some of the pits and sumps extended down to the bedrock and were potential sources of LNAPL in the clay and bedrock in the Former Machining Area during the GM and AAM operational periods.

Borings for the recovery wells will be advanced through the overlying concrete, fill, and clay to the top of bedrock using 10.25-inch inside diameter hollow-stem augers (14.75-inch diameter to the outside of the flights). During drilling, soil samples will be collected for lithological characterization. Unconsolidated material samples will be collected for characterization, photographs, and screening with a Photoionization Detector (PID) equipped with a 10.6 eV lamp in a continuous interval over the total depth of the boring with a split barrel sampler driven in advance of the augers. Analytical soil samples will not be collected unless there is evidence of LNAPL in the recovered soil core. If LNAPL is identified, one sample will be submitted for laboratory analysis of Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), and Polychlorinated Biphenyls (PCBs).

Each recovery well will be screened from 5-feet bgs to the top of the bedrock (approximately 10-feet of screen). The screen may straddle the fill/clay interface and, depending on the location, may be entirely through re-worked material from the 5x9 Sewer installation. Each recovery well will be screened with an 8-inch diameter Schedule 40 polyvinyl chloride (PVC) well casing and 0.020-inch slotted screen. A sand filter pack will be placed from the bottom of the screened interval to a minimum of 1-foot above the top of the screen. A 2-foot bentonite seal will be placed on top of the filter pack and the remaining annular space will be completed with a cement grout. The wells will be completed flush to-grade within a traffic rated box and concrete apron sloped to prevent ponding of water. Temporary barriers will be placed around the extraction wells to prevent unintentional damage from heavy industrial equipment and other ongoing routine site activities during testing.

The recovery wells will be developed no sooner than two weeks after installation. The water levels in the wells will be manually measured using an oil/water interface probe prior to development. Depth to water, depth, and thickness of any LNAPL, and the total depth of the well will be measured and logged in the field notebook. The wells will be developed by removing three well volumes, purging the wells dry, or purging and surging the wells. The wells will be developed to remove fines that typically cause turbidity in water samples. All development and purge water will be treated by the onsite water treatment system and discharged to the BSA sewer.

3.1.1.2 Observation Wells

Three (3) new observation wells are proposed in the area surrounding the two recovery wells as shown on Figure 7. The proposed locations of the observation wells are situated to evaluate drawdown during the long-term recovery evaluation (Section 3.1.3) and intended to supplement several other existing monitoring wells that will be used for the same purpose.

Borings for the observation wells will be advanced through the overlying concrete, fill, and clay to the top of bedrock using 4.25-inch inside diameter hollow-stem augers. During drilling soil samples will be collected for lithological characterization. Unconsolidated material samples will be collected for characterization, photographs, and screening with a Photoionization Detector (PID) equipped with a 10.6 eV lamp in a continuous interval over the total depth of the boring with a split barrel sampler driven in advance of the augers. Analytical soil samples will not be collected unless there is evidence of LNAPL in the recovered soil core. If LNAPL is identified, one sample will be submitted for laboratory analysis of VOCs, SVOCs, and PCBs.

Each observation well will be screened from 5-feet bgs to the top of the bedrock similar to the recovery wells. The screen may straddle the fill/clay interface. Each well will be screened with a 2-inch diameter Schedule 40 PVC well casing and 0.010-inch slotted screen. The well sand filter pack, seal, and surface completion will follow the same procedures as specified for the recovery wells.

The observation wells will be developed no sooner than two weeks after installation. The water levels in the wells will be manually measured using an oil/water interface probe prior to development. Depth to water, depth, and thickness of any LNAPL, and the total depth of the well will be measured and logged in the field notebook. The wells will be developed by removing three well volumes, purging the wells dry, or purging and surging the wells. The well will be developed to remove fines that typically cause turbidity in water samples.

3.1.1.3 HASP and CAMP

The Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) contained in the March 2021 Remedial Investigation Work Plan (RIWP; Inventum 2021) will be adhered to during all intrusive site work. The previously approved CAMP includes special requirements for ground intrusive activities within 20 feet of the occupied structures or within the buildings.

Any subcontractors utilized to complete this work will be required to provide and adhere to a HASP for use by their employees that, at minimum, meets the same requirements as the HASP in the RIWP.

3.1.2 Baseline Monitoring

A baseline monitoring program will be conducted for 6 weeks following development of the new wells. The 6-week period is intended to provide time to capture some variability/range of precipitation events and any natural fluctuations in groundwater and LNAPL levels in the study area. Additionally, LNAPL in the subsurface, if present, generally requires a longer period after well installation to reach equilibrium.

Transducers will be installed at the following locations during the baseline monitoring period (Figure 7):

- The two (2) new recovery wells;
- The three (3) new observation wells;
- Fill monitoring well CP-2;
- Clay monitoring wells CP-2A and MW-805A; and
- The 5x9 Sewer manhole near GM/AAM Bay E-11, if located[4].

The transducers will record the water level in the wells/manhole at 15-minute intervals over the baseline monitoring period. Monitoring wells in the area where LNAPL had previously been present (MW-BCP-09A, MW-402R, CP-1B (if located), and others if identified) will be gauged bi-weekly.

Additional data collected over the baseline monitoring period will include operational data from the 250 Colorado Street IRM system and precipitation amounts recorded at the Buffalo-Niagara Airport[5].

Two (2) samples of LNAPL will be collected during the baseline period and submitted for laboratory analysis of density using ASTM D1475 (or similar). One sample will be collected from a new well, if LNAPL is present, and one sample will be collected from monitoring well MW-BCP-09A, if present. The LNAPL sample collected from a new well will also be submitted for laboratory analysis of PCBs, SVOCs, and VOCs.

3.1.3 Long-Term Recovery Evaluation

Total fluids (Groundwater and LNAPL) extraction pumps will be installed in each of the new extraction wells. A long-term recovery test will be conducted to monitor groundwater and LNAPL recovery under an applied gradient. The pump intake will be set and operated to maintain drawdown in the well below the invert elevation of the 5x9 Sewer which is estimated to be approximately 628-feet above mean sea level (ft AMSL) (Figure 7) or approximately 14-feet bgs at the proposed extraction well locations.

Extraction rates of under 0.5 gallon per minute (gpm) are anticipated based on low-flow sampling conducted during the RI. Extracted groundwater and LNAPL will be pumped to a temporary oil/water separator to allow for phase separation and recovery volume estimates. Recovered LNAPL from the oil/water separator will be routed to a 55-gallon collection drum, or 330-gallon tote and subsequently groundwater will be routed to the onsite treatment system. Any LNAPL recovered will be retained in the drum or tote.

The long-term recovery test will generally proceed as follows:

- Establish baseline groundwater elevations and LNAPL thicknesses in the new recovery wells, new observations wells, and existing "observation" well network (CP-2, CP-2A, MW-805A, CP-1B, CP-3B, CP-4B, MW-308, CP-4A, and MW-09A);

[4] Inventum was unable to locate this manhole during the RI. The transducer will be installed in the 5x9 Sewer Manhole at East Delevan Avenue if the Bay E-11 manhole cannot be located.
[5] https://newa.cornell.edu/all-weather-data-query/

- Install pumps and transducers in the new recovery wells and transducers in the new observation wells, existing observation wells (CP-2, CP-2A, and MW-805A), and the 5x9 sewer near bay E-11 (if the manhole can be located);
- Operate extraction pumps continuously for 30-days (minimum) maintaining drawdown to approximately 14-feet bgs;
- Conduct bi-weekly manual gauging in observation wells CP-1B, CP-3B, CP-4B, MW-308, CP-4A, and MW-09A;
- Monitor and record adjustments in extraction flow rates;
- Monitor and record recovered groundwater and LNAPL volumes;
- Monitor presence and/or fluctuations in LNAPL thickness in observation wells.

Inventum will notify the NYSDEC during the active pumping period with an e-mail summary of testing completed and will include any deviation from the work plan.

3.2 Survey

A survey will be conducted of the two recovery wells, three observation wells, and at the BSA sewer manhole gauging reference point. The survey will be conducted by a surveyor licensed in the State of New York consistent with standard technical practice. All horizontal locations will be referenced to the North American Datum of 1983 and the New York State Plane System. Vertical elevations will be referenced to the North American Vertical Datum of 1988 and reported in feet above mean sea level (ft. ASML). The ground surface, top of rim, and top of casing of each new well will be surveyed. The ground surface and top of rim for the BSA sewer manhole will be surveyed. The depth to the invert of the sewer will be measured with a water level gauge or weighted tape.

3.2.1 Investigative Derived Waste

3.2.1.1 Groundwater/LNAPL

Groundwater, LNAPL, and decontamination fluids generated during the work may be temporarily containerized in open topped DOT-compliant 55-gallon drums or other storage containers as required to complete the proposed investigative tasks.

All accumulated water and LNAPL will be processed through the EDP treatment system.

3.2.1.2 Soils

Drill cuttings not exhibiting any visual, olfactory, or field screening (PID) indication of potential impact will be staged on plastic sheeting and covered. Waste characterization samples of the stockpile will be collected, and material with concentrations below Industrial Use SCOs may be utilized onsite by EDP (excluding utility trenches).

Depending on the volume, drill cuttings that are grossly contaminated may be containerized in 55-gallon drums or segregated and stockpiled on plastic sheeting and covered. Grossly contaminated shall mean the visible presence of LNAPL and/or sustained PID readings exceeding 10 parts per million (ppm) for more than 1-minute. Discolored soil will not be considered grossly contaminated absent any other indications. Grossly contaminated soil will not be reused as backfill. Grossly contaminated material will be sampled and profiled for off-site disposal as a non-hazardous waste in accordance with all local, state, and federal regulations.

3.3 Indoor Air Sampling

Sub-slab vapor samples were collected at two (2) locations during the RI based on detections of VOCs in groundwater samples (Figure 8). TCE was the only VOC detected at a concentration in sub-slab vapor above NYSDOH criteria. Additional sampling is proposed to refine the BCP Site CSM and Qualitative Human Health Exposure Assessment (HHEA).

Sub-slab and indoor air sampling is proposed in the occupied office/non-profit organization spaces along East Delavan Avenue (Figure 8). Samples will not be collected in the operating commercial, manufacturing, or laboratory areas as they have active ventilation systems in the space, utilize volatile materials in the sales, manufacturing, and testing processes, and/or the manufacturing areas are often typically open to the atmosphere during occupied hours.

Sub-slab and indoor air samples will be collected at six (6) indoor locations and one (1) outdoor location as shown on Figure 8. The samples will be collected during the heating season of November 15, 2023 to March 31, 2024.

Inventum will notify the NYSDEC/NYSDOH a minimum of 15-days prior to collection of the first samples, and if necessary, can meet with the NYSDEC/NYSDOH representatives on the Site to coordinate the final location of the proposed samples.

Sub-slab and indoor air samples will be collected in general accordance with the applicable NYSDOH guidance document (NYSDOH 2006) including tracer gas sampling or a water dam to verify the integrity of the soil vapor probe seal. A pre-sampling product inventory inspection will be completed and documented.

One (1) 8-hour sample will be collected at each sub-slab and indoor air location in a laboratory certified clean Summa® canister and submitted to Alpha Analytical Laboratories of Buffalo, New York for VOC analysis using EPA Method TO-15/TO-15-SIM. Matric A and C compounds as listed within the NYSDOH guidance document[6] will utilize a minimum reporting limit of 0.20 micrograms per cubic meter (ug/m3). Matrix B compounds will utilize a reporting limit of 1.0 ug/m3. The inlet of the indoor air sample collection canisters will be elevated approximately 3-feet above the floor surface during collection.

Sub-slab samples will be collected from temporary sub-slab vapor probes installed at each location. The probes will be constructed with 0.125-inch or 0.25-inch low-density polyethylene (LDPE) tubing or Teflon extended no more than 2-inches into the sub-slab material. The core through the floor will be sealed with a non-VOC emitting surface sealant (ex. modeling clay). Alternatively, Inventum may utilize a Vapor Pin® sampling device for collection of sub-slab samples. Standard operating procedures for utilization of the Vapor Pin system will be adhered to and are provided for reference in Appendix B. After installation, one to three volumes (probe and tube) will be purged prior to collecting the sub-slab samples.

3.4 Surficial Material Sampling

Wipe samples or pulverized concrete samples will be collected for PCB analysis from five areas of stained concrete on the BCP Site. Samples will be collected from each of the five general areas shown on Figure 9. Inventum will coordinate with the NYSDEC PM to visually identify and mutually confirm the sample location and sample type (wipe sample or pulverized core sample) within each area prior to

[6] The most recent Soil Vapor/Indoor Air matrices at available at the time of sample collection will be utilized.

conducting the work. Wipe samples will be collected from stained areas with competent concrete and pulverized core samples will be collected from stained areas with chipped, broken, or cracked concrete.

PCB wipe sampling kits will be obtained from Eurofins TestAmerica Laboratories of Buffalo, NY. Each kit contains a 100 square centimeter template to delineate the area to be sampled and a hexane-soaked pad/cloth. The test area is blotted with the cloth horizontally with one side of the wet pad and then vertically with the other. The sample area is blotted uniformly at least five times in each direction. The sample pad is then rolled into a cylinder, placed in a vial, and capped with a Teflon-lined lid which is then sealed, labeled, and transported to the laboratory for PCB analysis using EPA Method 8082.

Pulverized core samples will be collected by using a 1-inch diameter drill bit and rotary impact hammer. Surface debris will be removed from the sampling location prior to drilling. Aluminum foil surrounding the sampling location will be used to contain the powder generated during the drilling. Samples will be collected at 0.5-inch depth intervals and will not exceed 2-inches in depth. Multiple holes located close to each other may be drilled to generate sufficient sample volume. The pulverized material will be contained in appropriate laboratory supplied bottleware and analyzed for PBCs using EPA method 8082.

One duplicate wipe sample and one duplicate pulverized sample will be collected. One wipe sample “equipment” blank consisting of hexane only will also be collected. The duplicate samples will be collected within the same stained area but will be a separate test area from the primary sample. Photographs of each sample location will be collected.

4 Reporting

A Pre-Design Investigation Report will be prepared and will include, at a minimum, the following components:

- Introduction
- Site Description and History
- PDI Scope of Work and Results Summary
    - LNAPL analyses
    - Groundwater and LNAPL recovery data
    - Sub-slab and indoor air sampling data
    - Wipe sample data
- Assessment of LNAPL recoverability, mobility, and migration potential
- Updated schedule through submittal of the Alternatives Analysis Report

6 Schedule

A schedule for completion of the PDI scope of work through submittal of a revised Alternative Analysis Report is provided below:

- PDI Work Plan Approval – September 2023
- Revised Remedial Investigation Report – 30-days after NYSDEC approval of PDI Work Plan
- PDI Field Work – October 2023 through December 2023
- PDI Report – January 2024
- Revised Alternatives Analysis Report – 30-days after NYSDEC approval of PDI Report

7 Bibliography

ASTM E2856-13. 2021. Standard Guide for Estimation of LNAPL Transmissivity.

Conestoga-Rovers & Associates. June 2009. Remedial Investigation Report Addendum – DRAFT. American Axle Plan Site. NYSDEC Site NO. 915196.

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Inventum Engineering, P.C. September 2022. DRAFT Remedial Investigation Report. Brownfield Cleanup Program Site #C915196B. 1001 East Delavan Avenue, Buffalo, New York.

NYSDEC. May 2019. Technical Guidance for Site Investigation and Remediation

NYSDOH. October 2006. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, New York State Department of Health, Center for Environmental Health Bureau of Environmental Exposure Investigation.

Figures

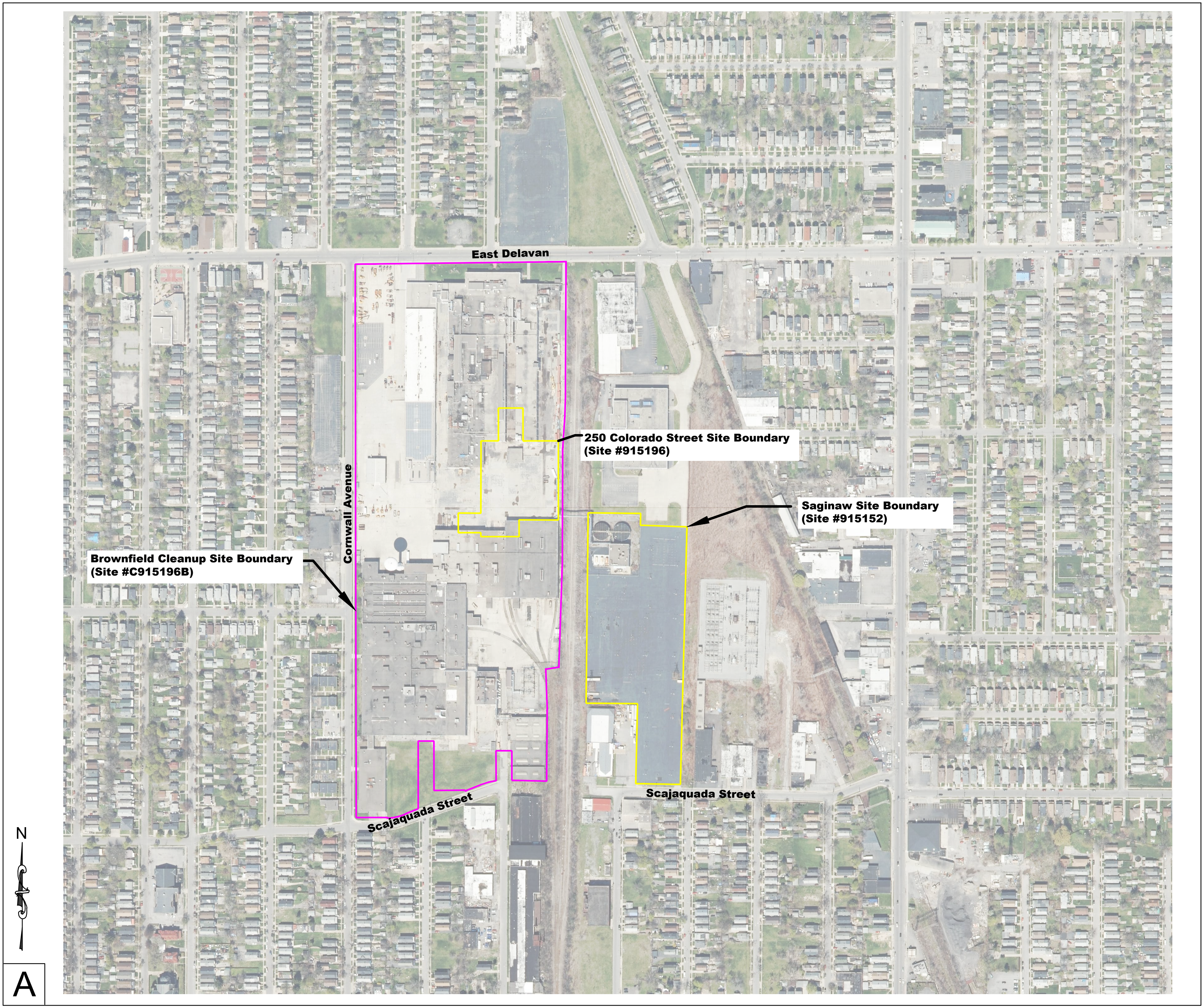

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FIGURE 01

SITE LOCATION

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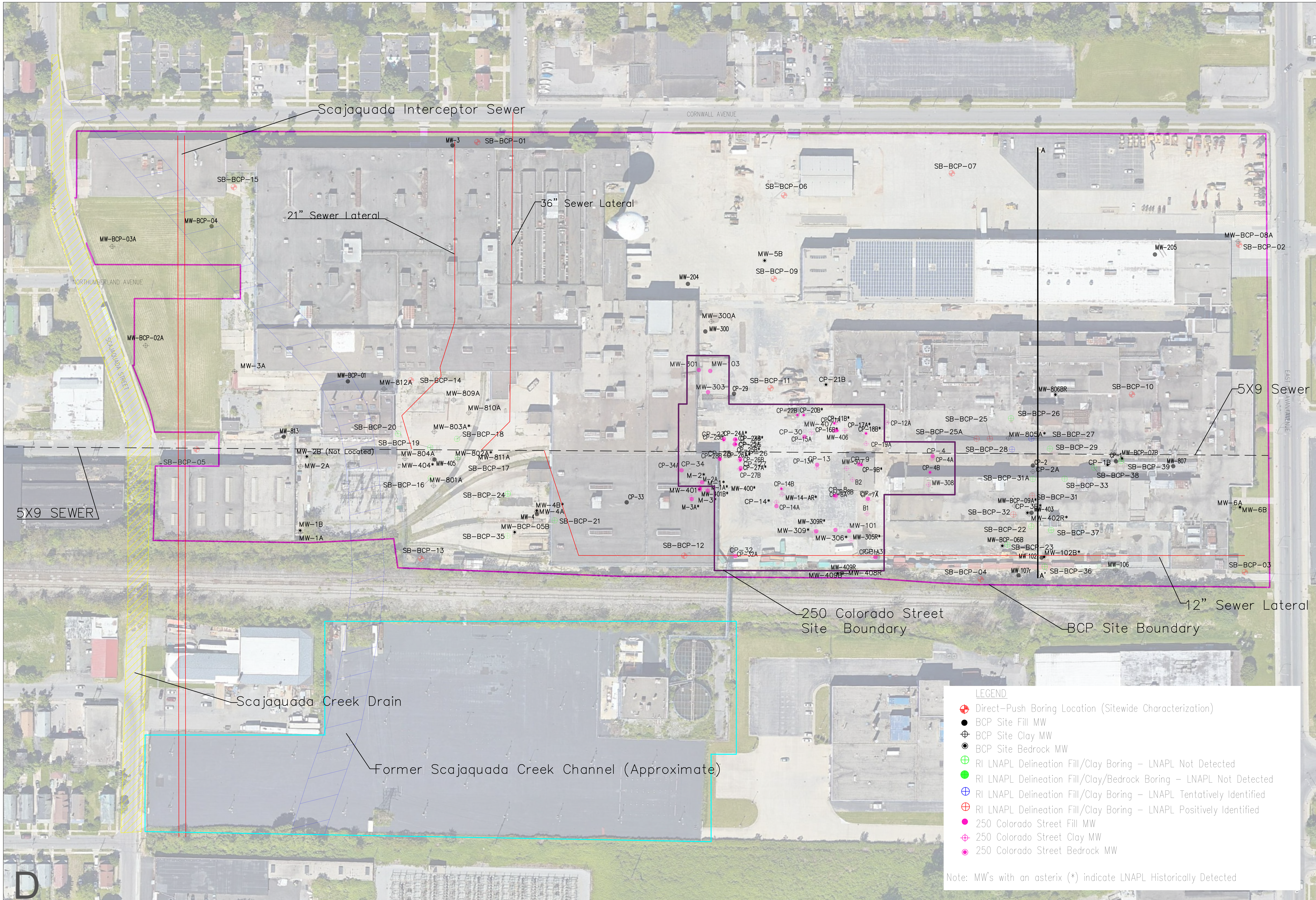
FIGURE 1

SCALE: 1" = 400'



REMEDIAL INVESTIGATION
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FIGURE 2
SITE LAYOUT

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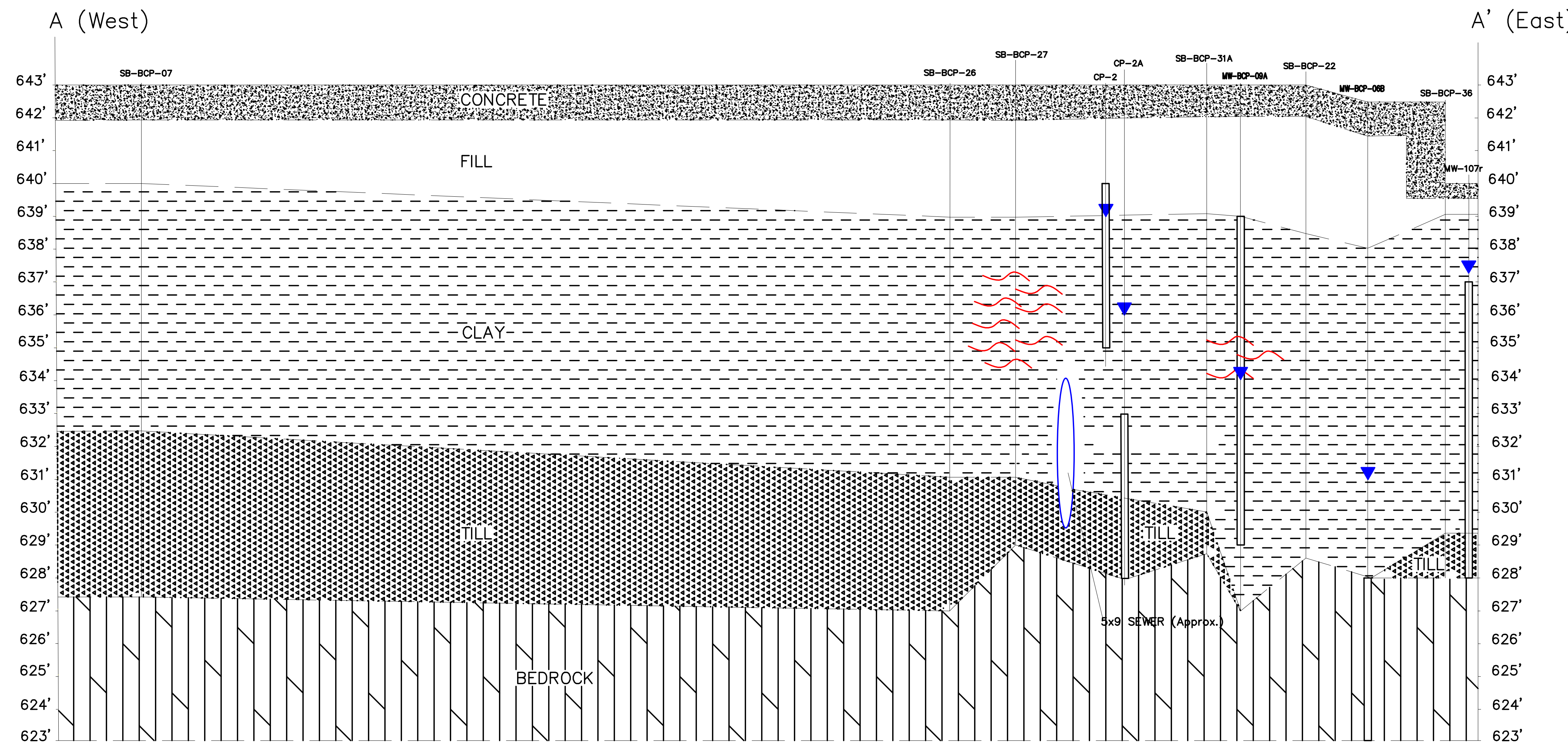
FIGURE 2



POTENTIAL LNAPL PRESENCE

SCREEN INTERVAL OR OPEN BOREHOLE (BEDROCK WELL)

WATER LEVEL

Notes:

1. Groundsurface elevations are approximated from monitoring well survey.
2. 5x9 Sewer Depth approximated from July 2017 GHD Consulting Services Drawing. Buffalo Sewer Authority. Colorado Ave. Sewer. Sheet No. 111-37297-C008. Elevation coordinate conversion BSA Datum + 575.45 feet ASML.

VERTICAL SCALE
1" = 4'
4' 2' 0' 4'

HORIZONTAL SCALE
1" = 70'
70' 35' 0' 70'

B

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FIGURE 3
GEOLOGIC CROSS SECTION
A - A'

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FIGURE 3

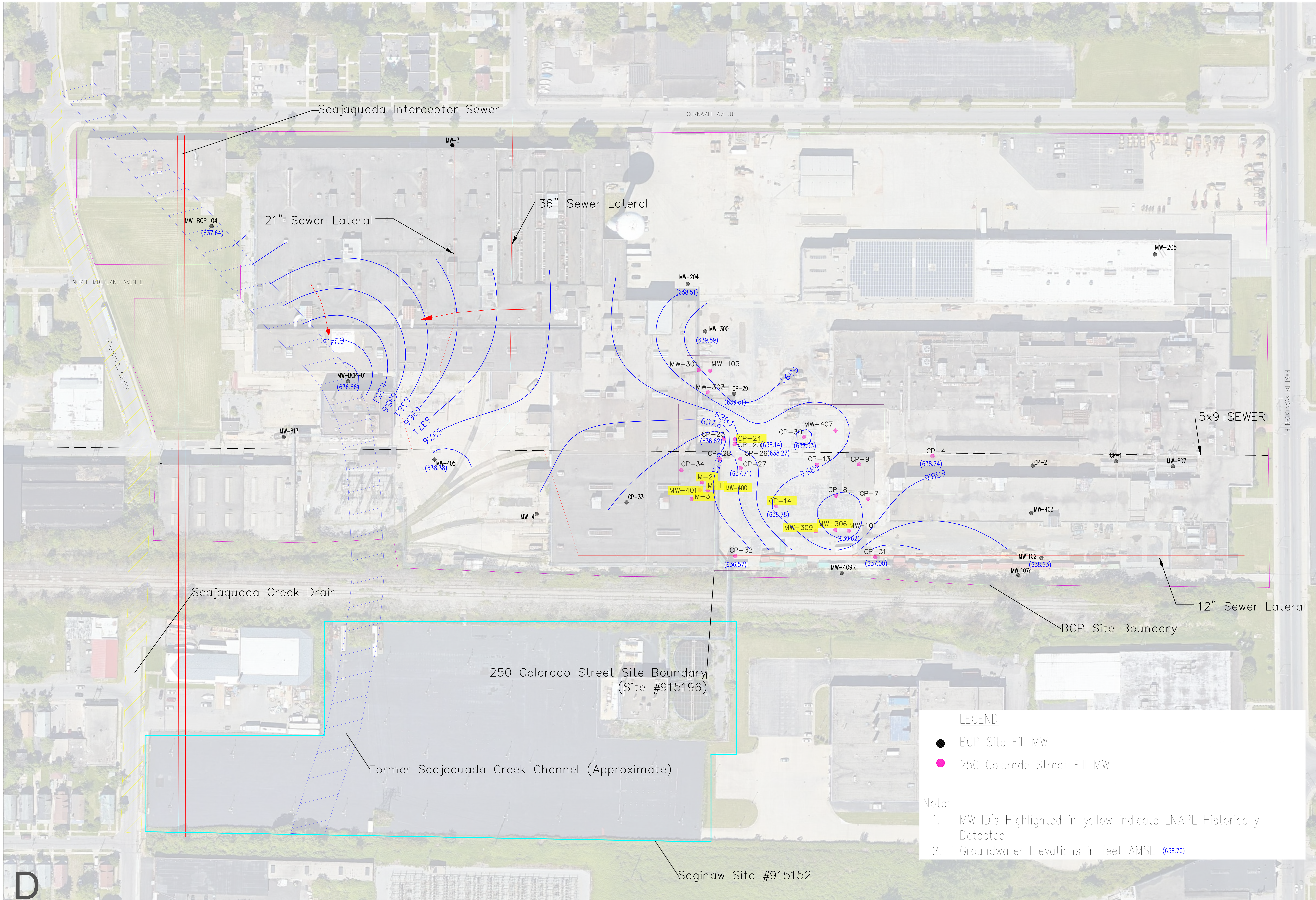

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FIGURE 4

GROUNDWATER
CONTOURS
FILL WELLS
DECEMBER 2021

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FIGURE 4

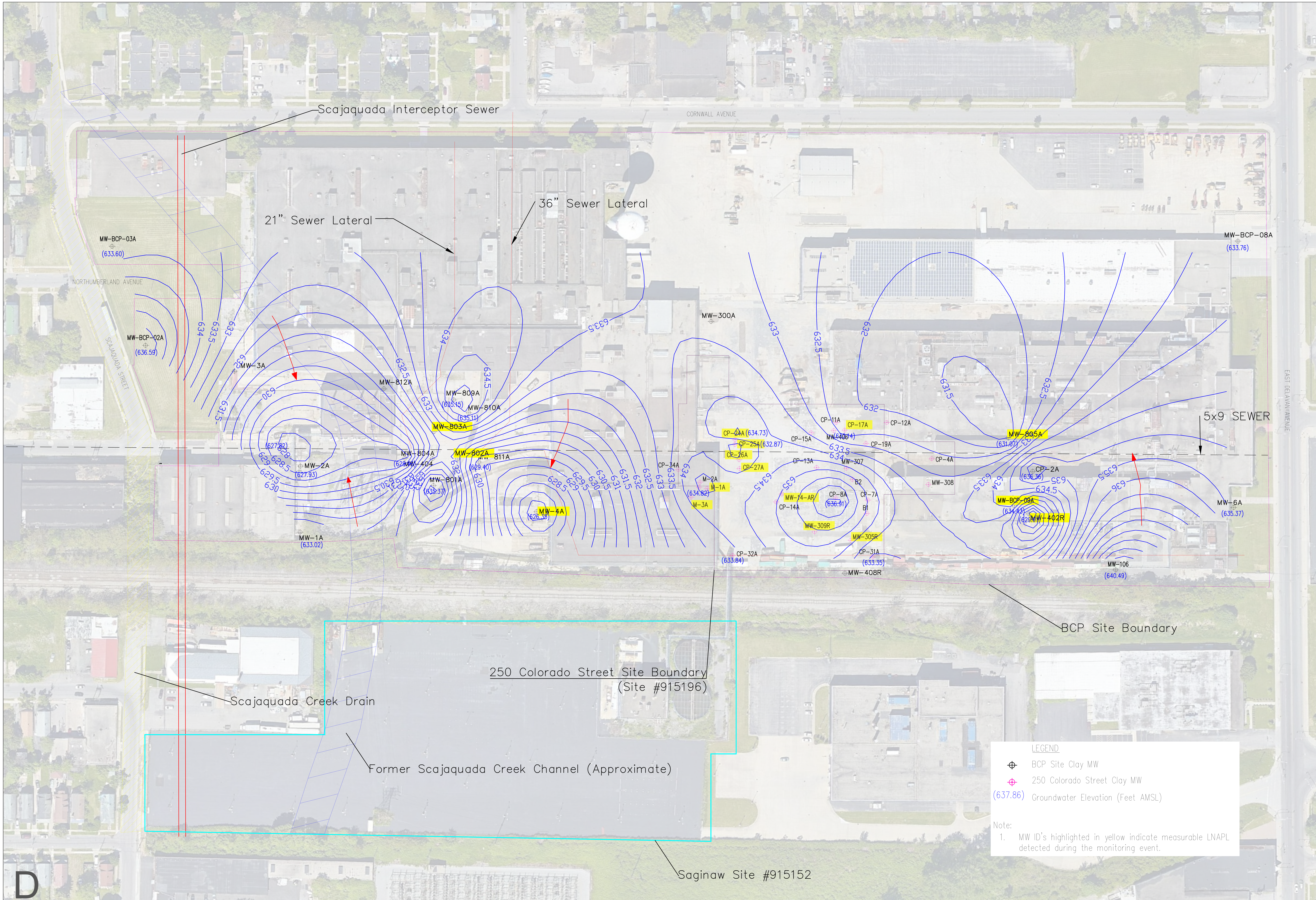

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FIGURE 5

GROUNDWATER CONTOURS
CLAY WELLS
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FIGURE 5

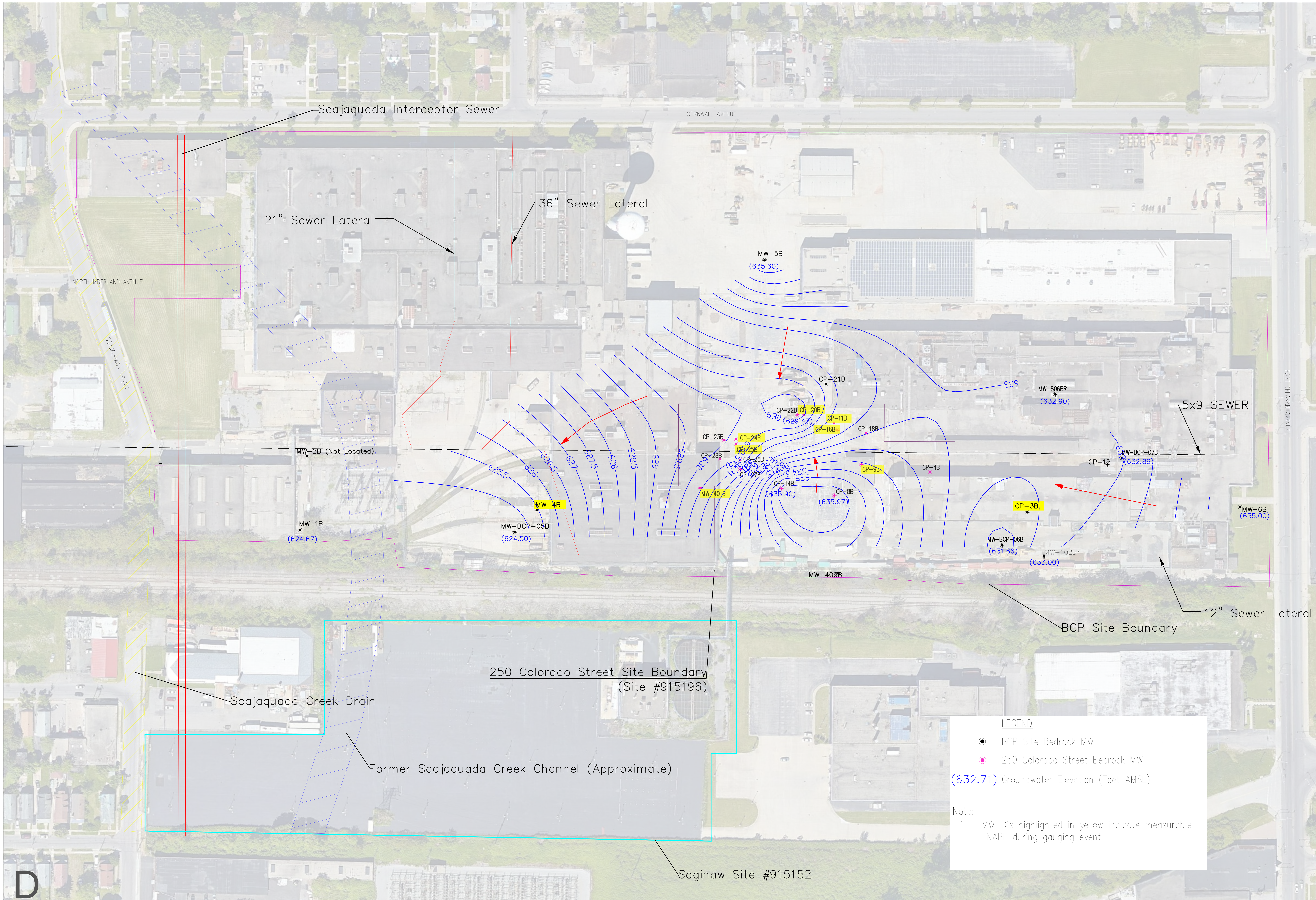

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FIGURE 6

GROUNDWATER CONTOURS
BEDROCK WELLS
DECEMBER 2021

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FIGURE 6

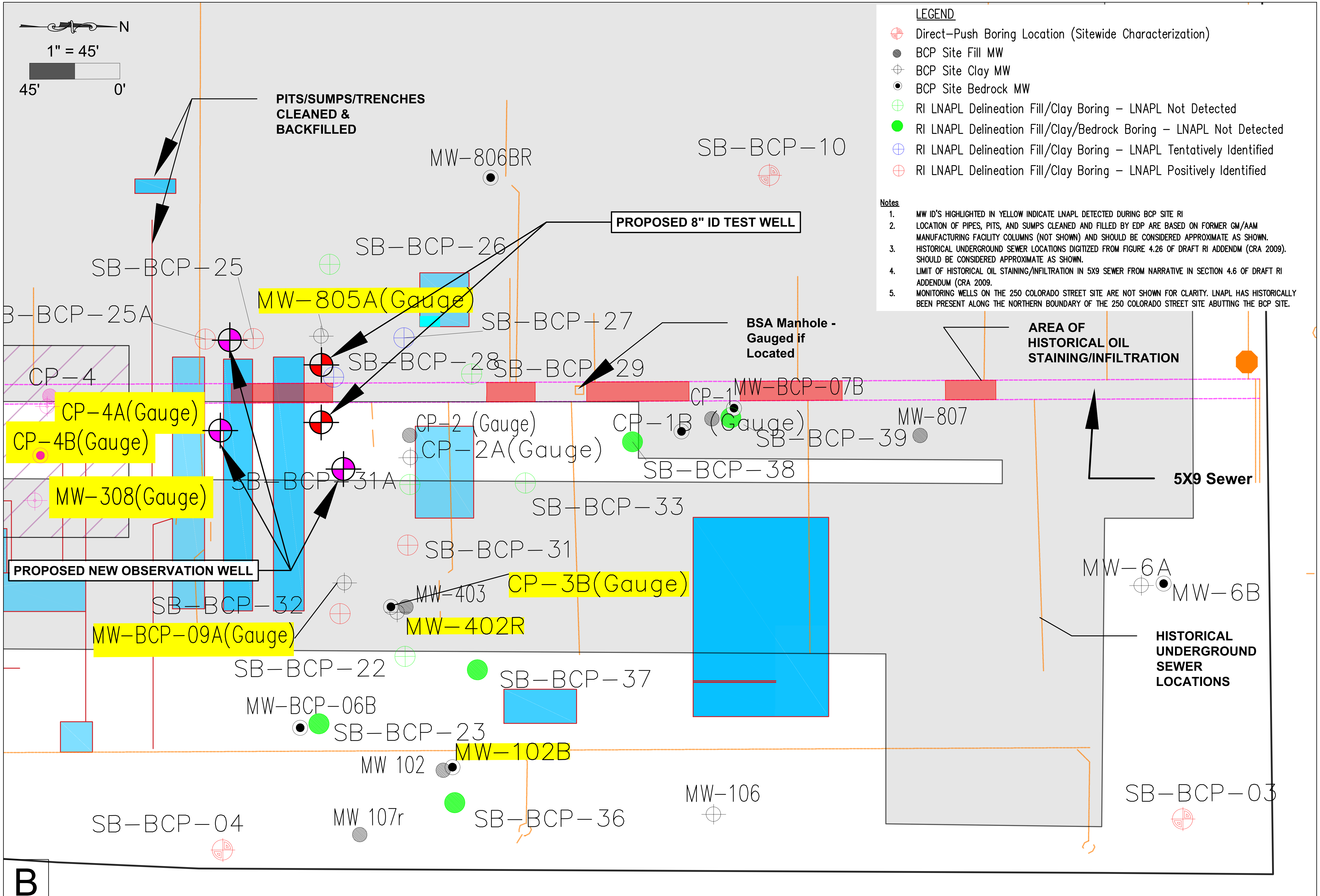

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FIGURE 7

PROPOSED LNAPL MOBILITY TESTING
NEW WELL LOCATIONS

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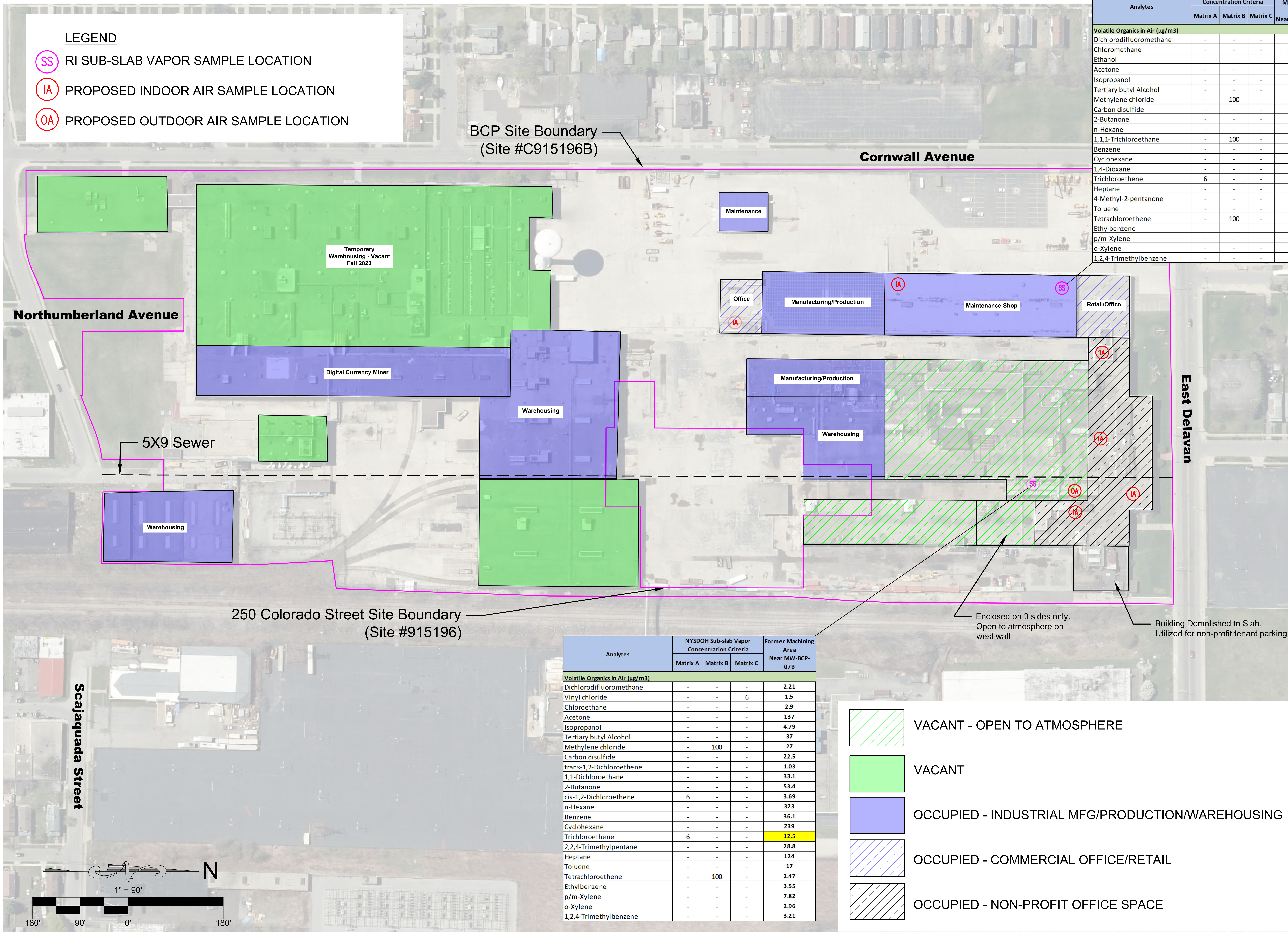
FIGURE 7
DRAWING NUMBER



Analytes	NYSDOH Sub-slab Vapor Concentration Criteria			Former Machnine Shop Near MW-205
	Matrix A	Matrix B	Matrix C	
Volatile Organics in Air (µg/m3)				
Dichlorodifluoromethane	-	-	-	**2.22**
Chloromethane	-	-	-	**0.525**
Ethanol	-	-	-	**17.1**
Acetone	-	-	-	**542**
Isopropanol	-	-	-	**23.8**
Tertiary butyl Alcohol	-	-	-	**17.9**
Methylene chloride	-	100	-	**20.8**
Carbon disulfide	-	-	-	**16.5**
2-Butanone	-	-	-	**52.2**
n-Hexane	-	-	-	**55.7**
1,1,1-Trichloroethane	-	100	-	**43.4**
Benzene	-	-	-	**3.55**
Cyclohexane	-	-	-	**84.7**
1,4-Dioxane	-	-	-	**1.74**
Trichloroethene	6	-	-	**1.88**
Heptane	-	-	-	**70.5**
4-Methyl-2-pentanone	-	-	-	**20.9**
Toluene	-	-	-	**291**
Tetrachloroethene	-	100	-	**21.4**
Ethylbenzene	-	-	-	**5.26**
p/m-Xylene	-	-	-	**21.2**
o-Xylene	-	-	-	**8.08**
1,2,4-Trimethylbenzene	-	-	-	**3.21**

Analytes	NYSDOH Sub-slab Vapor Concentration Criteria			Former Machining Area Near MW-BCP-07B
	Matrix A	Matrix B	Matrix C	
Volatile Organics in Air (µg/m3)				
Dichlorodifluoromethane	-	-	-	**2.21**
Vinyl chloride	-	-	6	**1.5**
Chloroethane	-	-	-	**2.9**
Acetone	-	-	-	**137**
Isopropanol	-	-	-	**4.79**
Tertiary butyl Alcohol	-	-	-	**37**
Methylene chloride	-	100	-	**27**
Carbon disulfide	-	-	-	**22.5**
trans-1,2-Dichloroethene	-	-	-	**1.03**
1,1-Dichloroethane	-	-	-	**33.1**
2-Butanone	-	-	-	**53.4**
cis-1,2-Dichloroethene	6	-	-	**3.69**
n-Hexane	-	-	-	**323**
Benzene	-	-	-	**36.1**
Cyclohexane	-	-	-	**239**
Trichloroethene	6	-	-	**12.5**
2,2,4-Trimethylpentane	-	-	-	**28.8**
Heptane	-	-	-	**124**
Toluene	-	-	-	**17**
Tetrachloroethene	-	100	-	**2.47**
Ethylbenzene	-	-	-	**3.55**
p/m-Xylene	-	-	-	**7.82**
o-Xylene	-	-	-	**2.96**
1,2,4-Trimethylbenzene	-	-	-	**3.21**

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FIGURE 8

PROPOSED SUB-SLAB AND INDOOR AIR SAMPLING LOCATIONS

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FIGURE 8

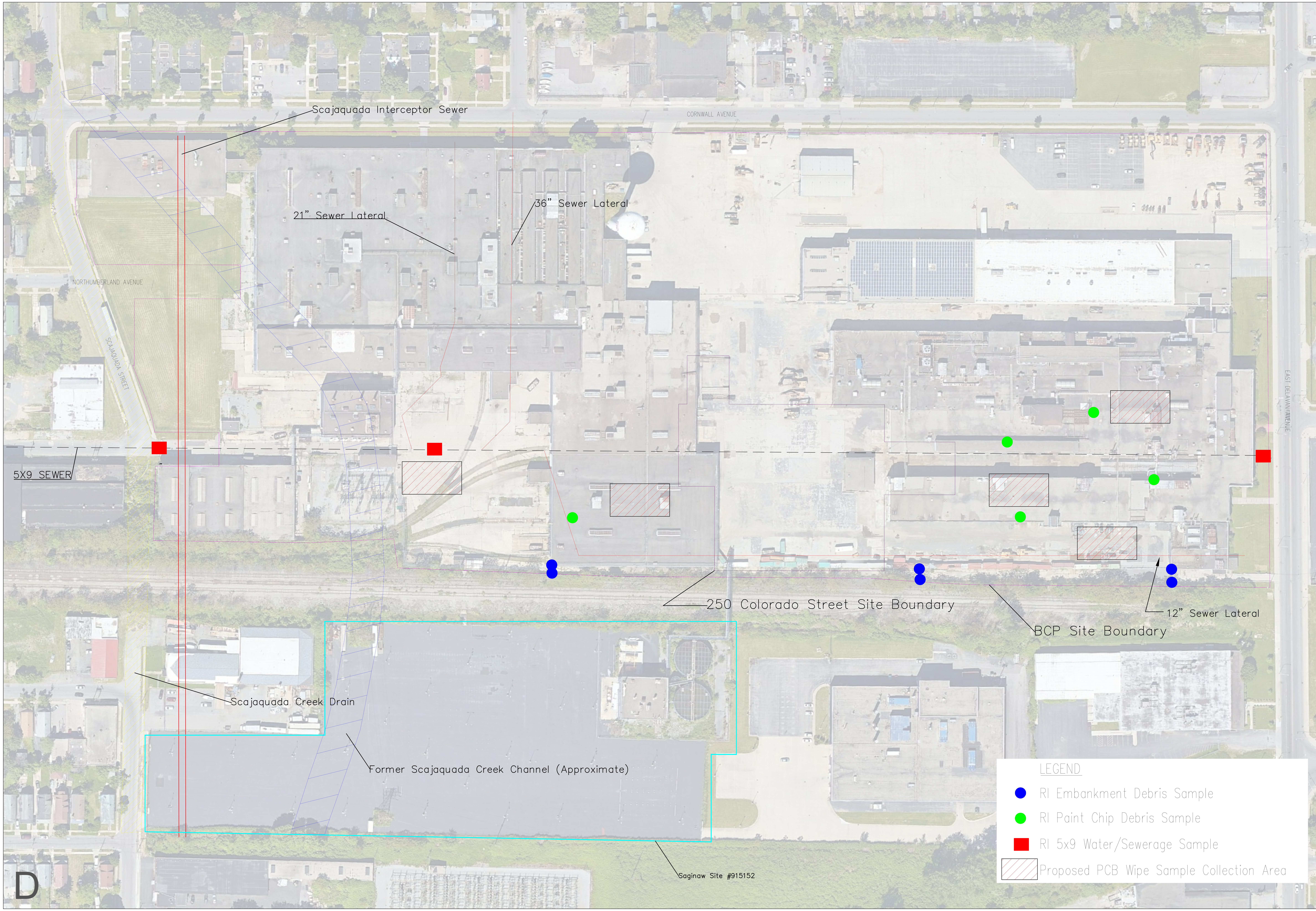

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FIGURE 9

PROPOSED PCB WIPE
SAMPLING AREAS

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FIGURE 9

Appendix A – Photograph Log

Client Name: East Delavan Avenue LLC	Photo Date: Sept. 2009	Project: East Delavan Avenue BCP Site No. C915196B

Photo No. 1

Direction Photo Taken:
Unknown

Description:

Typical. Cleaning of pit/sump in former machining area. Scale of personnel and equipment indicate base of pit/sump is close to clay/bedrock interface (~12 to 14-feet bgs).

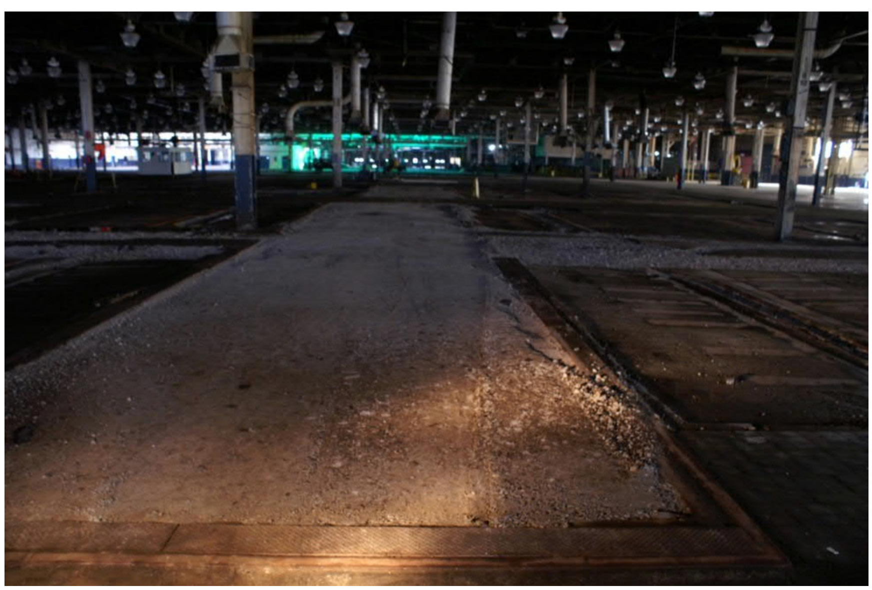
Client Name: East Delavan Avenue LLC	Photo Date: June 2009	Project: East Delavan Avenue BCP Site No. C915196B

Photo No. 2

Direction Photo Taken:
Looking west

Description:

Typical. Backfilled trenches and pits in former machining area after cleaning.



Client Name: East Delavan Avenue LLC	Photo Date: July 2009	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 3		
Direction Photo Taken: N/A		
Description: Former machining area. Pit under former equipment prior to cleaning by EDP.		

Client Name: East Delavan Avenue LLC	Photo Date: July 2009	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 4		
Direction Photo Taken: N/A		
Description: Former machining area. Water/LNAPL in pit. Prior to removal, cleaning, and backfilling by EDP		

Client Name: East Delavan Avenue LLC	Photo Date:	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 5		
Direction Photo Taken: N/A		
Description: Typical coal and industrial urban debris in Fill.		

Client Name: East Delavan Avenue LLC	Photo Date:	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 6		
Direction Photo Taken: N/A		
Description: Typical Fill column. Coal and industrial urban debris and reworked native clays.		

Client Name: East Delavan Avenue LLC	Photo Date: July 2009	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 7		
Direction Photo Taken: N/A		
Description: Typical brownish-red clay.		

Client Name: East Delavan Avenue LLC	Photo Date:	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 8		
Direction Photo Taken: N/A		
Description: Typical brown-red clay.		

Client Name: East Delavan Avenue LLC	Photo Date:	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 9		
Direction Photo Taken: N/A		
Description: LNAPL Sheen in clay core at SB-BCP-25		
Client Name: East Delavan Avenue LLC	**Photo Date:** June 2009	**Project:** East Delavan Avenue BCP Site No. C915196B
Photo No. 10		
Direction Photo Taken: N/A		
Description: LNAPL in TerraCore (VOC Sample collection) at SB-BCP-31		

Client Name: East Delavan Avenue LLC	Photo Date:	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 11 Direction Photo Taken: N/A Description: LNAPL containing clay in water after 24-hours. Note no separation or LNAPL in the water.		
Client Name: East Delavan Avenue LLC	Photo Date:	Project: East Delavan Avenue BCP Site No. C915196B
Photo No. 12 Direction Photo Taken: N/A Description: Limestone bedrock core. Typical.		

Appendix B – Vapor Pin® Standard Operating Procedures

Standard Operating Procedure

Installation and Extraction
Vapor Pin® Sampling Device

Scope & Purpose

Scope

This standard operating procedure describes the installation and extraction of the Vapor Pin® Sampling Device for use in sub-slab soil-gas sampling.

Purpose

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the Vapor Pin® Sampling Device.

Equipment Needed

- Vapor Pin® Sampling Device
- Vapor Pin® Sleeves
- Vapor Pin® Cap
- Installation/Extraction Tool
- Rotary Hammer Drill
  - ⅝-Inch (16mm) diameter hammer bit
  - 1½-Inch (38mm) diameter hammer bit for flush mount applications
- ¾-Inch (19mm) diameter bottle brush
- Wet/Dry Vacuum with HEPA filter (optional)
- Dead Blow Hammer
- VOC-free hole patching material (hydraulic cement) and a putty knife or trowel
  - This is for repairing the hole following the extraction of the Vapor Pin® Sampling Device

Installation Procedure

1. Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.
2. Set up wet/dry vacuum to collect drill cuttings.
3. For a temporary installation, drill a ⅝-inch (16mm) diameter hole through the slab and approximately 1-inch (25mm) into the underlying soil to form a void. The hole must be ⅝-inch (16mm) in diameter to ensure a seal.
   - If a flush mount installation is required, drill a 1½-inch (38mm) diameter hole at least 1¾-inches (45mm) into the slab. We highly recommend using the Stainless Steel Drilling Guide and to reference the Standard Operating Procedure Drilling Guide & Secure Cover.
4. Remove the drill bit, brush the hole with the bottle brush and remove the loose cuttings with the vacuum.
5. Assemble the Vapor Pin® Sampling Device and Vapor Pin® Sleeve (Figure 1).
6. Place the lower end of the Vapor Pin® Sampling Device assembly into the drilled hole. Place the small hole located in the handle of the Installation/Extraction Tool, over the Vapor Pin® to protect the barb fitting and tap the Vapor Pin® into place using a dead blow hammer (Figure 2). Make sure the Installation/Extraction Tool is aligned parallel to the Vapor Pin® to avoid damaging the barb.
   - During installation, the Vapor Pin® Sleeve may form a slight bulge between the slab and the Vapor Pin® Sampling Device shoulder.
7. Place the Vapor Pin® Cap on the Vapor Pin® to prevent vapor loss prior to sampling (Figure 3).
8. For flush mount installations, cover the Vapor Pin® with a flush mount cover, using either the plastic cover or the optional Stainless Steel Secure Cover (Figure 4).
9. Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to re-equilibrate prior to sampling.

Figure 1.

Figure 2.

Figure 3.

Figure 4.

Sampling

1. Remove the Vapor Pin® Cap and connect your sample tubing to the barb fitting of the Vapor Pin® Sampling Device.
2. Create a connection by using a short piece of Tygon™ tubing to join the Vapor Pin® Sampling Device with the Nylaflow tubing (Figure 5). Put the Nylaflow tubing as close to the Vapor Pin® Sampling Device as possible to minimize contact between soil gas and Tygon™ tubing. You do not **have** to use Nyflaflow tubing, any stiff tubing will suffice.
3. Prior to sampling, conduct a leak test in accordance with applicable guidance. If a leak test is not specified, refer to the SOP Leak Testing the Vapor Pin® Sampling Device, via Mechanical Means (Figure 6). For flush-mount installations, distilled water can be poured directly into the 1½ inch (38mm) hole.

Figure 5.

Figure 6.

Figure 7.

Extraction Procedure & Reuse Notes

1. Remove the protective cap, and thread the Installation/Extraction Tool onto the Vapor Pin® Sampling Device (Figure 7). Turn the tool clockwise continuously, don't stop turning, the Vapor Pin® Sampling Device will feed into the bottom of the Installation/Extraction Tool and will extract from the hole like a wine cork, **DO NOT PULL!**
2. Fill the void with hydraulic cement and smooth with a trowel or putty knife.
3. Prior to reuse, remove the silicon Vapor Pin® Sleeve and Vapor Pin® Cap and discard. Decontaminate the Vapor Pin® Sampling Device in a Alconox® solution, then heat in an oven to a temperature of 265° F (130°C). For Stainless – ½ hour, Brass 8 minutes.

Standard Operating Procedure

Leak Testing the Vapor Pin® Sampling Device Via Water Dam

Scope & Purpose

Scope

The operating procedure describes the methodology to test a Vapor Pin® Sampling Device or equivalent sub-slab sampling device for leakage of indoor air.

Purpose

The purpose of this procedure is to assess the potential for indoor air to leak past the Vapor Pin® Sampling Device.

Equipment Needed

- Water Dam
- Distilled water
- VOC free modeling clay or equivalent
- Vapor Pin® Sampling Device and associated sample tubing

Procedure

1. Drill a ⅝-inch (16mm) hole in the concrete slab and install the Vapor Pin® Sampling Device as per the Standard Operating Procedure (SOP).
2. Clean the slab within a 2-inch radius of the Vapor Pin® Sampling Device to remove dust. Avoid wetting the concrete or wait until the concrete is dry before proceeding and avoid cleaning with VOC-containing substances. A whisk broom or shop vacuum is recommended. Remaining dust can be picked up with a piece of scrap modeling clay.
3. Roll a 1-inch diameter ball of modeling clay between your palms to form a "snake" approximately 7 inches long and press it against the end of the water dam. Push the water dam gently against the slab to form a seal with the concrete.
4. Attach the sample tubing to the top of the Vapor Pin® Sampling Device and pour enough distilled water into the water dam to immerse the base of the Vapor Pin® and the tubing connection at the top of the Vapor Pin® Sampling Device.
5. Purge the sample point as required by the data quality objectives. Concrete will absorb some of the water, which is normal; however, if water is lost to the sub-slab, stop, remove the water from the water dam, and reposition the Vapor Pin® Sampling Device to stop the leakage. Reseat the leak test equipment, if needed.
6. If the Vapor Pin® Sampling Device is installed in the flush-mount configuration, the larger hole can be filled with water in place of the water dam modeling clay.

Figure 1. Water dam used for leak detection