



Interim Remedial Measures Work Plan RAOC #1 and RAOC #2

Location:

Former Wollensack Optical
872 & 886 Hudson Avenue
Rochester, New York

Prepared for:

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312 State Street
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LaBella Project No. 2182207

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Certification

I, _____ certify that I am currently a NYS registered professional engineer and that this Interim Remedial Measures 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).

NYS Professional Engineer #

Date

Signature



1.0 INTRODUCTION

LaBella Associates, D.P.C. (“LaBella”) is submitting this Interim Remedial Measures (IRM) Work Plan on behalf of Jefferson Wollensack LLC for the Former Wollensack Optical Site located at 872 & 886 Hudson Avenue, City of Rochester, Monroe County, New York, herein after referred to as the “Site.” Refer to Figure 1 for a Site Location Map. The Site was entered into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) in January 2019 as Site #C828209.

The Remedial Investigation (RI) is currently in progress and has identified an apparent source of chlorinated volatile organic compounds (CVOCs) in the overburden in the southwestern portion of the Site Building; this area is designated Remedial Area of Concern (RAOC #1). In addition, building materials containing levels of gamma radiation above background have been identified in discrete locations; these areas are designated RAOC #2. This Work Plan includes in-situ chemical oxidation (ISCO) as an IRM for the overburden soil and groundwater in RAOC #1 and removal of building materials containing radiation as an IRM for RAOC #2.

2.0 SITE DESCRIPTION AND HISTORY

2.1 *Site Description and Surrounding Properties*

The Site is comprised of two (2) tax parcels with a total area of approximately 0.48± acres. The tax parcels are addressed as 872 Hudson Avenue (SBL 091.81-2-59) and 886 Hudson Avenue (SBL 091.81-2-58). Attached Figure 2 illustrates the location and surrounding area of the Site. The Site is currently developed with a vacant 26,000-square foot (sq ft), 4-story former manufacturing facility. The Site building has a partial basement in the southeastern quadrant. The Site building is located on the 872 Hudson Avenue tax parcel and the footprint of the building comprises approximately 0.14-acres of the 0.48-acre parcel. The remaining, undeveloped portion of the Site is covered in gravel or vegetation. A separate building was previously located on the 886 Hudson Avenue tax parcel but was demolished by the City of Rochester in 2015.

The Site is located to the northeast of the intersection of Hudson Avenue and Avenue D and is bounded by Hudson Avenue to the west and Avenue D to the south. Commercial properties are located to the south of the Site beyond Avenue D and to the southwest, beyond the intersection of Avenue D and Hudson Avenue. Residential properties are located to the west of the Site, beyond Hudson Avenue and adjacent to the north and east of the Site.

2.2 *Site History*

Historical records indicate the Site was utilized for residential purposes and as a tailor and electric motor shop in at least 1911. The current Site building at 872 Hudson Avenue, formerly operated by Wollensack Optical (AKA Wollensack Optical), was constructed in approximately 1930 based on tax information. The building formerly located at 886 Hudson Ave was operated by J.S. Graham Co., manufacturers of Photo Mounts and was constructed in approximately 1912 based on tax information. Various manufacturing companies occupied the Site from 1926 to 2010 including Wollensack Optical, Anson Instrument, Minnesota Mining and Manufacturing, Virgenville Lens Company, and Surplus Shed. Since approximately 2010, the building has been stripped of most plumbing, electrical, and mechanical fixtures.

The building on the 886 Hudson Avenue parcel was recently demolished by the City of Rochester. The Phase I ESA indicates optical lens manufacturing, printing and photographic mount (AKA mat) manufacturing was completed at the Site from the early 1900s to at least the mid-1970s. However, note that historical street directory listings indicate the Site was affiliated with various optical manufacturing companies from the mid-1970s until at least 2010, if not utilized for active manufacturing purposes.

NYSDEC Spill #0651965 was opened in 2007 as a result of a flood in the basement of the former building at 886 Hudson Ave formerly located adjacent to the current Site building after a petroleum sheen was noted on the water flowing out from the former building's basement. Seven (7) fuel storage tanks were identified in a vault accessible from the Site Building's basement and appear to be located within the right-of-way beneath Avenue D. Each tank is reportedly 275-gallons in capacity. This vault is accessible via a doorway from the Site building's basement.

Based on the review of Sanborn Fire Insurance Mapping, properties adjacent to the north, east and west of the Site were historically utilized for residential purposes since at least 1911.

Historic records indicate this property to the southwest of the Site (beyond the intersection of Hudson Avenue and Avenue D) appears to have been utilized for residential and commercial purposes in the early 1900s, and as a gasoline filling station from at least 1950 to 1971. The southwestern adjacent property is currently utilized for commercial (retail) purposes.

The property adjacent to the south of the Site was historically utilized for retail purposes from the early 1900s to present day. Although not adjacent, a manufacturing facility has been located approximately 200-ft to the south of the Site since at least 1950. Historical records included in the Phase I ESA (refer to Section 3.1) indicate this facility was utilized for clothing manufacturing from approximately 1926 to approximately 1940 and for optical manufacturing and related operations from approximately 1940 to present day.

3.0 PREVIOUS INVESTIGATIONS

The following environmental investigations have been completed or are in the process of being completed for the Site and were used in developing this IRM Work Plan:

- *Phase I Environmental Site Assessment (ESA)*, completed by Seeler Engineering, P.C. ("Seeler"), September 2017;
- *Phase II ESA*, completed by LaBella, August 2018;
- *Preliminary Shallow Bedrock Groundwater Study Summary Letter*, completed by LaBella, October 11, 2018;
- *Draft Remedial Investigation*, LaBella (ongoing).

Key findings of the abovementioned reports are summarized as follows.

3.1 *Phase I ESA report completed by Seeler dated September 2017*

This Phase I ESA identified a Recognized Environmental Condition (REC) associated with seven (7) fuel storage tanks in a vault beneath the sidewalk adjacent to the south of the Site building (refer to Figure 2). Each tank is reportedly 275-gallons in capacity. This vault is accessible via a doorway from the Site building's basement. Based on NYSDEC Spill listing #0651965 and Seeler's Phase I ESA, the tanks



reportedly contained fuel oil for heating the building. The volume of product currently in the tanks is unknown.

LaBella discussed the Spill listing with the NYSDEC on June 8, 2018. The NYSDEC indicated that the Department had previously requested prior property owners to properly remove the tanks and perform a subsurface investigation consisting of the advancement of soil borings in the sidewalk surrounding the tank vault and within the vault itself, if possible.

In addition to the REC, the Phase I ESA described the Site's historical use for industrial purposes including optical lens manufacturing, printing and photographic mount (AKA mat) manufacturing from the early 1900s until at least the mid-1970s. As described in Section 2.2, the Site appears to have at least been affiliated with various optical manufacturing companies from the mid-1970s until at least 2010, if not utilized for active manufacturing purposes.

3.2 Phase II ESA report completed by LaBella dated August 2018

This Phase II ESA was conducted to evaluate the Site subsurface based on the historical industrial operations and the presence of fuel storage tanks in the underground vault located immediately south of the Site (refer to Section 3.1). The Phase II ESA generally consisted of the following:

- Interior screening for detectable VOCs using a handheld photo-ionization detector (PID) capable of reading in units of parts per billion (ppb) was completed throughout the basement and 1st floor of the building. Features such as piping, floor and wall cracks, floor drains, sumps, etc., located in the basement and 1st floor of the building were screened for potential infiltration sources of VOCs. This evaluation identified readings above background in the vicinity of a sump located on the 1st floor (4,434 ppb), from a crack in the floor on the western side of the first floor (1,260 ppb) and from cracks in the floor and wall in the southwestern quadrant of the basement (1,228-1,848 ppb).
- In addition to the VOC screening, LaBella utilized a Ludlum 3-97 Survey Meter on all floors throughout the building to assess for radiation levels above background levels based on the potential for radioactive materials to be stored/used in the building based on historical optical processes. Elevated radiation readings were not identified in any other portions of the building with the exception of one (1) area where a measurement (10 ur/hr) slightly above background (i.e., 0 to 2 ur/hr) was identified in the southwestern corner of the 1st floor. This reading does not appear to be indicative of substantial radioactive material.
- A total of seventeen (17) soil borings were advanced, including two (2) borings within the building and six (6) borings in the right-of-way (sidewalks) adjacent to the south and west of the Site. Ten (10) soil borings were converted to groundwater monitoring wells, including one (1) interior boring (SB-16).
- Due to the presence of friable asbestos containing materials (ACMs) within the building, interior work was limited and LaBella personnel who completed such work wore half-mask air purifying respirators as well as chemical resistant suits and gloves. Interior borings (SB-16 and SB-17) were advanced using handheld equipment, which limited the terminal depth of these borings. All borings were advanced to equipment refusal or several feet into the water table. Terminal depths of the borings ranged from approximately 5 to 20-ft bgs. Boring SB-16 was advanced within the building basement and boring SB-17 was advanced on the 1st floor of the building, in the vicinity of the sump described in Section 5.0. The floor of the basement is approximately 10-ft below the exterior ground surface. All other borings were advanced in exterior locations.



Based on the Phase II ESA and the subsequent shallow bedrock groundwater study (refer to Section 3.3), the top of bedrock at the Site appears to be present between 22.5-ft and 24-ft bgs. Soils at the Site were generally comprised of tightly packed brown silt, sandy silts and fine to coarse subangular and subrounded gravel. Trace amounts of fill including cinders and ash were observed near the surface of a limited number of borings, particularly on the eastern side of the Site. This urban fill material was encountered to depths of approximately 3-ft bgs. It should be noted that this area is generally in the location of the former building that was recently demolished by the City of Rochester.

Groundwater flow modeling completed using Golden Software Surfer 14.0, Kriging Method indicates groundwater flow is radiating from the southeastern corner of the Site building and flow across much of the Site is to the west-northwest, with a relatively steep hydraulic gradient across the southwestern portion of the Site. Groundwater flow in the southeastern-most portion of the Site appears to be to the south-southwest. Mile Square Mapping obtained from the City of Rochester which shows sewer locations and invert elevations indicate that groundwater is generally flowing towards these underground sewers, particularly in Hudson Avenue. However, note that at the time of measurement, the water table elevation appears to be deeper than the deepest sewer invert, which would indicate the sewer may not be influencing groundwater flow direction. Refer to Figure 7 for the groundwater flow model completed as part of the 2018 Phase II ESA.

The following conclusions were made based on the results of the Phase II ESA:

- The primary contaminant of concern at the Site appears to be trichloroethene (TCE), a chlorinated solvent often historically utilized for metal degreasing. Tetrachloroethene (PCE) was also detected in groundwater at concentrations above NYCRR Part 703 groundwater standards in several wells with the greatest concentration (247 ug/L) detected in MW-SB-07 west of the Site building. Additional chlorinated VOCs (CVOCs), including breakdown products of TCE and PCE, were also identified at elevated concentrations in groundwater. Although the highest concentrations of TCE in groundwater were identified in the sidewalk adjacent to the south (up to 82,900 ug/L in MW-SB-14) and west (up to 28,600 ug/L in MW-SB-07) of the Site, these impacts appear to be emanating from the Site. Groundwater flow modeling generated from data collected in August 2018 indicates groundwater flow in the immediately vicinity of the building is to the west-northwest. The highest concentrations of TCE in soil (0.605 mg/kg) were identified beneath the building's basement and to the south of the building, indicating the source of TCE impacts may be within the building's footprint.
- In addition to CVOC impacts, apparent petroleum-related VOCs were identified at concentrations slightly above their respective NYCRR Part 703 groundwater standards in well SB-MW-04. This well is located approximately 15-ft to the northeast of the tank vault located beneath the sidewalk along Avenue D. Based on the proximity of SB-MW-04 to the vault and the building's basement, these low-level impacts may be associated with a prior petroleum release from the tanks in the vault; however, groundwater flow modeling indicates this well is hydraulically upgradient of the vault. Additional petroleum impacts were not identified in wells and soil borings surrounding the vault, indicating substantial subsurface impacts are not present associated with this vault.
- Finally, urban fill material including ash and cinders were identified at the Site, primarily in the top 3-ft of the soil column. Samples of this material were analyzed for SVOCs and metals; however, concentrations of targeted compounds were not identified above NYCRR Part 375 SCOs.

3.3 Preliminary Shallow Bedrock Groundwater Study completed by LaBella dated October 2018



This study was completed based on the identification of elevated concentrations of TCE and other chlorinated solvents in overburden soil and groundwater at the Site. The objective of this study was to determine if these impacts have descended into shallow bedrock groundwater and the rock matrix itself.

This preliminary investigation consisted of the advancement of three (3) shallow bedrock groundwater monitoring wells to the east, west and south of the building. Wells to the west and south of the building were advanced in the right-of-ways (sidewalks) in close proximity to the overburden groundwater monitoring wells which had identified the highest concentrations of TCE. Bedrock was encountered between 23.2-ft to 24.0-ft bgs in the three (3) well locations. Wells were designated BW-01 through BW-03 installed as open rock wells into the top 10-ft of competent bedrock, with the exception of well BW-03. Although well BW-03 was cored to 10-ft bgs, due to the low competency of the rock, much of the core was lost back into the well during drilling, causing the sample interval of BW-03 to be limited to the top 6-ft of bedrock in this area.

During well installation, rock cores were examined, screened with a PID capable of measuring VOC concentrations in ppb and rock quality designations (RQDs) were calculated. Following installation and development, bedrock wells were sampled using low-flow methodology for target compound list (TCL) and NYSDEC Commissioner Policy 51 (CP-51) list VOCs. In addition to the groundwater samples, samples of the bedrock itself were submitted for laboratory analysis of these same parameters. Although New York State comparison criteria do not exist for bedrock, these samples were collected to determine CVOC levels in the rock matrix itself and thus the potential for back diffusion following groundwater remediation. Two (2) rock samples were collected from each corehole at two separate depths in an effort to delineate the extent of contamination within bedrock, if present. Samples were biased towards the top of bedrock and in areas of fractures.

The following conclusions were made based on the results of the Preliminary Shallow Bedrock Groundwater Study:

- Although CVOCs were detected in groundwater within wells BW-01 and BW-02, substantial CVOC concentrations were only identified at elevated concentrations in well BW-03, located to the west of the Site building. Concentrations of TCE and cis-1,2-dichloroethene were identified at 7,200 ug/L and 1,000 ug/L, respectively in BW-03. Overburden well SBMW-07 advanced in the immediate vicinity of BW-03 previously identified total VOCs at concentrations between approximately 10,500 ug/L and 29,000 ug/L.
- RQD values varied widely between the three (3) wells. RQDs calculated in the top 5-ft of each rock section were 72.5%, 97.5% and 30% in wells BW-01, BW-02 and BW-03, respectively. The poor rock competency identified in well BW-03 could explain the apparent contaminant infiltration into bedrock in this area indicated by the substantial levels of CVOCs in this bedrock well and not the others.
- In addition to TCE impacts, one (1) petroleum-related VOC (benzene) was identified at a concentration slightly above its respective NYCRR Part 703 groundwater standard in bedrock well BW-02. Benzene and methyl-tert butyl ether, which was identified at a concentration below the NYCRR Part 703 groundwater standard in well BW-01, are typically associated with gasoline. The source of these compounds in bedrock groundwater at the Site is unknown but could be associated with nearby historical gasoline filling stations.
- CVOCs were not identified above laboratory detection limits in any of the bedrock samples with the exception of 1,2-dichloroethane in BW-01 (24.7-24.9 ft bgs) and methylene chloride in all six (6) bedrock samples. It should be noted methylene chloride is utilized in laboratory analytical procedures and may not be a result of Site contaminants. Methylene chloride was also detected in



the blank sample. At this time, it does not appear that any of the targeted CVOCs observed in other sample media have infiltrated into the bedrock matrix.

3.4 Remedial Investigation, LaBella (ongoing)

A Remedial Investigation Work Plan dated December 2018 and revised April 2019 was conditionally approved by NYSDEC on May 31, 2019. The RI is currently in progress and all overburden data planned to be collected per the NYSDEC-approved RI Work Plan has been collected. The remedial areas of concern (RAOCs) to be addressed in this IRM Work Plan are summarized below. Note that additional RAOCs may be identified as the RI is completed and the RAOCs summarized below may be amended. The information below is based on data collected to date, and subsequent remedial work plans will be developed as deemed necessary. Data included herein has not been validated. Validated data will be included in the final RI Report. Refer to Figure 3 for cumulative investigation locations.

RAOC #1 – Overburden CVOC Impacts

CVOCs including TCE, PCE and associated breakdown compounds have been detected in soil and groundwater above applicable Site SCGs. TCE has been detected in soil up to 98 mg/kg in RIBW-A at 13.5-ft bgs. RIBW-A was installed in the southwestern portion of the Site Building. TCE was detected in RIBW-A at 27 mg/kg directly above bedrock (21.5-ft bgs), and in RIMW-17 (15-ft bgs) at 25 mg/kg. TCE has been detected in overburden groundwater up to 180,000 µg/L in MW-SB-14 installed to the south of the Site Building. PCE has been detected in groundwater up to 1,800 µg/L in RIMW-18 installed in the southwestern portion of the Site Building. As of the date of this report, bedrock groundwater data has not yet been obtained; this IRM will address overburden impacts. Refer to Figure 4 and Figure 5 for a summary of VOCs in soil and groundwater.

RAOC #2 – Building Materials Containing Radiation

Austin Master Services, LLC (AMS) performed a radiological survey of the building as part of the RI which identified four (4) areas within the building that identified elevated gamma count rate levels above background; southwestern portions of the first and third floors, the boiler basin in the basement, and the sump in the northeastern portion of the first floor.

4.0 STANDARDS, CRITERIA AND GUIDELINES

This section identifies the Standards, Criteria and Guidelines (SCGs) for the Site. The SCGs identified are used in order to quantify the extent of contamination at the Site that requires remedial work based on the cleanup goal. The SCGs to be utilized as part of the implementation of this RI Work Plan are identified below:

Soil SCGs: The following SCGs for soil were used in developing this RI Work Plan:

- NYCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives (RPSCOs) for the Protection of Groundwater;
- NYCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives (RPSCOs) for Unrestricted Use;
- NYCRR Subpart 375-6 RPSCOs for the Protection of Public Health/Restricted Residential Use; and,

Groundwater SCGs: The following SCGs for groundwater were used in developing this RI Work Plan:

- NYSDEC Part 703 Groundwater Standards; and,
- Technical and Operational Guidance Series (TOGS) 1.1.1 Water Quality Standards and Guidance



Values.

5.0 SITE GEOLOGY AND HYDROGEOLOGY

5.1 Geology

Soils at the Site were generally comprised of tightly packed brown silt, sandy silts and fine to coarse subangular and subrounded gravel. Trace amounts of fill including cinders and ash were observed near the surface of a limited number of borings, particularly on the eastern side of the Site. This urban fill material was encountered to depths of approximately 3-ft bgs. It should be noted that this area is generally in the location of the former building that was recently demolished by the City of Rochester. Depth to bedrock in the area of RAOC #1 ranges from approximately 20-21.5-ft bgs.

5.2 Hydrogeology

Groundwater flow modeling generated from data collected in August 2018 indicates groundwater flow in the immediately vicinity of the building is to the west-northwest (refer to Figure 7). Mile Square Mapping obtained from the City of Rochester which shows sewer locations and invert elevations indicate that groundwater is generally flowing towards these underground sewers, particularly in Hudson Avenue; however, note that at the time of measurement, the water table elevation appears to be deeper than the deepest sewer invert, which would indicate the sewer may not be influencing groundwater flow direction. Depth to groundwater in RAOC #1 ranges from approximately 10-12-ft bgs.

6.0 OBJECTIVES

The objectives of this IRM are to:

- Reduce the source area concentrations of CVOCs in overburden soil and groundwater in RAOC #1 within the southwestern portion of the Site via in-situ chemical injections.
- Remove building materials containing radioactive material and dispose of such materials in accordance with applicable regulations.

7.0 IRM RAOC #1 – OVERBURDEN CVOC IMPACTS

7.1 Summary of RAOC #1 Impacts

Concentrations of CVOCs including TCE and PCE have been detected in soil and groundwater above Site SCGs as shown on Figure 4 and Figure 5.

The greatest concentrations of CVOCs in groundwater have been detected south of the Site directly adjacent to the southwestern portion of the Site building. TCE has been detected up to 180,000 ug/L in MW-SB-14 to the south of the Site Building. The greatest concentration of TCE detected in groundwater within the Site building is 46,000 ug/L in RIMW-18. PCE has been detected in groundwater up to 1,800 ug/L in RIMW-18. Refer to Figure 5 for a summary of VOCs in groundwater and contours representing CVOCs in overburden groundwater. Bedrock data was collected during the 2018 Phase II ESA and identified TCE up to 7,200 ug/L in BW-03 installed to the west of the Site Building. Bedrock groundwater data collected during the RI has not been obtained as of the date of this report; this IRM Work Plan is to address impacts in the overburden.



The greatest concentrations of TCE in soil have been detected in the southwestern portion of the Site Building including 98 mg/kg in RIBW-A at 10.5-ft bgs, 27 mg/kg in RIBW-A at 21.5-ft bgs, and 25 mg/kg in RIMW-17 at 15-ft bgs. PCE has been detected in soil up to 5.4 mg/kg in RIMW-17 at 15-ft bgs.

Groundwater flow direction was evaluated during the Phase II ESA and was determined to be towards the west-northwest. Additional groundwater modeling is being completed as part of the RI.

7.2 IRM for RAOC #1 - In-Situ Chemical Oxidation

In-situ chemical oxidation (ISCO) will be implemented as an IRM for overburden CVOC impacts. This IRM will consist of injection of permanganate (e.g., sodium permanganate) in the overburden within the southwestern portion of the Site Building which is the inferred source of CVOCs in soil and groundwater. One (1) round of injections is anticipated to be completed as part of this IRM. Groundwater monitoring will be performed to assess the effectiveness of the IRM and determine the need for subsequent injections. Subsequent injections and/or long-term monitoring will be detailed in the Site Management Plan.

The IRM for RAOC #1 will consist of installation of approximately 17 injection wells within the southwestern portion of the Site Building on the ground level (i.e., first floor). Injection wells will be spaced approximately 12 to 15-feet apart and will extend to the top of bedrock (approximately 20-21.5-ft below the current finished floor). While this IRM is designed to treat overburden CVOC impacts, it is anticipated the treatment chemical will come into contact with the top of bedrock and may travel through bedrock fractures. Additionally, the highly weathered bedrock observed in BW-03 likely has a high porosity and the treatment chemical will likely migrate into this zone. Refer to Figure 6 for RAOC #1 treatment area.

Sodium permanganate will be injected via permanent injection wells installed in the locations shown on Figure 6. The Site Building is being redeveloped into an apartment building and injection wells will be accessed through piping routed beneath the floor to the eastern exterior of the Site Building. Trenching for the injection well piping will be completed through the existing floor slab as shown on Figure 6. An EPA Inventory of Injection Wells form will be completed and sent to EPA. A copy of the EPA approval will be sent to NYSDEC prior to implementation.

Utility lines are located in the right-of-ways to the west and south of the Site building (i.e., Avenue D and Hudson Ave). Mile Square Mapping obtained from the City of Rochester which shows the sewer inverts are below the water table elevation. It should be noted that unlike many other oxidants, permanganate does not generate heat during reaction and is not typically introduced to the subsurface at high concentrations. In addition, based on information from the chemical vendor, permanganate is not known to react with the piping typically associated with water, sewer and electric lines. As such, it appears that the introduction of permanganate to the subsurface will not damage the utilities. Locations of utilities on-Site will be verified prior to injections and monitored as needed during injections.

7.2.1 Injection Well Installation

Boreholes for injection well installation will be drilled using a Geoprobe® with 4 ¼ inch hollow stem augers. Injection wells will be constructed with 15-ft of 2-inch diameter 0.020-slot PVC connected to an appropriate length of solid PVC riser to complete the well. A sandpack will be placed around the screened section to 1-ft above the top of the screen. The remainder of the annulus will be packed with bentonite, and sealed with 1-ft of grout. The riser will terminate beneath the bottom of the floor slab and will not be completed with a curb box (refer to Section 7.2.1 for trenching information). Refer to Appendix 6 for injection well construction detail.



A 1-inch diameter PVC pipe will be connected to each well using a PVC reducing sweep elbow and 1-inch diameter solid PVC piping will be connected to the elbow and placed in the trench beneath the floor slab. Trenches will be backfilled with pea stone and concrete will be restored to the finished floor elevation.

7.2.2 Piping and Trenching

The 1-inch PVC piping within the trenches will be routed to a central location at the western basement wall. A corehole will be drilled at the elevation of the trenching through the basement wall which is approximately 8-feet above the basement floor. The 1-inch diameter pipes will be routed through the basement wall and out the eastern exterior building wall. Pipes will be sealed into the wall at the western basement wall and eastern exterior wall. Piping will be installed at a minimum of $\frac{1}{4}$ inch per foot pitch towards the injection wells to allow for treatment chemical to gravity drain from the eastern exterior of the Site building into the wells so that treatment chemical will not be trapped within the piping.

On the exterior of the building, pipes will be fitted with an elbow and additional vertical piping (approximately 2-4 feet) to allow for treatment chemical to be gravity fed through the pipes at ground level. The piping will terminate at the eastern exterior of the building within an area of USTs that are to be removed. The pipes will terminate in the UST excavation following UST removal, which will be left partially open below grade to house the piping. A Bilco® door, or similar, will be installed over the exterior piping to allow for secured access to the injection piping. The door will be locked when injections are not taking place.

7.2.3 Treatment Chemical

Permanganate natural oxidant demand (PNOD) analysis was completed by Carus Remediation Technologies (Carus) for a soil sample collected from RIBW-B. The 48-hour PNOD was 0.5 g/kg. Generally, remediation sites with a soil demand of less than 20 g/kg are favorable for in situ chemical oxidation with permanganate. The PNOD was less than 1 g/kg and ISCO with permanganate is highly recommended by Carus as soil contribution to the demand is very low.

The In-Situ Chemical Oxidation (ISCO) process includes the injection of a chemical oxidant into the subsurface to chemically oxidize contaminants of concern and enhance degradation. To facilitate the ISCO process a total of approximately 5,400-pounds (lbs) sodium permanganate (“RemOx® L”) will be introduced at a 10% concentration into the seventeen (17) injection wells via gravity feed. The volume and injection concentrations were estimated by the chemical vendor (Carus) using analytical data and the known geology of the Site with the vendor’s proprietary algorithm for estimating permanganate mass necessary to degrade the contaminants and to overcome the natural oxidant demand within the soil. A copy of the Carus calculation sheet, RemoOx® L fact sheet and SDS are included in Appendix 4.

Approximately 5,400 lbs of RemOx® L ISCO Reagent will be injected at a 10% solution which will require 2,443 gallons of water. The treatment chemical will be transported to the Site in 330 lb drums, 3,000 lb totes or some combination of drums and totes, and will be mixed on-Site in 275-gallon totes or a 1,000 gallon mixing tank with potable water. The slurry will be pumped or gravity fed via the piping installed on the exterior of the building and evenly distributed amongst the seventeen (17) injection wells. Approximately 318 lbs of sodium permanganate will be injected per well.

Groundwater monitoring will be completed 3 to 4 months following the injection event to monitor the progress. Future injections will be completed as needed and will be specified along with long-term



monitoring in the Site Management Plan. Groundwater sampling results will be provided to NYSDEC as the data is generated.

7.2.4 Storage, Secondary Containment and Injections

The trenching and piping infrastructure shown on Figure 6 will be utilized for injection work after the floor construction is completed. If this IRM is completed prior to redevelopment work that will allow for direct access to the injection wells from within the building, the treatment chemical may be gravity drained into the wells at the well head. If this IRM can be completed prior to floor construction, the piping infrastructure will still be installed for future injection events. This IRM will be completed prior to building occupancy.

The treatment chemical will be stored within secondary containment. Treatment chemical may be mixed in tanks/ totes up to 1,000 gallons in capacity. The treatment chemical and mixing tank/ totes will be stored within the secondary containment at all times. Anticipated exterior secondary containment is shown on Figure 8. Extension pipes/ hoses will be connected to the individual injection pipes on the exterior of the building and the chemical will be injected into the pipe/ hose from within the secondary containment area.

The secondary containment will consist of at least 2-layers of 10-mil plastic sheeting, which is compatible with sodium permanganate. This sheeting will also be wrapped around and secured to the walls of the berm. The walls consist of lumber approximately 6-in. in height and be constructed such that the lumber is outside the containment area (i.e., wood will not be in contact with permanganate in the event of a spill). The secondary containment area (i.e., berm limits) will be approximately 30-ft. by 30-ft. (i.e., about 900-sq. ft.). The area occupied with two (2) totes (a total of approximately 64-sq. ft.) and the 1,000-gallon mixing tank (assuming a 6-ft. diameter, a total of 28.3-sq. ft.) and miscellaneous equipment (pump, hosing, etc.) equates to approximately 100-sq. ft. As such, the available containment area is approximately 800-sq. ft. and thus a containment capacity of 2,992-gallons. Based on the largest single tank of 1,000-gallons, the containment is over 200%. This analysis represents a scenario for the greatest possible volume (i.e., tanks greater than 1,000 gallons will not be utilized). Figure 9 provides a detail of the containment area.

A neutralizing agent (e.g., sodium thiosulfate) will be made readily available in the event that a spill of the sodium permanganate occurs. The neutralizing agent will only be applied in a diluted form. Prior to applying the neutralizing agent any release of sodium permanganate will first be heavily diluted with water. The manufacturer recommends the permanganate solution be diluted to 6% or less permanganate prior to applying any neutralizing agent.

7.3 Post-Remedial Monitoring

Between 3 and 4 months following the injections, groundwater monitoring will be completed. The Site building is in the process of being renovated into apartments. Some of the existing interior wells will be within common areas or corridors and may remain in place, while others will be within individual apartments and will be removed prior to occupancy. Specifically, RIMW-14, RIMW-15, and RIMW-18 are within planned individual apartment units and will not be used for long-term monitoring. A request will be made to decommission wells within individual apartment units prior to occupancy. The following wells will be monitored:

- RIMW-02 (basement)
- RIMW-04 (basement)
- RIMW-16 (first floor corridor)
- RIMW-17 (first floor community room)
- SB-MW-07 (exterior)



- SB-MW-11 (exterior)
- SB-MW-14 (exterior)
- SB-MW-15 (exterior)
- SB-MW-16 (basement)

Wells will be sampled using low-flow techniques and water quality parameters will be recorded at 5 minute intervals. Samples will be collected once the parameters have stabilized as noted below:

- Water level drawdown (<0.3')
- Temperature (+/- 3%)
- pH (+/- 0.1 unit)
- Dissolved oxygen (+/- 10%)
- Specific conductance (+/- 3%)
- Oxidation reduction potential (+/- 10 millivolts)
- Turbidity (+/- 10%, <50 NTU for metals)

Once parameters have stabilized, a sample will be collected from each well for analysis of USEPA TCL VOCs including TICs via USEPA Method 8260. One (1) MS/MSD, blind duplicate, and trip blank will be collected and analyzed for TCL VOCs and TICs for each shipment of samples.

Any additional injections or long-term monitoring requirements will be determined following the planned IRM and specified in the Site Management Plan.

8.0 IRM RAOC #2 – BUILDING MATERIALS CONTAINING RADIATION

Radiation was identified in building materials in discrete areas during the RI by Austin Master Services (AMS). AMS will complete removal of the contaminated building materials in accordance with applicable regulations. Elevated gamma count rate levels above background were identified in four (4) areas within the building: southwestern portions of the first and third floors, the boiler basin in the basement, and the sump in the northeastern portion of the first floor. Refer to the Work Plan by AMS included in Appendix 5 for this IRM.

9.0 COMMUNITY AIR MONITORING

The NYSDOH Generic Community Air Monitoring Program (CAMP) included as Appendix 1 will be implemented for these IRMs.

10.0 HEALTH AND SAFETY

The Health and Safety Plan (HASP) included as Appendix 2 will be implemented by LaBella personnel for these IRMs. Contractors will be responsible for development and implementation of their own HASP.

11.0 QUALITY CONTROL PLAN

LaBella's Quality Control Plan included in Appendix 3 will be followed during implementation of these IRMs.



12.0 IRM-DERIVED WASTE

All soil and groundwater generated during this IRM will be containerized on-Site and characterized for disposal in accordance with applicable regulations.

13.0 DELIVERABLES & SCHEDULE

These IRMs are anticipated to begin within 45 days of NYSDEC approval. The IRM for RAOC #1 will be completed in approximately 8 months including one (1) round of injections and associated groundwater monitoring. The IRM for RAOC #2 will be completed within 3 months of NYSDEC approval. These IRMs will be documented in a Construction Completion Report (CCR)/ Final Engineering Report (FER).

I:\JEFFERSON WOLLENSACK LLC\2182207 - 872 & 886 HUDSON BROWNFIELD\REPORTS\IRM WORK PLAN - ISCO\DRAFT C828209 FORMER WOLLENSACK OPTICAL IRMWP.DOCX





FIGURES



0 500 1,000
Feet
1 inch = 1,000 feet

INTENDED TO PRINT AS: 11" X 17"

PROJECT:
INTERIM REMEDIAL MEASURES
WORK PLAN
FORMER WOLLENSACK OPTICAL
NYSDEC BCP C828209
872 & 886 HUDSON AVENUE
ROCHESTER, NEW YORK

DRAWING NAME:

SITE LOCATION MAP

PROJECT #/DRAWING #/ DATE

2182207
FIGURE 1

Legend

BCP Parcels

NOTES:

- 1) Property boundaries obtained from Monroe County GIS 2016 and are considered approximate.
- 2) Topographic map obtained from USGS and may not represent current conditions.



Legend

- Current & Former Site Buildings
- Basement (Approx.)
- ⊙ Sump (Approx.)
- Tank Vault (Approx.)
- BCP Site Parcels

NOTES:

- 1) Property boundaries obtained from Monroe County GIS and are considered approximate.
- 2) April 2018 aerial image obtained from Pictometry International, Inc. and may not represent current conditions.
- 3) Former Site buildings georeferenced from Sanborn Fire Insurance Mapping. Locations are approximate.



0 25 50 75 100
Feet

1 inch = 75 feet

INTENDED TO PRINT AS: 11" X 17"

PROJECT:
INTERIM REMEDIAL MEASURES
WORK PLAN

FORMER WOLLENSACK OPTICAL
NYSDEC BCP C828209
872 & 886 HUDSON AVENUE
ROCHESTER, NEW YORK

DRAWING NAME:

SITE FEATURES

PROJECT #/DRAWING #/ DATE

2182207

FIGURE 2

Legend

- RI Bedrock Wells
- RI Soil Gas Point
- RI Soil Boring
- RI Monitoring Well/Soil Boring
- Pre-BCP Overburden Monitoring Well
- Pre-BCP Soil Boring
- Pre-BCP Bedrock Wells
- Sump (Approx.)
- USTs Encountered During RI
- Basement (Approx.)
- Former AST Vault
- BCP Site Parcels



0 25
 Feet
 1 inch = 25 feet

INTENDED TO PRINT AS: 11" X 17"

PROJECT:
 INTERIM REMEDIAL MEASURES
 WORK PLAN
 FORMER WOLLENSACK OPTICAL
 NYSDEC BCP C828209
 872 & 886 HUDSON AVENUE
 ROCHESTER, NEW YORK

DRAWING NAME:
 INVESTIGATION
 LOCATIONS

PROJECT #/DRAWING #/ DATE

2182207

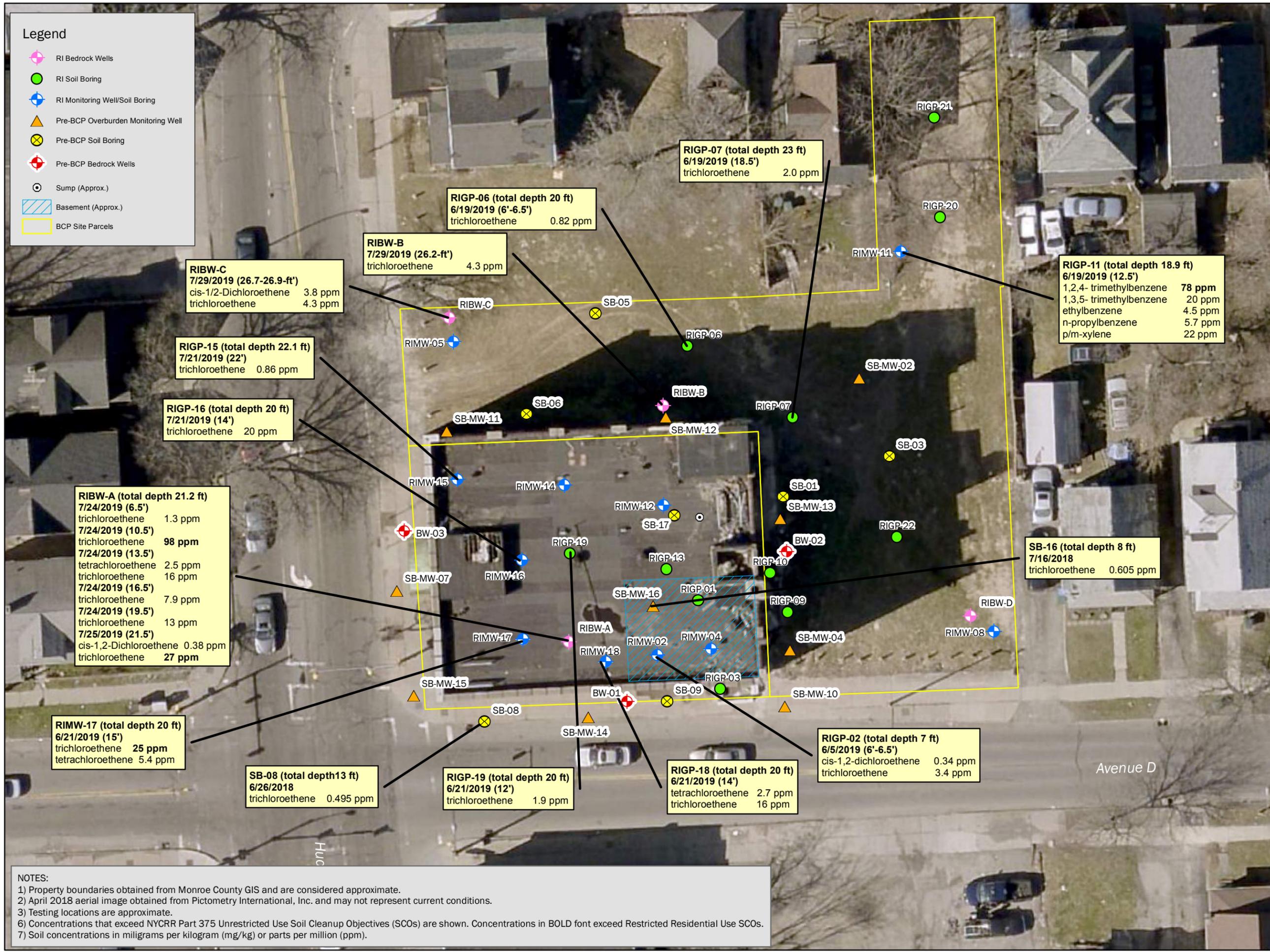
FIGURE 3

8/13/2019

NOTES:
 1) Property boundaries obtained from Monroe County GIS and are considered approximate.
 2) April 2018 aerial image obtained from Pictometry International, Inc. and may not represent current conditions.
 3) Testing locations are approximate.

Legend

-  RI Bedrock Wells
-  RI Soil Boring
-  RI Monitoring Well/Soil Boring
-  Pre-BCP Overburden Monitoring Well
-  Pre-BCP Soil Boring
-  Pre-BCP Bedrock Wells
-  Sump (Approx.)
-  Basement (Approx.)
-  BCP Site Parcels



0 25
Feet
1 inch = 25 feet

INTENDED TO PRINT AS: 11" X 17"

PROJECT:
INTERIM REMEDIAL MEASURES
WORK PLAN

FORMER WOLLENSACK OPTICAL
NYSDEC BCP C828209
872 & 886 HUDSON AVENUE
ROCHESTER, NEW YORK

DRAWING NAME:
VOCS IN SOIL
ABOVE UNRESTRICTED
USE SCOS

PROJECT #/DRAWING #/ DATE

2182207

FIGURE 4

8/14/2019

NOTES:
 1) Property boundaries obtained from Monroe County GIS and are considered approximate.
 2) April 2018 aerial image obtained from Pictometry International, Inc. and may not represent current conditions.
 3) Testing locations are approximate.
 4) Concentrations that exceed NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs) are shown. Concentrations in **BOLD** font exceed Restricted Residential Use SCOs.
 5) Soil concentrations in milligrams per kilogram (mg/kg) or parts per million (ppm).

Legend

- ◆ RI Bedrock Wells
- RI Soil Boring
- ◆ RI Monitoring Well/Soil Boring
- ▲ Pre-BCP Overburden Monitoring Well
- ⊗ Pre-BCP Soil Boring
- ◆ Pre-BCP Bedrock Wells
- Sump (Approx.)
- USTs Encountered During RI
- Basement (Approx.)
- BCP Site Parcels

CVOCs in Overburden Groundwater (ppb)

- 5
- 100
- 1,000
- 10,000
- 100,000
- 150,000



0 25
Feet
 1 inch = 25 feet

INTENDED TO PRINT AS: 11" X 17"

PROJECT:
 INTERIM REMEDIAL MEASURES
 WORK PLAN
 FORMER WOLLENSACK OPTICAL
 NYSDEC BCP C828209
 872 & 886 HUDSON AVENUE
 ROCHESTER, NEW YORK

DRAWING NAME:
 VOCs IN GROUNDWATER
 ABOVE GROUNDWATER
 QUALITY STANDARDS

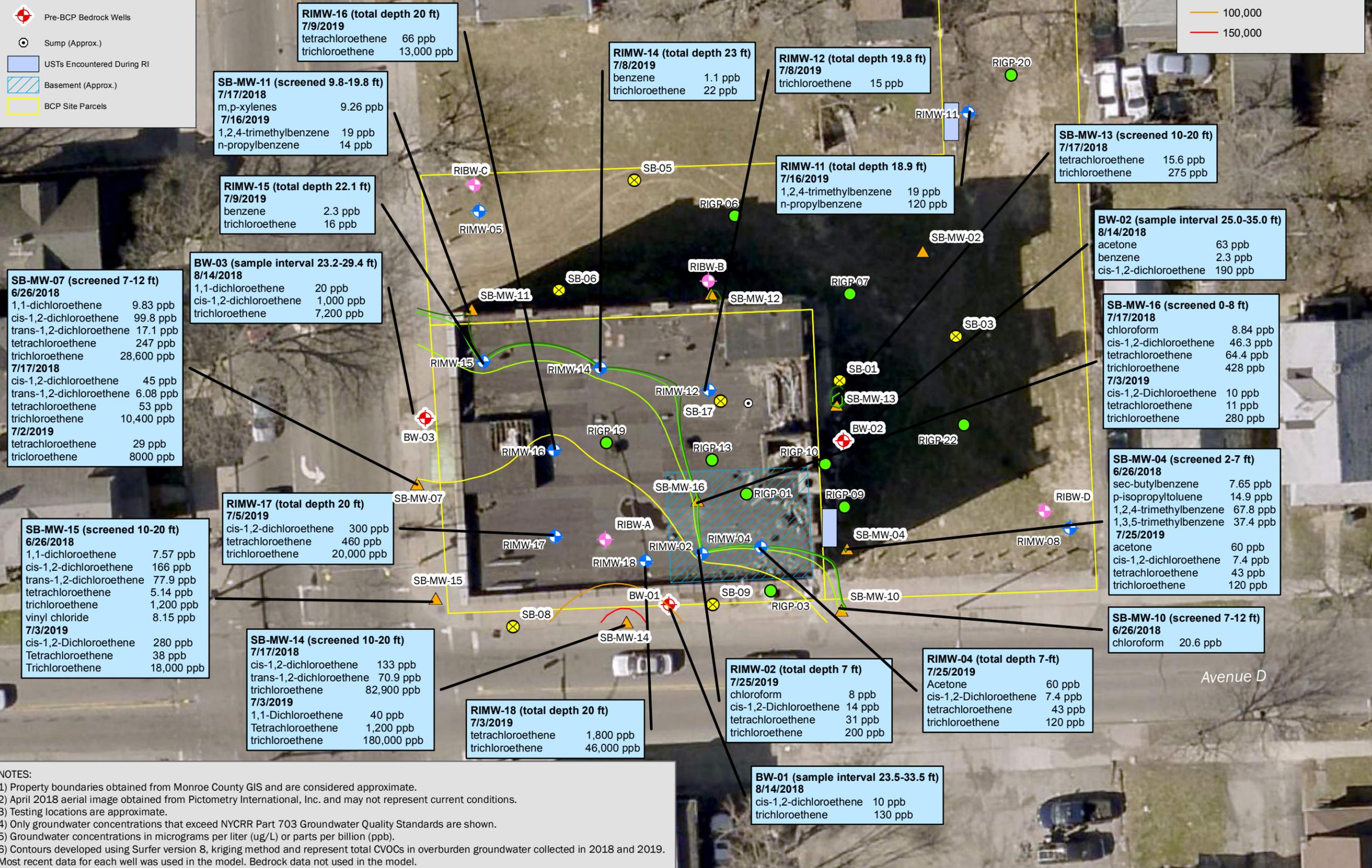
PROJECT #/DRAWING #/ DATE

2182207

FIGURE 5

8/14/2019

NOTES:
 1) Property boundaries obtained from Monroe County GIS and are considered approximate.
 2) April 2018 aerial image obtained from Pictometry International, Inc. and may not represent current conditions.
 3) Testing locations are approximate.
 4) Only groundwater concentrations that exceed NYCRR Part 703 Groundwater Quality Standards are shown.
 5) Groundwater concentrations in micrograms per liter (ug/L) or parts per billion (ppb).
 6) Contours developed using Surfer version 8, kriging method and represent total CVOCs in overburden groundwater collected in 2018 and 2019. Most recent data for each well was used in the model. Bedrock data not used in the model.



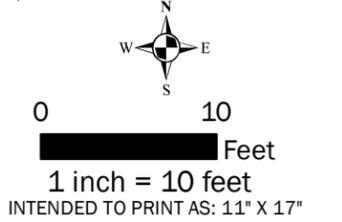
Legend

- Proposed Treatment Wells
- ⊕ RI Bedrock Wells
- RI Soil Boring
- ⊕ RI Monitoring Well/Soil Boring
- ▲ Pre-BCP Overburden Monitoring Well
- ⊗ Pre-BCP Soil Boring
- ⊕ Pre-BCP Bedrock Wells
- ⊙ Sump (Approx.)
- USTs Encountered During RI
- Proposed Injection Well Piping
- Proposed Trenching for Injection Well Piping
- Basement (Approx.)
- BCP Site Parcels
- Proposed RAOC#1 Treatment Area



NOTES:
 1) Property boundaries obtained from Monroe County GIS and are considered approximate.
 2) April 2018 aerial image obtained from Pictometry International, Inc. and may not represent current conditions.
 3) Testing locations are approximate.
 4) Injection well locations and trenching are approximate and subject to change based on site conditions.
 5) Wells that are circled will be used for monitoring.

It is a violation of New York Education Law Article 145 Sec. 7209, for any person, unless acting under the direction of a licensed architect, professional engineer, or land surveyor, to alter an item in any way. If an item bearing the seal of an architect, engineer, or land surveyor is altered; the altering architect, engineer, or land surveyor shall affix to the item their seal and notation "altered by" followed by their signature and date of such alteration, and a specific description of the alteration.



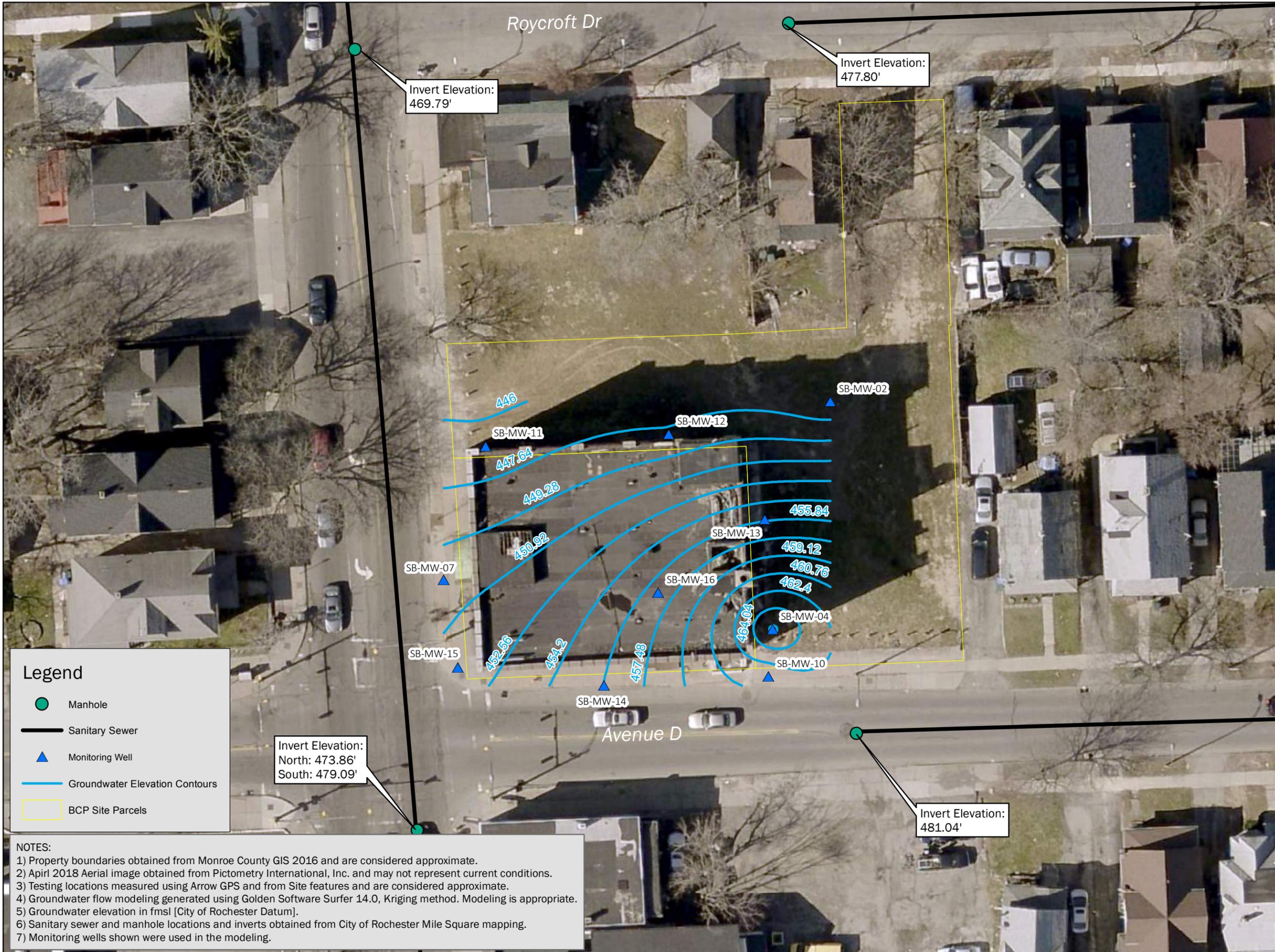
PROJECT:
 INTERIM REMEDIAL MEASURES
 WORK PLAN
 FORMER WOLLENSACK OPTICAL
 NYSDEC BCP C828209
 872 & 886 HUDSON AVENUE
 ROCHESTER, NEW YORK

DRAWING NAME:
 INTERIM REMEDIAL MEASURE
 RAOC #1 - IN-SITU CHEMICAL
 OXIDATION

PROJECT #/DRAWING #/ DATE

[2182207]
 [FIGURE 6]

8/16/2019



0 15 30
Feet
1 inch = 30 feet

INTENDED TO PRINT AS: 11" X 17"

PROJECT:
INTERIM REMEDIAL MEASURES
WORK PLAN

FORMER WOLLENSACK OPTICAL
NYSDEC BCP C828209
872 & 886 HUDSON AVENUE
ROCHESTER, NEW YORK

DRAWING NAME:
2018 PHASE II ESA
GROUNDWATER
ELEVATION CONTOURS

PROJECT #/DRAWING #/ DATE

2182207
FIGURE 7

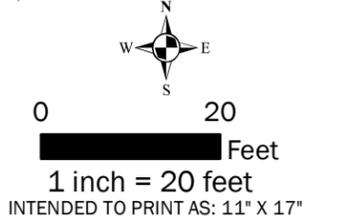
Legend

-  Temporary Pipe/ Hose for Connection to Injection Infrastructure
-  275 gallon totes
-  1,000 poly gallon mixing tank
-  Secondary Containment
-  Proposed Injection Well Piping
-  Basement (Approx.)
-  BCP Site Parcels
-  Proposed RAO#1 Treatment Area



NOTES:
 1) Property boundaries obtained from Monroe County GIS and are considered approximate.
 2) April 2018 aerial image obtained from Pictometry International, Inc. and may not represent current conditions.
 3) Refer to Figure 9 for containment details.
 4) Containment area is approximate and subject to change.

It is a violation of New York Education Law Article 145 Sec.7209, for any person, unless acting under the direction of a licensed architect, professional engineer, or land surveyor, to alter an item in any way. If an item bearing the seal of an architect, engineer, or land surveyor is altered; the altering architect, engineer, or land surveyor shall affix to the item their seal and notation "altered by" followed by their signature and date of such alteration, and a specific description of the alteration.



PROJECT:
 INTERIM REMEDIAL MEASURES
 WORK PLAN
 FORMER WOLLENSACK OPTICAL
 NYSDEC BCP C828209
 872 & 886 HUDSON AVENUE
 ROCHESTER, NEW YORK

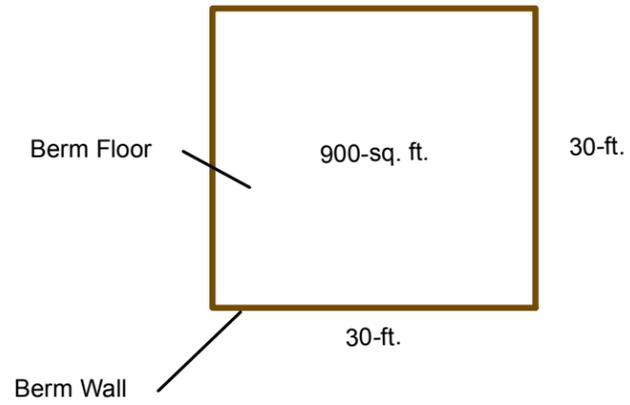
DRAWING NAME:
 SECONDARY
 CONTAINMENT AREA

PROJECT #/DRAWING #/ DATE

[2182207]
 [FIGURE 8]

8/16/2019

Secondary Containment: Birds-Eye View



It is a violation of New York Education Law Article 145 Sec.7209, for any person, unless acting under the direction of a licensed architect, professional engineer, or land surveyor, to alter an item in any way. If an item bearing the seal of an architect, engineer, or land surveyor is altered; the altering architect, engineer, or land surveyor shall affix to the item their seal and notation "altered by" followed by their signature and date of such alteration, and a specific description of the alteration.

INTENDED TO PRINT AS: 11" X 17"

PROJECT:
 INTERIM REMEDIAL MEASURES
 WORK PLAN
 FORMER WOLLENSACK OPTICAL
 NYSDEC BCP C828209
 872 & 886 HUDSON AVENUE
 ROCHESTER, NEW YORK

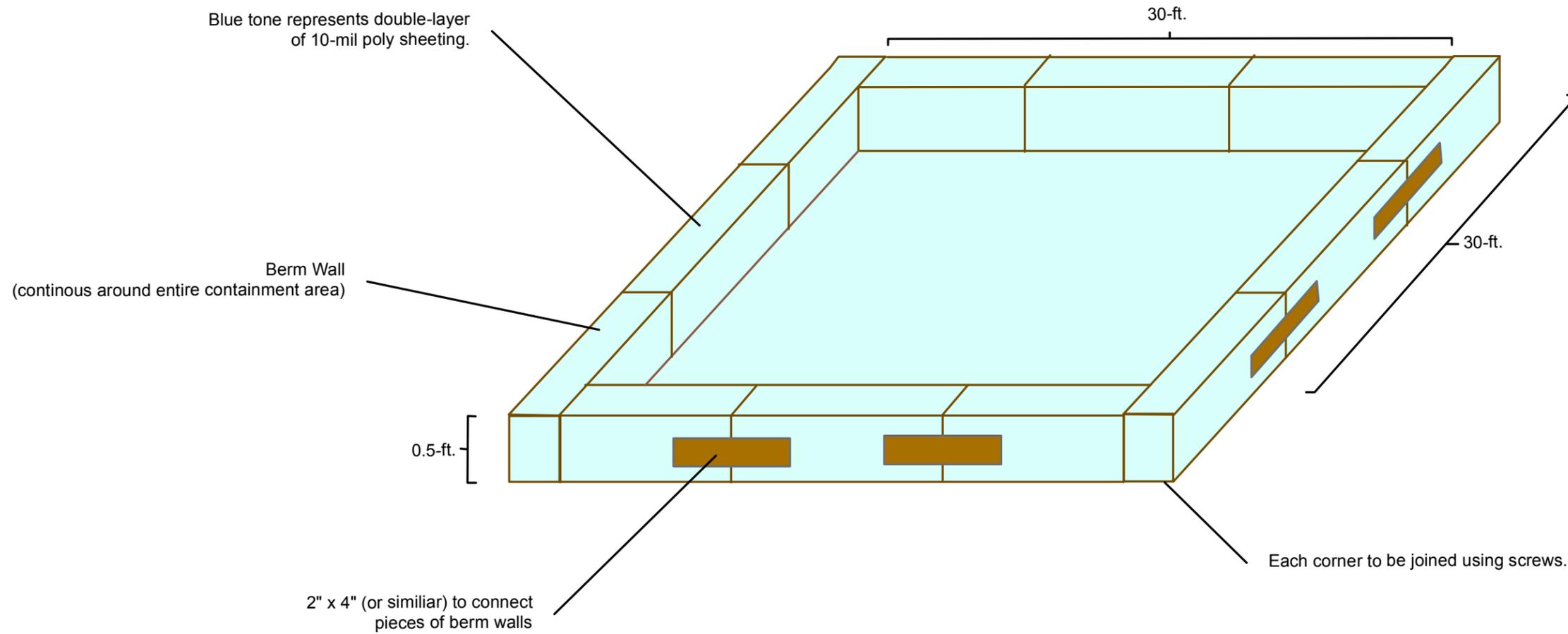
DRAWING NAME:
 SECONDARY
 CONTAINMENT DETAIL

PROJECT #/DRAWING #/ DATE

[2182207]

[FIGURE 9]

8/16/2019



NOTE: NOT TO SCALE (DIMENSIONS ONLY AS SHOWN)



APPENDIX 1

Community Air Monitoring Plan

Appendix 1A

New York State Department of Health Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009



APPENDIX 2

Health and Safety Play

Site Health and Safety Plan

Location:

Former Wollensack Optical
872 & 886 Hudson Avenue
Rochester, New York

Prepared For:

Jefferson Wollensack LLC
312 State Street
Rochester, New York 14614

LaBella Project No. 2182207

August 2019

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2.0 Responsibilities	1
3.0 Activities Covered	1
4.0 Work Area Access and Site Control	1
5.0 Potential Health and Safety Hazards	1
6.0 Work Zones.....	4
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11.0 Medical Surveillance	5
12.0 Employee Training.....	6

Tables

Table 1	Exposure Limits and Recognition Qualities
---------	---

SITE HEALTH AND SAFETY PLAN

Project Title:	Former Wollensack Optical - Brownfield Cleanup Program
Project Number:	2182207
Project Location (Site):	872 & 886 Hudson Avenue, Rochester, NY
Environmental Director:	To Be Determined
Project Manager:	To Be Determined
Site Safety Supervisor:	To Be Determined
Site Contact:	Ms. Carolyn Vitale
Safety Director:	To Be Determined
Proposed Date(s) of Field Activities:	To Be Determined
Site Conditions:	0.48± acres; Site is currently developed with one (1) building.
Site Environmental Information Provided By:	<ul style="list-style-type: none">□ <i>Phase I Environmental Site Assessment (ESA)</i>, completed by Seeler Engineering, PC, September 2017;□ <i>Phase II ESA</i>, completed by LaBella, August 2018□ <i>Preliminary Shallow Bedrock Groundwater Study</i>, completed by LaBella, October 2018
Air Monitoring Provided By:	To Be Determined
Site Control Provided By:	Contractor(s)

EMERGENCY CONTACTS

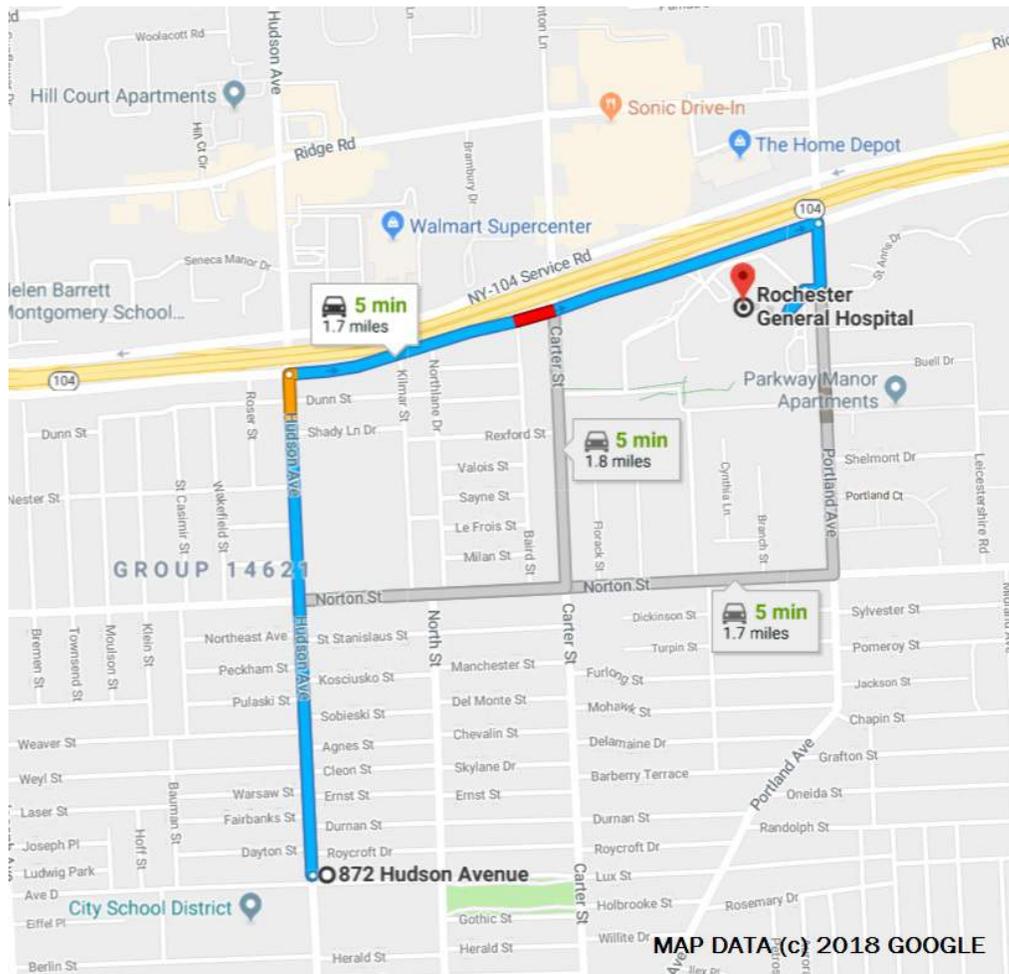
	Name	Phone Number
Ambulance:	As Per Emergency Service	911
Hospital Emergency:	Rochester General Hospital	585-922-4000
Poison Control Center:	Finger Lakes Poison Control	716-275-5151
Police (local, state):	Rochester Police Department	911
Fire Department:	Rochester Fire Department	911
Site Contact:	Ms. Carolyn Vitale	585-325-6530
Agency Contact:	NYSDEC – Ms. Charlotte Theobald NYSDOH – Mr. Arunesh Ghosh	585-226-5354 518-402-7880
Environmental Director:	To Be Determined	To Be Determined
Project Manager:	To Be Determined	To Be Determined
Site Safety Supervisor:	To Be Determined	To Be Determined
Safety Director	To Be Determined	To Be Determined

MAP AND DIRECTIONS TO THE MEDICAL FACILITY - ROCHESTER GENERAL HOSPITAL

Total Est. Time: 5 minutes Total Est. Distance: 1.7 miles

- 1:** Start out going NORTH on HUDSON AVENUE toward ROYCROFT DRIVE 0.7 miles
- 2:** Turn RIGHT onto NY-104 SERVICE ROAD EAST 0.8 miles
- 3:** Turn RIGHT onto PORTLAND AVENUE 0.1 miles
- 4:** Turn RIGHT onto ROCHESTER GENERAL HOSPITAL DRIVE 0.1 miles

End at **1425 Portland Avenue**
Rochester, NY 14621



1.0 Introduction

The purpose of this Health and Safety Plan (HASP) is to provide guidelines for responding to potential health and safety issues that may be encountered during implementation of Interim Remedial Measures (IRMs) at the Former Wollensack Optical, 872 & 886 Hudson Avenue in the City of Rochester, Monroe County, New York (Site). This HASP only reflects the policies of LaBella Associates D.P.C. The requirements of this HASP are applicable to all approved LaBella personnel at the work site. This document's project specifications, and the Community Air Monitoring Plan (CAMP), are to be consulted for guidance in preventing and quickly abating any threat to human safety or the environment. The provisions of the HASP do not replace or supersede any regulatory requirements of the USEPA, NYSDEC, OSHA or other regulatory bodies.

2.0 Responsibilities

This HASP presents guidelines to minimize the risk of injury to project personnel, and to provide rapid response in the event of injury. The HASP is applicable only to activities of approved LaBella personnel and their authorized visitors. The Project Manager shall implement the provisions of this HASP for the duration of the project. It is the responsibility of LaBella employees to follow the requirements of this HASP, and all applicable company safety procedures.

3.0 Activities Covered

The activities covered under this HASP are limited to the following:

- Management of environmental investigation and remediation activities
- Environmental Monitoring
- Radiation Screening
- Collection of samples
- Management of excavated soil and fill
- In-situ chemical oxidation injections

4.0 Work Area Access and Site Control

The contractor(s) will have primary responsibility for work area access and site control.

5.0 Potential Health and Safety Hazards

This section lists some potential health and safety hazards that project personnel may encounter at the project site and some actions to be implemented by approved personnel to control and reduce the associated risk to health and safety. This is not intended to be a complete listing of any and all potential health and safety hazards. New or different hazards may be encountered as site environmental and site work conditions change. The suggested actions to be taken under this plan are not to be substituted for good judgment on the part of project personnel. At all times, the Site Safety Officer has responsibility for site safety and their instructions must be followed. A tailgate meeting should be conducted at the beginning of each work day to review potential health and safety hazards at the Site.

5.1 *Hazards Due to Heavy Machinery*

Potential Hazard:

Heavy machinery including trucks, drilling rigs, trailers, etc. will be in operation at the site. The presence of such equipment presents the danger of being struck or crushed. Use caution when working near heavy machinery.

Protective Action:

Make sure that operators are aware of your activities, and heed operator's instructions and warnings. Wear bright colored clothing and walk safe distances from heavy equipment. A hard hat, safety glasses and steel toe shoes are required.

5.2 *Excavation Hazards*

Potential Hazard:

Excavations and trenches can collapse, causing injury or death. Edges of excavations can be unstable and collapse. Toxic and asphyxiant gases can accumulate in confined spaces and trenches. Excavations that require working within the excavation will require air monitoring in the breathing zone (refer to Section 9.0).

Excavations left open create a fall hazard which can cause injury or death.

Protective Action:

Personnel must receive approval from the Project Manager to enter an excavation for any reason. Subsequently, approved personnel are to receive authorization for entry from the Site Safety Officer. Approved personnel are not to enter excavations over 4 feet in depth unless excavations are adequately sloped. Additional personal protective equipment may be required based on the air monitoring.

Personnel should exercise caution near all excavations at the site as it is expected that excavation sidewalls will be unstable. Do not proceed closer than 3 feet to an unsupported or non-sloped excavation side wall.

Fencing and/or barriers accompanied by "no trespassing" signs should be placed around all excavations when left open for any period of time when work is not being conducted.

5.3 *Cuts, Punctures and Other Injuries*

Potential Hazard:

In any excavation and construction work site there is the potential for the presence of sharp or jagged edges on rock, metal materials, and other sharp objects. Serious cuts and punctures can result in loss of blood and infection.

Protective Action:

The Project Manager is responsible for making First Aid supplies available at the work site to treat minor injuries. The Site Safety Officer is responsible for arranging the transportation of authorized on-site personnel to medical facilities when First Aid treatment is not sufficient. Do not move seriously injured workers. All injuries requiring treatment are to be reported to the Project Manager. Serious injuries are to be reported immediately to the Site Safety Officer

5.4 *Injury Due to Exposure of Chemical Hazards*

Potential Hazards:

Contaminants identified in testing locations at the Site include various petroleum-related volatile organic compounds (VOCs) and chlorinated-volatile organic compounds (CVOCs). Volatile organic vapors, chlorinated solvents or other chemicals may be encountered during subsurface activities at the project work site. Inhalation of high concentrations of volatile organic vapors can cause headache, stupor, drowsiness, confusion and other health effects. Skin contact can cause irritation, chemical burn, or dermatitis.

Protective Action:

The presence of organic vapors may be detected by their odor and by monitoring instrumentation. Approved employees will not work in environments where hazardous concentrations of organic vapors are present. Air monitoring (refer to Section 9.0) of the work area will be performed at least every 60 minutes or more often using a Photoionization Detector (PID). Personnel are to leave the work area whenever PID measurements of ambient air exceed 25 ppm consistently for a 5 minute period. In the event that sustained total volatile organic compound (VOC) readings of 25 ppm are encountered personnel should upgrade personal protective equipment to Level C (refer to Section 8.0) and an Exclusion Zone should be established around the work area to limit and monitor access to this area (refer to Section 6.0).

5.5 *Injuries due to Radiation Exposure*

Potential Hazards:

Radioactive material could be encountered and pose a risk to humans once encountered.

Protective Action:

Radiation surveys of the building and soil cover will be completed by a NYSDOH Radioactive Material Licensed (RML) contractor. The RML contractor will also provide training to LaBella personnel in the use of radiation meters for screening of subsurface soils and ambient air during the soil boring program.

LaBella personnel are to leave the work area if the radiation levels exceeds 10 milliRems per hour (mR/Hr) above background at 3-feet distance from the source or 200 mR/Hr at the surface of the source above background. Work will be stopped in affected areas when the above referenced radiation dose rates are exceeded. A radiation badge monitoring program and appropriate safety procedures will be developed as required by the materials encountered at the Site.

5.6 *Injuries due to extreme hot or cold weather conditions*

Potential Hazards:

Extreme hot weather conditions can cause heat exhaustion, heat stress and heat stroke or extreme cold weather conditions can cause hypothermia.

Protective Action:

Precaution measures should be taken such as dress appropriately for the weather conditions and drink plenty of fluid. If personnel should suffer from any of the above conditions, proper

techniques should be taken to cool down or heat up the body and taken to the nearest hospital if needed.

5.7 Treatment Chemical Hazards

Potential Hazards:

Sodium permanganate is a strong oxidizer. Ignition can occur with cloth or paper. Can cause skin burns and eye damage.

Protective Action:

Avoid contact with skin and eyes. Per the fact sheet provided by Carus included in the IRM Work Plan, protective equipment such as face shields and/or goggles, rubber or plastic gloves and rubber or plastic apron shall be worn during handling. Spillage should be collected and cleaned up properly. If clothing becomes spotted, wash off immediately.

6.0 Work Zones

In the event that conditions warrant establishing various work zones (i.e., based on hazards - Section 5.0), the following work zones should be established:

Exclusion Zone (EZ):

The EZ will be established in the immediate vicinity and adjacent downwind direction of site activities that elevate breathing zone VOC concentrations to unacceptable levels based on field screening. These site activities include contaminated soil excavation and soil sampling activities. If access to the site is required to accommodate non-project related personnel then an EZ will be established by constructing a barrier around the work area (yellow caution tape and/or construction fencing). The EZ barrier shall encompass the work area and any equipment staging/soil staging areas necessary to perform the associated work. The contractor(s) will be responsible for establishing the EZ and limiting access to approved personnel. Depending on the condition for establishing the EZ, access to the EZ may require adequate PPE (e.g., Level C).

Contaminant Reduction Zone (CRZ):

The CRZ will be the area where personnel entering the EZ will don proper PPE prior to entering the EZ and the area where PPE may be removed. The CRZ will also be the area where decontamination of equipment and personnel will be conducted as necessary.

7.0 Decontamination Procedures

Upon leaving the work area, approved personnel shall decontaminate footwear as needed. Under normal work conditions, detailed personal decontamination procedures will not be necessary. Work clothing may become contaminated in the event of an unexpected splash or spill or contact with a contaminated substance. Minor splashes on clothing and footwear can be rinsed with clean water. Heavily contaminated clothing should be removed if it cannot be rinsed with water. Personnel assigned to this project should be prepared with a change of clothing whenever on site.

Personnel will use the contractor's disposal container for disposal of PPE.

8.0 Personal Protective Equipment

Generally, site conditions at this work site require level of protection of Level D or modified Level D; however, air monitoring will be conducted to determine if up-grading to Level C PPE is required (refer to Section 9.0). Descriptions of the typical safety equipment associated with Level D and Level C are provided below:

Level D:

Hard hat, safety glasses, rubber nitrile sampling gloves, steel toe construction grade boots, etc.

Level C:

Level D PPE and full or ½-face respirator and tyvek suit (if necessary). [Note: Organic vapor cartridges are to be changed after each 8-hours of use or more frequently.]

9.0 Air Monitoring

According to 29 CFR 1910.120(h), air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection required for personnel working onsite. Air monitoring will consist at a minimum of the procedure listed below. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

The Air Monitor will utilize a photoionization detector (PID) to screen the ambient air in the work areas (drilling, excavation, soil staging, and soil grading areas) for total Volatile Organic Compounds (VOCs) and a DustTrak™ Model 8520 aerosol monitor or equivalent for measuring particulates. Work area ambient air will generally be monitored in the work area and downwind of the work area. Air monitoring of the work areas and downwind of the work areas will be performed at least every 60 minutes using a PID and the DustTrak meter.

If sustained PID readings of greater than 25 ppm are recorded in the breathing zone, either personnel are to leave the work area until satisfactory readings are obtained or approved personnel may re-enter the work areas wearing at a minimum a ½ face respirator with organic vapor cartridges for an 8-hour duration (i.e., upgrade to Level C PPE). Organic vapor cartridges are to be changed after each 8-hour use or more frequently, if necessary. If PID readings are sustained, in the work area, at levels above 50 ppm for a 5 minute average, work will be stopped immediately until safe levels of VOCs are encountered or additional PPE will be required (i.e., Level B).

If downwind PID measurements reach or exceed 25 ppm consistently for a 5 minute period downwind of the work area, PID readings will be taken within the buildings (if occupied) on Site to ensure that the vapors are not penetrating any occupied building and effecting the personnel working within. If the PID measurements reach or exceed 25 ppm within the nearby buildings, the personnel should be evacuated via a route in which they would not encounter the work area. The building should then be ventilated until the PID measurements within the building are at or below background levels. It should be noted that the site buildings are currently vacant.

10.0 Emergency Action Plan

In the event of an emergency, employees are to turn off and shut down all powered equipment and leave the work areas immediately. Employees are to walk or drive out of the Site as quickly as possible, wait at the assigned 'safe area' and follow the instructions of the Site Safety Officer.

Employees are not authorized or trained to provide rescue and medical efforts. Rescue and medical efforts will be provided by local authorities.

11.0 Medical Surveillance

Medical surveillance will be provided to all employees who are injured due to overexposure from an emergency incident involving hazardous substances at this site.

12.0 Employee Training

Personnel who are not familiar with this site plan will receive training on its entire content and organization before working at the Site.

Individuals involved with the remedial investigation must be 40-hour OSHA HAZWOPER trained with current 8-hour refresher certification.

Table 1
Exposure Limits and Recognition Qualities

Compound	PEL-TWA (ppm)(b)(d)	TLV-TWA (ppm)(c)(d)	STEL (ppm)(b)	LEL (%) (e)	UEL (%) (f)	IDLH (ppm)(g)(d)	Odor	Odor Threshold (ppm)	Ionization Potential
Acetone	750	500	NA	2.15	13.2	20,000	Sweet	4.58	9.69
Anthracene	.2	.2	NA	NA	NA	NA	Faint aromatic	NA	NA
Benzene	1	0.5	5	1.3	7.9	3000	Pleasant	8.65	9.24
Benzo (a) pyrene (coal tar pitch volatiles)	0.2	0.1	NA	NA	NA	700	NA	NA	NA
Benzo (a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo (b) Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo (g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo (k) Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	10.88
Carbon Disulfide	20	1	NA	1.3	50	500	Odorless or strong garlic type	.096	10.07
Chlorobenzene	75	10	NA	1.3	9.6	2,400	Faint almond	0.741	9.07
Chloroform	50	2	NA	NA	NA	1,000	ethereal odor	11.7	11.42
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethylene	200	200	NA	9.7	12.8	400	Acrid	NA	9.65
1,2-Dichlorobenzene	50	25	NA	2.2	9.2		Pleasant		9.07
Ethyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	100	100	NA	1.0	6.7	2,000	Ether	2.3	8.76
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl Alcohol	400	200	500	2.0	12.7	2,000	Rubbing alcohol	3	10.10
Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	500	50	NA	12	23	5,000	Chloroform-like	10.2	11.35
Naphthalene	10, Skin	10	NA	0.9	5.9	250	Moth Balls	0.3	8.12
n-propylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphoric Acid	1	1	3	NA	NA	10,000	NA	NA	NA
Polychlorinated Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium Hydroxide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethane	NA	NA	NA	NA	NA	NA	Sweet	NA	NA
Toluene	100	100	NA	0.9	9.5	2,000	Sweet	2.1	8.82
Trichloroethylene	100	50	NA	8	12.5	1,000	Chloroform	1.36	9.45
1,2,4-Trimethylbenzene	NA	25	NA	0.9	6.4	NA	Distinct	2.4	NA
1,3,5-Trimethylbenzene	NA	25	NA	NA	NA	NA	Distinct	2.4	NA
Vinyl Chloride	1	1	NA	NA	NA	NA	NA	NA	NA
Xylenes (o,m,p)	100	100	NA	1	7	1,000	Sweet	1.1	8.56
Metals									
Arsenic	0.01	0.2	NA	NA	NA	100, Ca	NA	NA	NA
Cadmium	0.2	0.5	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	1	0.5	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.05	0.15	NA	NA	NA	700	NA	NA	NA
Mercury	0.05	0.05	NA	NA	NA	28	NA	NA	NA
Selenium	0.2	0.02	NA	NA	NA	Unknown	NA	NA	NA

- (a) Skin = Skin Absorption
- (b) OSHA-PEL Permissible Exposure Limit (flame weighted average, 8-hour): NIOSH Guide, June 1990
- (c) ACGIH - 8 hour time weighted average from Threshold Limit Values and Biological Exposure Indices for 2003.
- (d) Metal compounds in mg/m³
- (e) Lower Exposure Limit (%)
- (f) Upper Exposure Limit (%)
- (g) Immediately Dangerous to Life or Health Level: NIOSH Guide, June 1990.

Notes:

1. All values are given in parts per million (PPM) unless otherwise indicated.
2. Ca = Possible Human Carcinogen, no IDLH information.



APPENDIX 3

Quality Control Plan



Quality Control Program (QCP)

Site Location:

Former Wollensack Optical
872 & 886 Hudson Avenue
Rochester, New York

August 2019

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1.0 Introduction

LaBella's Quality Control Program (QCP) is an integral part of its approach to environmental investigations. By maintaining a rigorous QC program, our firm is able to provide accurate and reliable data. This QCP should be followed during implementation of environmental investigation and remediation projects and should serve as a basis for quality control methods to be implemented during field programs. Project-specific requirements may apply.

The QC program contains procedures which allow for the proper collection and evaluation of data and documents that QC procedures have been followed during field investigations. The QC program presents the methodology and measurement procedures used in collecting quality field data. This methodology includes the proper use of equipment, documentation of sample collection, and sample handling procedures.

Procedures used in the firm's QC program are compatible with federal, state, and local regulations, as well as, appropriate professional and technical standards.

This QC program includes the following:

- QC Objectives and Checks
- Field Equipment, Handling, and Calibration
- Sampling and Logging Techniques
- Sample Handling, Packaging, and Shipping
- Laboratory Requirements and Deliverables

It should be noted that project-specific work plans (e.g., Remedial Investigation Work Plans) may have project specific details that will differ from the procedures in this QC program. In such cases, the project-specific work plan should be followed (subsequent to regulatory approval).

The characteristics of major importance for the assessment of generated data are accuracy, precision, completeness, representativeness, and comparability. Application of these characteristics to specific projects is addressed later in this document. The characteristics are defined below.

1.1 Accuracy

Accuracy is the degree of agreement of a measurement or average of measurements with an accepted reference or "true" value and is a measure of bias in the system.

1.2 Precision

Precision is the degree of mutual agreement among individual measurements of a given parameter.

1.3 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under correct normal conditions.

1.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition

Careful choice and use of appropriate methods in the field will ensure that samples are representative. This is relatively easy with water or air samples since these components are homogeneously dispersed. In soil and sediment, contaminants are unlikely to be evenly distributed, and thus it is important for the sampler and analyst to exercise good judgment when removing a sample.

1.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. The data sets may be inter- or intra- laboratory.

2.0 Measurement of Data Quality

2.1 Accuracy

Accuracy of a particular analysis is measured by assessing its performance with "known" samples. These "knowns" take the form of EPA standard reference materials, or laboratory prepared solutions of target analytes spiked into a pure water or sample matrix. In the case of gas chromatography (GC) or GC/MS (mass spectrometry) analyses, solutions of surrogate compounds are used. These solutions can be spiked into every sample and are designed to mimic the behavior of target analytes without interfering with their determination.

In each case the recovery of the analyte is measured as a percentage, correcting for analytes known to be present in the original sample if necessary, as in the case of a matrix spike analysis. For EPA supplied known solutions, this recovery is compared to the published data that accompany the solution.

For the firm's prepared solutions, the recovery is compared to EPA-developed data or the firm's historical data as available. For surrogate compounds, recoveries are compared to EPA CLP acceptable recovery tables.

If recoveries do not meet required criteria, then the analytical data for the batch (or, in the case of surrogate compounds, for the individual sample) are considered potentially inaccurate. The analyst or his supervisor must initiate an investigation of the cause of the problem and take corrective action. This can include recalibration of the instrument, reanalysis of the QC sample, reanalysis of the samples in the batch, or flagging the data as suspect if the problems cannot be resolved. For

highly contaminated samples, recovery of the matrix spike may depend on sample homogeneity. As a rule, analyses are not corrected for recovery of matrix spike or surrogate compounds.

2.2 Precision

Precision of a particular analysis is measured by assessing its performance with duplicate or replicate samples. Duplicate samples are pairs of samples taken in the field and transported to the laboratory as distinct samples. Their identity as duplicates is typically not known to the laboratory. For most purposes, precision is determined by the analysis of replicate pairs (i.e., two samples prepared at the laboratory from one original sample). Often in replicate analysis the sample chosen for replication does not contain target analytes so that quantitation of precision is impossible. For EPA CLP analyses, replicate pairs of spiked samples, known as matrix spike/matrix spike duplicate samples, are used for precision studies. This has the advantage that two real positive values for a target analyte can be compared.

Precision is calculated in terms of Relative Percent Difference (RPD).

- Where X_1 and X_2 represent the individual values found for the target analyte in the two replicate analyses or in the matrix spike/matrix spike duplicate analyses.
- RPDs must be compared to the method RPD for the analysis. The analyst or his supervisor must investigate the cause of RPDs outside stated acceptance limits. This may include a visual inspection of the sample for non-homogeneity, analysis of check samples, etc. Follow-up action may include sample reanalysis or flagging of the data as suspect if problems cannot be resolved.
- During the data review and validation process, field duplicate RPDs are assessed as a measure of the total variability of both field sampling and laboratory analysis.

2.3 Completeness

Completeness for each parameter is calculated as follows:

- The firm's target value for completeness for all parameters is 100%. A completeness value of 95% will be considered acceptable. Incomplete results will be reported to the site managers. In planning the field sample collection, the site manager will plan to collect field duplicates from identified critical areas. This procedure should assure 100% completeness for these areas.

2.4 Representativeness

The characteristic of representativeness is not quantifiable. Subjective factors to be taken into account are as follows:

- The degree of homogeneity of a site;
- The degree of homogeneity of a sample taken from one point in a site; and
- The available information on which a sampling plan is based.

To maximize representativeness of results, sampling techniques and sample locations will be carefully chosen so that they provide laboratory samples representative of the site and the specific area. Within the laboratory, precautions are taken to extract from the sample bottle an aliquot representative of the whole sample. This includes premixing the sample and discarding pebbles from soil samples.

2.5 Comparability

Comparability of laboratory tests is ensured by utilizing only New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)- certified laboratories. This certification is the basis for demonstrating proficiency in testing requirements. Using ELAP certified laboratories will result in consistency amongst analytical data within a specific project and across projects.

3.0 Quality Control Targets

Target values for detection limit, percent spike recovery and percent "true" value of known check standards, and RPD of duplicates/replicates are included in the QCP, Analytical Procedures. Note that tabulated values are not always attainable. Instances may arise where high sample concentrations, non-homogeneity of samples, or matrix interferences preclude achievement of target detection limits or other quality control criteria. In such instances, the firm will report reasons for deviations from these detection limits or noncompliance with quality control criteria.

4.0 Soil Boring Advancement & Monitoring Well Installation Procedures

Soil and groundwater sampling shall be conducted in accordance with NYSDEC Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation dated May 3, 2010 and any Site-specific work plans.

Prior to drilling, all drill sites will be cleared with appropriate utility companies to avoid potential accidents relating to underground utilities. Utility drawings will be reviewed, if available.

4.1 Drilling Equipment and Techniques

Direct Push Geoprobe Advanced Borings:

Soil borings and monitoring wells will be advanced with a Geoprobe direct push sampling system. The use of direct push technology allows for rapid sampling, observation, and characterization of relatively shallow overburden soils. The Geoprobe utilizes a four to five-foot macrocore sampler, with disposable polyethylene sleeves. Soil cores will be retrieved in four or five-foot sections, and can be easily cut from the polyethylene sleeves for observation and sampling. The macrocore sampler will be decontaminated between boring locations using an alconox and water solution.

Prior to initiating drilling activities, the Macrocores, drive rods, and pertinent equipment, will be

steam cleaned or washed with an alconox and water solution. This cleaning procedure will also be used between each boring. Throughout and after the cleaning processes, direct contact between the equipment and the ground surface will be avoided. Plastic sheeting and/or clean support structures (e.g., pallets, sawhorses) will be used.

Test borings will be advanced with 2-inch (or larger) inside diameter (ID) direct push Macrocore through overburden soils. Drilling fluids, other than potable water will not be allowed without special consideration and agreement from NYSDEC. The use of lubricants is also not allowed unless approved by the NYSDEC representative.

During the drilling, a properly calibrated photoionization detector (PID) will be used to screen soil cores retrieved from the Macrocores.

Direct Push Geoprobe advanced groundwater-monitoring wells typically utilize minimum 1.25-inch threaded flush joint PVC pipe with 0.010-in. slotted screen or pre-packed well screens. PVC piping used for risers and screens will conform to the requirements of ASTM-D 1785 Schedule 40 pipe.. All materials used to construct the wells will be NSF/ASTM approved. Solvent PVC glue shall not be used at any time in the construction of the wells. The bottom of the screen shall be sealed with a treated cap or plug. No lead shot or lead wool is to be employed in sealing the bottom of the well or for sealant at any point in the well. Stainless steel wells or pre-packed PVC wells may be used if specified in the work plan and approved by the NYSDEC.

Hollow-Stem Auger Advanced Borings:

The drilling and installation of soil borings and monitoring wells will be performed using a rotary drill rig which will have sufficient capacity to perform 4 1/4-inch inside diameter (ID) hollow-stem auger drilling in the overburden, retrieve Macrocore or split-spoon samples, and perform necessary rock coring using NX, NQ, HQ or core barrel size as specified in the project-specific work plan. The borehole may be reamed up to 5 1/2-inch diameter prior to monitoring well installation as cased hole in the bedrock, or may be left as open bedrock hole, with regulatory concurrence. Equipment sizes and diameters may vary based on project-specific criteria. Any investigative derived waste generated during the advancement of soil borings and monitoring well installations will be containerized and characterized for proper disposal.

Prior to initiating drilling activities, the augers, rods, Macrocore, split spoons, and other pertinent equipment will be steam cleaned or washed with an alconox and water solution. This cleaning procedure will also be used between each boring. Steam cleaning activities will be performed in a designated on-site decontamination area. During and after the cleaning processes, direct contact between the equipment and the ground surface will be avoided. Plastic sheeting and/or clean support structures (e.g., pallets, sawhorses) will be used.

Test borings will be advanced with 4 1/4-inch (ID) hollow stem augers through overburden, and cored with a NX, NQ, HQ or core barrel size as specified in the project-specific work plan sized diamond core barrels in competent rock, driven by truck-, track-, or trailer-mounted drilling equipment. Alternative methods of drilling or equipment may be allowed or requested for project-specific criteria, but must be approved by the NYSDEC. Drilling fluids, other than water from a

NYSDEC-approved source, will not be allowed without special consideration and agreement from NYSDEC. The use of lubricants is also not allowed unless approved by the NYSDEC representative.

During the drilling, a (PID) will be used to screen soils retrieved from the split spoons or Macrocores. In the event that headspace field screening is required to determine the presence of VOCs in soil samples, the following procedure will be utilized:

- Soils from core will be inserted into an airtight glass jar and/or disposable polyethylene bag, and the container will be sealed immediately
- After sealing the container, the soils will be shaken or kneaded for 10-15 seconds to release volatiles into the headspace of the sealed container
- The PID inlet will be inserted into the headspace of the airtight container to screen soil samples for VOCs

During the drilling, visual screening will be utilized to identify any Non-Aqueous Phase Liquid (NAPL) in the soil cores.

Where bedrock wells are required, test borings shall be advanced into rock with NX, NQ, HR (or similar) coring tools. Only water from an approved source shall be used in rock coring. The consultant shall monitor and record the petrology, core recovery, fractures, rate of advance, and water lost or produced in each test boring. The Rock Quality Determination (RQD) value shall be calculated for each 5-foot core. Each core shall be screened with a PID upon extraction. All core samples shall be retained and stored by the consultant in an approved wooden core box for a period of not less than one year.

The method selected may be percussion or rotary drilling. The method and equipment selected must be capable of penetrating the bedrock at each well location to a depth required by the work plan.

Bedrock well installation will involve construction of a rock socket in the weathered bedrock. The socket will be drilled into the top of rock (typically 1-ft. to 5-ft. into the top of rock) at each bedrock well location to allow a permanent steel casing to be grouted securely in place prior to completion of the well. The purpose for this is to provide a seal at the overburden/bedrock interface and into the upper bedrock surface, to prevent the entrance of overburden water into the bedrock. After the grout and casing have set up for a minimum of 12 hours, the remaining bedrock can be NX (or similar) cored through the steel casing to a depth determined by the project-specific work plan.

Bedrock wells will either be open coreholes in the rock or consist of threaded, flush-joint PVC piping. Construction will vary depending on the project and as such, specific construction of the wells will be detailed in the project-specific work plan. Bedrock wells which do utilize PVC piping for risers and screens will conform to the requirements of ASTM-D 1785 Schedule 40 pipe. All materials used to construct the wells will be NSF/ASTM approved.

Screen and riser sections shall be joined by flush-threaded coupling to form watertight unions that retain 100% of the strength of the casing. Solvent PVC glue shall not be used at any time in the construction of the wells. The bottom of the screen shall be sealed with a treated cap or plug. No lead shot or lead wool is to be employed in sealing the bottom of the well or for sealant at any point

in the well.

4.1.1 Artificial Sand Pack

When utilized, granular backfill will be chemically and texturally clean, inert, siliceous, and of appropriate grain size for the screen slot size and the host environment. The sand pack will be installed using a tremie pipe, when possible (i.e., a tremie pipe may not fit into smaller, 2-in. diameter boreholes). When utilized, the well screen and casing will be installed, and the sand pack placed around the screen and casing to a depth extending at least 2-ft.. A pre-packed well screen may be used if pre-approved by the NYSDEC.

An artificial sand pack will not be utilized in bedrock wells without screens (i.e., open borehole wells).

4.1.2 Bentonite Seal

A minimum 2-ft. thick seal will be placed directly on top of the sand pack, and care will be taken to avoid bridging. In the event that Site geology does not allow for a 2-ft. seal (e.g., only 1-ft. of space remains between the top of the sand pack and ground surface), the remaining space in the annulus will be filled with bentonite.

4.1.3 Grout Mixture

Upon completion of the bentonite seal, the well may be grouted with a non-shrinking cement grout (e.g., Volclay[®]) mix to be placed from the top of the bentonite seal to the ground surface. The cement grout shall consist of a mixture of Portland cement (ASTM C 150) and water, in the proportion of not more than 7 gallons of clean water per bag of cement (1 cubic foot or 94 pounds). Additionally, 3% by weight of bentonite powder may be added.

4.1.4 Surface Protection

At all times during the progress of the work, precautions shall be used to prevent tampering with or the entrance of foreign material into the well. Upon completion of the well, a suitable cap shall be installed to prevent material from entering the well. Where permanent wells are to be installed, the well riser shall be protected by a flush mounted road box set into a concrete pad or locking well cap for stick-up wells. A concrete pad, sloped away from the well, shall be constructed around the flush mount road box or stick-up casing at ground level.

Any well that is to be temporarily removed from service or left incomplete due to delay in construction shall be capped with a watertight cap.

4.2 Surveying

Coordinates and elevations will be established for each monitoring well and sampling location. Elevations to the closest 0.01 foot shall be used for the survey. These elevations shall be referenced to a regional, local, or project-specific datum. The location, identification, coordinates, and elevations of the wells will be plotted on maps with a scale large enough to show their location with reference to other structures at each site.

4.3 Well Development

After completion of the well, but not sooner than 24 hours after grouting is completed, development will be accomplished using pumping, bailing, or surge blocking. No dispersing agents, acids, disinfectants, or other additives will be used during development or introduced into the well at any other time. During development, water will be removed throughout the entire water column by periodically lowering and raising the pump intake (or bailer stopping point).

Development water will be either properly contained and treated as waste until the results of chemical analysis of samples are obtained or discharged on Site as determined by the Site-specific work plans and/or consultation with the NYSDEC representatives on Site.

The development process will continue until removal of a minimum of 110% of the water lost during drilling, three well volumes; whichever is greater, or as specified in the work plan. In the event that limited recharge does not allow for the recovery of all drilling water lost in the well or three (3) well volumes, the well will be allowed to stabilize to conditions deemed representative of groundwater conditions. Stabilization periods will vary by project but will be confirmed with the NYSDEC prior to sampling.

4.4 PFAS Soil Sampling Procedure

Soil samples for PFAS analysis will be collected using PFAS-Free equipment. Samples will be collected in bottleware provided by the laboratory. Because PFAS are found in numerous everyday items, the following special precautions will be taken during sampling activities:

- No use of Teflon®-containing materials (e.g., Teflon® tubing, bailers, tape, sample jar lid liners, plumbing paste).
- No use of low density polyethylene (LDPE)-containing materials.
- No Tyvek® clothing will be worn by samplers.
- Clothes treated with stain-resistant or rain-resistant coatings (e.g., Gortex®) will be not be worn by samplers.
- All clothing worn by sampling personnel must have been laundered multiple times.
- No fast food wrappers, disposable cups or microwave popcorn will be within the vicinity of the wells/ samples.
- There will be no use of chemical (blue) ice packs, aluminum foil, or Sharpies® within the vicinity of the wells/ samples.
- No use of sunscreen, insect repellants, cosmetic, lotions or moisturizers will be allowed by sampling personnel the day of sampling.
- If any of the above items are handled by the field personnel prior to sampling activities, field personnel will wash their hands thoroughly with soap and water prior to any sampling activities.
- Powder-free nitrile gloves will be worn during all sample collection activities.

Quality assurance/ quality control (QA/QC) samples for PFAS sampling will include one (1) field duplicate, one (1) matrix spike / matrix spike duplicates (MS/MSD) and one (1) equipment blank. The procedures and rationale for collecting these samples are described below.

- **Field duplicate** – Sample will be used to assess the variability in concentrations of samples from the same well due to the combined effects of sample processing in the field and laboratory as well as chemical analysis.
- **Matrix spike/matrix spike duplicate** – Sample will be used to provide information about the effect of the sample matrix on the design and measurement methodology used by the laboratory.
- **Equipment blank** – Sample will be collected to help identify possible contamination from sampling equipment (i.e., shovel, soil core, etc.).

PFAS samples will be submitted to an Environmental Laboratory Accreditation Program (ELAP) certified laboratory for analysis of the full PFAS target analyte list (21 compounds listed in the NYSDEC Guidance) via modified USEPA Method 537 with a method detection limit not to exceed 1 ug/kg. Note, the laboratory utilized will be ELAP certified for PFOA and PFOS in drinking water by EPA method 537 or ISO 25101 as ELAP does not currently offer certification for PFAS compounds in matrices other than finished drinking water.

5.0 Geologic Logging and Sampling

At each investigative location, borings will be advanced through overburden using either a drill rig and hollow-stem auger or direct push technology (split spoons or Macrocore). Soils will be evaluated for visual and olfactory evidence of impairment (i.e., staining, odors, and elevated PID readings) by a qualified individual. Sampling devices will be decontaminated according to procedures outlined in the Decontamination section of this document. When utilized, split-spoon samplers will be driven into the soil using a minimum 140-pound safety hammer and allowed to free-fall 30-inches, in accordance with ASTM-D 1586-84 specifications. The number of blows required to drive the sampler each 6-inches of penetration will be recorded. When required, samples will be stored in the appropriate bottleware (refer to Section 10) until analysis or deemed unnecessary.

In the event that maximum design depth of investigation is reached and hydrogeologic conditions are not suitable for well installation, the maximum drilling depth may be revised.

Boulders and bedrock encountered during well installation may be cored by standard diamond-core drilling methods using an NX, NQ, HQ size core barrel or other if specified in the project-specific work plan. All rock cores recovered will be logged by a qualified individual, and stored in labeled wooden core boxes. The cores will be stored by the firm until the project is completed or for at least one year. Drilling logs will be prepared by a qualified individual who will be present during drilling operations. One copy of each field boring and well construction log and groundwater data, will typically be submitted as part of the investigation summary report (e.g., Remedial Investigation Report). The RQD value shall be calculated for each 5-foot section. Information provided in the logs shall include, but not be limited to, the following:

- Date(s), test hole identification, and project identification;

- Name of individual developing the log;
- Name of driller and assistant(s);
- Drill, make and model, auger size;
- Identification of alternative drilling methods used and justification thereof (e.g., rotary drilling with a specific bit type to remove material from within the hollow stem augers);
- Standard penetration test (ASTM D-1586) blow counts;
- Field diagram of each monitoring well installed with the depth to bottom of well/ screen, top of screen, length of riser, depth of steel casing, depths of sand pack, bentonite seal, grout, type of well completion etc.;
- Depth of each change of stratum;
- Identification of the material of which each stratum is composed, according to the USCS system or standard rock nomenclature, as appropriate;
- Depth interval from which each sample was taken, sample identification, and sample time;
- Depth at which hole diameters (bit sizes) change;
- Depth at which groundwater is encountered;
- Drilling fluid and quantity of water lost during drilling;
- Depth or location of any loss of tools or equipment;
- Depths of any fractures, joints, faults, cavities, or weathered zones

6.0 Groundwater Sampling Procedures

The groundwater in all new monitoring wells will be allowed to stabilize for at least 1week following development prior to sampling. Water levels will be measured to within 0.01 feet prior to purging and sampling. Sampling of each well will typically be accomplished in one of two ways; active or passive.

Active Sampling:

Active sampling includes bailing or pumping. Purging will be completed prior to active sampling if specified in the project-specific work plan. During purging, the following will be recorded in field books or groundwater sampling logs:

- date
- purge start time
- weather conditions
- presence of NAPL, if any, and approximate thickness
- pump rate
- pH
- dissolved oxygen
- temperature
- conductivity
- redox
- turbidity
- depth of well
- depth to water

- depth to pump intake
- purge end time
- volume of water purged

During low flow sampling, the water quality parameters including pH, conductivity, temperature, dissolved oxygen, redox, water level drawdown, and turbidity will be recorded at five (5) minute intervals. Samples will be collected after the parameters have stabilized for three (3) consecutive 5-minute intervals to within the specified ranges below:

- Water level drawdown (<0.3')
- Turbidity (+/- 10%, < 50-NTU for Metals Samples)
- pH (+/-0.1)
- Temperature (+/- 3%)
- Specific conductivity (+/- 3%)
- Dissolved Oxygen (+/- 10%)
- Oxidation reduction potential (+/- 10 millivolts)

Passive Sampling:

Groundwater samples will be collected via passive methods (i.e., no-purge) according to the following procedures and in the volumes specified in Table 10-1:

Samples will be collected via passive diffusion bag (PDB) samplers. PDB samplers are made of low-density polyethylene plastic tubing (typically 4 mil), filled with laboratory grade (ASTM Type II) deionized water and sealed at both ends.

- Pre-filled PDBs will not be stored for longer than 30 days and will be kept stored at room temperature in a sealed plastic bag until ready to use.
- PDBs filled in the field will be used immediately and not stored for future use.
- PDB samplers will only be used to collect groundwater samples which will be analyzed for VOCs.
- Mesh covers will be utilized for open rock holes as to not puncture the PDB and will be secured to the bag using zip-ties.
- PDB samplers will be deployed by hanging in the well at the depth(s) specified in the project-specific work plan. The depth at which the PDB is deployed will be recorded on the groundwater sampling form. The PDB samplers will be deployed at least 14 days prior to sampling;
- When transferring water from the PDB to sample containers, care will be taken to avoid agitating the sample, since agitation promotes the loss of volatile constituents;
- Gloves will be changed between collection of each PDB and tools used to open the PDB will be decontaminated with an alconox and potable water solution between each PDB;
- Any volume not used will be treated as investigation derived waste;
- Any observable physical characteristics of the groundwater (e.g., color, sheen, odor, turbidity) at the time of sampling will be recorded; and

- Weather conditions (i.e., air temperature, sky condition, recent heavy rainfall, drought conditions) at the time of sampling will be recorded.

6.1 PFAS Groundwater Sampling Procedure

Samples for PFAS analysis will be collected using PFAS-Free equipment, specifically a dedicated disposable high density polyethylene (HDPE) or PVC bailers, and/or low-flow sampling equipment with PFAS-Free components. Samples will be collected in bottleware provided by the laboratory. Because PFAS are found in numerous everyday items, the following special precautions will be taken during sampling activities:

- No use of Teflon®-containing materials (e.g., Teflon® tubing, bailers, tape, sample jar lid liners, plumbing paste).
- No use of low density polyethylene (LDPE)-containing materials.
- No Tyvek® clothing will be worn by samplers.
- Clothes treated with stain-resistant or rain-resistant coatings (e.g., Gortex®) will not be worn by samplers.
- All clothing worn by sampling personnel must have been laundered multiple times.
- No fast food wrappers, disposable cups or microwave popcorn will be within the vicinity of the wells/ samples.
- There will be no use of chemical (blue) ice packs, aluminum foil, or Sharpies® within the vicinity of the wells/ samples.
- No use of sunscreen, insect repellants, cosmetic, lotions or moisturizers will be allowed by sampling personnel the day of sampling.
- If any of the above items are handled by the field personnel prior to sampling activities, field personnel will wash their hands thoroughly with soap and water prior to any sampling activities.
- Powder-free nitrile gloves will be worn during all sample collection activities.

Quality assurance/ quality control (QA/QC) samples for PFAS sampling will include one (1) field duplicate, one (1) matrix spike / matrix spike duplicates (MS/MSD) and one (1) equipment blank. The procedures and rationale for collecting these samples are described below.

- **Field duplicate** – Sample will be used to assess the variability in concentrations of samples from the same well due to the combined effects of sample processing in the field and laboratory as well as chemical analysis.
- **Matrix spike/matrix spike duplicate** – Sample will be used to provide information about the effect of the sample matrix on the design and measurement methodology used by the laboratory.
- **Equipment blank** – Sample will be collected to help identify possible contamination from sampling equipment (i.e., bailer). One equipment blank will be collected by pouring laboratory certified analyte-free deionized water over a bailer into the sample container.

PFAS samples will be submitted to an Environmental Laboratory Accreditation Program (ELAP) certified laboratory for analysis of the full PFAS target analyte list (21 compounds listed in the

NYSDEC Guidance) via modified USEPA Method 537 with a method detection limit not to exceed 2 ng/L. Note, the laboratory utilized will be ELAP certified for PFOA and PFOS in drinking water by EPA method 537 or ISO 25101 as ELAP does not currently offer certification for PFAS compounds in matrices other than finished drinking water.

7.0 Soil Vapor Intrusion Sampling Procedures

Soil vapor intrusion (SVI) sampling is to be conducted in accordance with the *NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York* dated October 2006 and subsequent updates. Tracer gas testing is to be conducted for sub-slab sampling points to ensure concentrations of the tracer gas are not detected in the sub-slab at greater than 10% of the concentration detected in the atmosphere. An outdoor air sample is to be collected at an upwind direction as a control. A building inventory should be completed to document building construction information and identify products that may be contributing to the levels in indoor air.

8.0 Radiation Screening Procedures

A building and soil cover walkover survey will be completed by a NYSDEC Radioactive Materials Licensed (RML) Contractor.

The RML Contractor will also provide training and oversight to LaBella personnel during implementation of the overburden soil and groundwater and shallow bedrock groundwater evaluations.

Based on the project-specific aspects of the radiation screening, detailed procedures are included in Section 6.1.1 of the RIWP.

9.0 Field Documentation

9.1 Daily Logs/ Field Notebook

Daily logs are necessary to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. Daily logs may be kept in a project-specific notebook labelled with the project name/ number and contact information.

The daily log is the responsibility of the field personnel and will include:

- Name of person making entry;
- Start and end time of work;
- Names of team members on-site;
- Changes in required levels of personnel protection:
 - Level of protection originally used;

- Changes in protection, if required; and
 - Reasons for changes.
- Air monitoring locations, start and end times, and equipment identification numbers;
- Summary of tasks completed;
- Summary of samples collected including location, matrix, etc.;
- Field observations and remarks;
- Weather conditions, wind direction, etc.;
- Any deviations from the work plan;
- Initials/ signature of person recording the information.

As with any data logbooks, no pages will be removed for any reason. If corrections are necessary, these must be made by drawing a single line through the original entry (so that the original entry can still be read) and writing the corrected entry alongside. The correction must be initialed and dated. Corrected errors may require a footnote explaining the correction.

Sample documents, forms, or field notebooks are not to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on a document assigned to one individual, that individual may make corrections simply by crossing a line through the error and entering the corrected information. The incorrect information should not be obliterated. Any subsequent error discovered on a document should be corrected by the person who made the entry. All corrections must be initialed and dated.

9.2 Photographs

Photographs will be taken to document the work. Documentation of a photograph is crucial to its validity as a representation of an existing situation. Photographs should be documented with date, location, and description of the photograph.

10.0 Investigation Derived Waste

Purpose:

The purposes of these guidelines are to ensure the proper holding, storage, transportation, and disposal of materials that may contain hazardous wastes. Investigation-derived waste (IDW) included the following:

- Drill cuttings, drilling mud solids;
- Water produced during drilling;
- Well development and purge waters, unused PDB waters;
- Decontamination waters and associated solids;

IDW will be managed in substantial accordance with DER-10 and all applicable local, State and Federal regulations.

Procedure:

1. Contain all investigation-derived wastes in Department of Transportation (DOT)-approved 55-gallon drums, roll-off boxes, or other containers suitable for the wastes.
2. Place different media in separate drums (i.e., do not combine solids and liquids).
3. To the extent practicable, separate solids from drilling muds, decontamination waters, and similar liquids. Place solids within separate containers.
4. Transfer all waste containers to a staging area. Access to this area will be controlled. Waste containers must be transferred to the staging area as soon as practicable after the generating activity is complete.
5. Label all containers with regard to contents, origin, and date of generation. Use indelible ink for all labeling.
6. Collect samples for waste characterization purposes, use boring/well sample analytical data for characterization.
7. For wastes determined to be hazardous in character, be aware on accumulation time limitations. Coordinate the disposal of these wastes with the Owner and NYSDEC.
8. Dispose of investigation-derived wastes as follows;
 - Soil, water, and other environmental media for which analysis does not detect organic constituents, and for which inorganic constituents are at levels consistent with background, may be spread on-site (pending NYSDEC approval) or otherwise treated as a non-waste material.
 - Soils, water, and other environmental media in which organic compounds are detected or metals are present above background will be disposed as industrial waste or hazardous waste, as appropriate. Alternate disposition must be consistent with applicable State and Federal laws.
 - Personal protective equipment, disposable bailers, and similar equipment may be disposed as municipal waste, unless waste characterization results mandate disposal as industrial wastes
9. If waste is determined to be listed hazardous waste, it must be handled as hazardous waste as described above, unless a contained-in determination is accepted by the NYSDEC.

11.0 Decontamination Procedures

Sampling methods and equipment have been chosen to minimize decontamination requirements and to prevent the possibility of cross-contamination. Decontamination of equipment will be performed between discrete sampling locations. Equipment used to collect samples between composite sample locations will not require decontamination between collection of samples. All drilling equipment will be decontaminated after the completion of each drilling location. Special attention will be given to the drilling assembly and augers.

Split spoons and other non-disposable equipment will be decontaminated between each sampling location. The sampler will be cleaned prior to each use, by one of the following procedures:

- Initially cleaned of all foreign matter;
- Sanitized with a steam cleaner;

OR

- Initially cleaned of all foreign matter;
- Scrubbed with brushes in alconox solution;
- Triple rinsed; and
- Allowed to air dry.

Other sampling equipment including but not limited to low-flow sampling pumps, surface soil sampling trowel, water level meters, etc. will be decontaminated between sample location using an alconox solution. Consumables including gloves, tubing, bailers, string, etc. will be dedicated to one sample location and will not be reused.

12.0 Sample Containers

The containers required for sampling activities are pre-washed and ordered directly from a laboratory, which has the containers prepared in accordance with USEPA bottle washing procedures. The following tables detail sample volumes, containers, preservation and holding time for typical analytes.

**Table 11-1
Groundwater Samples**

Type of Analysis	Type and Size of Container	Number of Containers and Sample Volume (per sample)	Preservation	Holding Time Until Extraction/ Analysis
VOCs	40-ml glass vial with Teflon-backed septum	Two (2); fill completely, no headspace	Cool to 4° C (ice in cooler), Hydrochloric acid to pH <2	14 days
Semi-volatile Organic Compounds (SVOCs)	1,000-ml amber glass jar	One (1); fill completely	Cool to 4° C (ice in cooler)	7/40 days
Pesticides	1,000-ml amber glass jar	One (1); fill completely	Cool to 4° C (ice in cooler)	7/40 days
Polychlorinated biphenyls (PCBs)	1,000-ml amber glass jar	One (1); fill completely	Cool to 4° C (ice in cooler)	7/40 days
Metals	250-ml HDPE	One (1); fill completely	Cool to 4° C (ice in cooler) Nitric acid to pH <2	180 days (28 for mercury)
Cyanide	1,000-mL HDPE		Cool to 4° C (ice in cooler) Nitric acid to pH <2	14 days
1,4-Dioxane	40-ml glass vial with Teflon-backed septum	Three (3); fill completely, no headspace	Cool to 4° C (ice in cooler), Hydrochloric acid to pH <2	14 days
PFAS	250-mL HDPE, no Teflon	Two (2); fill completely	Cool to 4° C (ice in cooler), Trizma	14 days

Note:

All sample bottles will be prepared in accordance with USEPA bottle washing procedures.

Consult with laboratory as bottleware may vary by laboratory.

Holding time begins at the time of sample collection.

**TABLE 11-2
Soil Samples**

Type of Analysis	Type and Size of Container	Number of Containers and Sample Volume (per sample)	Preservation	Holding Time Until Extraction/Analysis
VOCs	4-oz, glass jar with Teflon-lined cap	One (1), fill as completely as possible	Cool to 4° C (ice in cooler)	14 days
VOCs via EPA 5035	40 mL vials with sodium bisulfate, methanol, and/or DI water	Three (3), 5 grams each	Cool to 4° C (ice in cooler)	2 days*
SVOCs	4-oz, glass jar with Teflon-lined cap	One (1), fill as completely as possible	Cool to 4° C (ice in cooler)	7/40 days
PCBs	4-oz, glass jar with Teflon-lined cap	One (1), fill as completely as possible	Cool to 4° C (ice in cooler)	7/40 days
Pesticides	4-oz, glass jar with Teflon-lined cap	One (1), fill as completely as possible	Cool to 4° C (ice in cooler)	14/40 days
Metals	4-oz, glass jar with Teflon-lined cap	One (1), fill as completely as possible	Cool to 4° C (ice in cooler)	180 days (28 for mercury)
Cyanide	4-oz, glass jar with Teflon-lined cap	One (1), fill as completely as possible	Cool to 4° C (ice in cooler)	14 days
1,4-Dioxane	40 mL vials with sodium bisulfate, methanol, and/or DI water	Three (3), 5 grams each	Cool to 4° C (ice in cooler)	2 days*
PFAS	8-oz HDPE, no Teflon	One (1); fill as completely as possible	Cool to 4° C (ice in cooler)	28 days

Note:

**Or freeze within holding time.*

All sample bottles will be prepared in accordance with USEPA bottle washing procedures.

Consult with laboratory as bottleware may vary by laboratory.

Holding time begins at the time of sample collection.

**Table 11-3
Air Samples**

Type of Analysis	Type and Size of Container	Number of Containers and Sample Volume (per sample)	Preservation	Holding Time Until Extraction/ Analysis
VOCs	1 - Liter Summa® Canister	One (1) 1-Liter 1.4- Liter for MS/MSD	N/A	14 days

Note:

All sample bottles will be prepared in accordance with USEPA bottle washing procedures. Consult with laboratory as bottleware may vary by laboratory. Holding time begins at the time of sample collection.

13.0 Sample Custody and Shipment

13.1 Sample Identification

All containers of samples collected from the project will be identified using the following format on a label or tag fixed to the sample container:

AA-BB-CC-DD-EE

- AA: This set of initials indicates an abbreviation for the Site from which the sample was collected.
- BB This set of initials represents the type of sample (e.g., SB for soil boring and MW for monitoring well)
- CC: These initials identify the unique sample location number.
- DD: These initials identify the sample start depth (if soil sample)
- EE These initials identify the sample end depth (if soil sample)

Each sample will be labeled, chemically preserved (if required) and sealed immediately after collection. To minimize handling of sample containers, labels will be filled out prior to sample collection when possible. The sample label will be filled out using waterproof ink and will be firmly affixed to the sample containers. The sample label will give the following information:

- Date and time of collection
- Sample identification
- Analysis required
- Project name/number
- Preservation

Sample tags attached to or affixed around the sample container must be used to properly identify all samples collected in the field. The sample tags are to be placed on the bottles so as not to obscure any QC lot numbers on the bottles; sample information must be printed in a legible manner using waterproof ink. Field identification must be sufficient to enable cross-reference with the logbook.

For chain-of-custody purposes, all QC samples are subject to exactly the same custodial procedures and documentation as "real" samples.

13.2 Chain of Custody

This section describes standard operating procedures for sample identification and chain-of-custody to be utilized for all field activities. The purpose of these procedures is to ensure that the quality of the samples is maintained during their collection, transportation, and storage through analysis. All chain-of-custody requirements comply with standard operating procedures indicated in USEPA sample handling protocol.

Sample identification documents must be carefully prepared so that sample identification and chain-of-custody can be maintained and sample disposition controlled. Sample identification documents include:

- Field notebooks;
- Sample label; and
- Chain-of-custody records.

The primary objective of the chain-of-custody procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from collection to completion of all required analyses. A sample is in custody if it is:

- In someone's physical possession;
- In someone's view;
- Locked up; or
- Kept in a secured area that is restricted to authorized personnel.

As few persons as possible should handle samples. Sample bottles will be obtained pre-cleaned from the a laboratory. Sample containers should only be opened immediately prior to sample collection. The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under chain-of-custody rules. The sample collector will record sample data in the field notebook and/or field logs.

The chain-of-custody record must be fully completed in duplicate, using black carbon paper where possible, by the field technician who has been designated by the project manager as responsible for sample shipment to the appropriate laboratory for analysis. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations, etc.), the person completing the chain-of-custody record should note these constraints on the chain of custody.

13.3 Transfer of Custody and Shipment

The coolers in which the samples are packed must be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them must sign, date, and note the time on the chain-of-custody record. This record documents sample custody transfer.

Shipping containers must be sealed with custody seals for shipment to the laboratory. The method of shipment, name of courier, and other pertinent information are entered on the chain-of-custody.

All shipments must be accompanied by the chain-of-custody record identifying their contents. The original record accompanies the shipment. The other copies are distributed appropriately to the site manager.

13.4 Custody Seals

Custody seals are preprinted adhesive-backed seals. Sample shipping containers (coolers, cardboard boxes, etc., as appropriate) are sealed in as many places as necessary to ensure security. Seals must be signed and dated before shipment. On receipt at the laboratory, the custodian must check (and certify, by completing the package receipt log and LABMIS entries) that seals on boxes and bottles are intact. Strapping tape should be placed over the seals to ensure that seals are not accidentally broken during shipment.

13.5 Sample Packaging

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample packaging requirements will be followed:

- Sample bottle lids must never be mixed. All sample lids must stay with the original containers.
- The label should not cover any bottle preparation QC lot numbers.
- All sample bottles are placed in a plastic bag and/or individual bubble wrap sleeves to minimize the potential for cross-contamination and breaking.
- Shipping coolers must be partially filled with packing materials and ice when required, to prevent the bottles from moving during shipment.
- The sample bottles must be placed in the cooler in such a way as to ensure that they do not directly come in contact with other samples. Ice will be added to the cooler to ensure that the samples reach the laboratory at temperatures no greater than 4°C.
- Any remaining space in the cooler should be filled with inert packing material. Under no circumstances should material such as sawdust, sand, etc., be used.
- A chain of custody record must be placed in a plastic bag inside the cooler. Custody seals must be affixed to the sample cooler.

13.6 Sample Shipment

Shipping containers are to be custody-sealed for shipment as appropriate. The container custody seal will consist of tape wrapped around the package and custody seals affixed in such a way that access to the container can be gained only by cutting the filament tape and breaking the seal. Chain of custody seals shall be placed on the container, signed, and dated prior to taping the container to ensure the chain of custody seals will not be destroyed during shipment. In addition, the coolers must also be labeled and placarded in accordance with DOT regulations if shipping medium and high hazard samples.

Field personnel will make arrangements for transportation of samples to the lab. The lab must be notified as early as possible regarding samples intended for Saturday delivery. The transportation and handling of samples must be accomplished in a manner that not only protects the integrity of the sample, but also prevents any detrimental effects due to the possible hazardous nature of samples. Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the United States DOT in the Code of Federal Regulation, 49 CFR 171 through 177. All samples will be delivered to the laboratory and analyzed within the holding times specified by the analytical method for that particular analyte.

All chain-of-custody requirements must comply with standard operating procedures in the USEPA sample handling protocol.

13.7 Laboratory Custody Procedures

A designated sample custodian accepts custody of the shipped samples and verifies that the sample identification number matches that on the chain-of-custody record and traffic reports, if required. Pertinent information as to shipment, pickup, and courier is entered on the chain of custody or attached forms.

14.0 Deliverables

This section will describe laboratory requirement and procedures to be followed for laboratory analysis. Samples collected in New York State will be analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified laboratory. When required, analyses will be conducted in accordance with the most current NYSDEC Analytical Services Protocol (ASP). For example, ASP Category B reports will be completed by the laboratory for samples representing the final delineation of the Remedial Investigation, confirmation samples, samples to determine closure of a system, and correlation samples taken using field testing technologies analyzed by an ELAP-certified laboratory to determine correlation to field results. Data Usability Summary Reports will be completed by a third party for samples requiring ASP Category B format reports. Electronic data deliverables (EDDs) will also be generated by the laboratory in EQUIS format for samples requiring ASP Category B format reports.

NYSDEC DER-10 DUSR requirements are as follows:

- a) Background. The Data Usability Summary Report (DUSR) provides a thorough evaluation of analytical data with the primary objective to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use.
 1. The development of the DUSR must be carried out by an experienced environmental scientists, such as the project Quality Assurance Officer, who is fully capable of conducting a full data validation. The DUSR is developed from:
 - i. A DEC ASP Category B Data Deliverable; or

- ii. *The USEPA Contract Laboratory Program National Functional Data Validation Standard Operating Procedures for Data Evaluation and Validation.*
 2. The DUSR and the data deliverables package will be reviewed by DER staff. If full third party data validation is found to be necessary (e.g. pending litigation) this can be carried out at a later date on the same data package used for the development of the DUSR.
- b) **Personnel Requirements.** The person preparing the DUSR must be pre-approved by DER. The person must submit their qualifications to DER documenting experience in analysis and data validation. Data validator qualifications are available on DEC's website identified in the table of contents.
- c) **Preparation of a DUSR.** The DUSR is developed by reviewing and evaluating the analytical data package. In order for the DUSR to be acceptable, during the course of this review the following questions applicable to the analysis being reviewed must be answered in the affirmative.
1. Is the data package complete as defined under the requirements for the most current DEC ASP Category B or USEPA CLP data deliverables?
 2. Have all holding times been met?
 3. Do all the QC data; blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?
 4. Have all of the data been generated using established and agreed upon analytical protocols?
 5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?
 6. Have the correct data qualifiers been used and are they consistent with the most current DEC ASP?
 7. Have any quality control (QC) exceedances been specifically noted in the DUSR and have the corresponding QC summary sheets from the data package been attached to the DUSR?
- d) **Documenting the validation process in the DUSR.** Once the data package has been reviewed and the above questions asked and answered the DUSR proceeds to describe the samples and the analytical parameters, including data deficiencies, analytical protocol deviations and quality control problems are identified and their effect on the data is discussed.

15.0 Equipment Calibration

All instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations as well as criteria set forth in the applicable analytical methodology references. Operation, calibration, and maintenance will be performed by personnel properly trained in these procedures. Section 11 lists the major instruments to be used for sampling and analysis. In addition, brief descriptions of calibration

procedures for major field and laboratory instruments follow.

15.1 Photovac/MiniRae Photoionization Detector (PID)

Standard operating procedures for the PID require that routine maintenance and calibration be performed every six months. Field calibration will be performed on a daily basis. The packages used for calibration are non-toxic analyzed gas mixtures available in pressurized containers. All calibration procedures will follow the manufacturer recommendations.

15.2 Conductance, Temperature, and pH Tester

Temperature and conductance instruments are factory calibrated. Temperature accuracy can be checked against an NBS certified thermometer prior to field use if necessary. Conductance accuracy may be checked with a solution of known conductance and recalibration can be instituted, if necessary.

15.3 O₂/Explosimeter

The specific meter used at the time of work shall be calibrated in accordance with manufacturer recommendations. The model 260 O₂/ Explosimeter is described below.

The primary maintenance item of the Model 260 is the rechargeable 2.4 volt (V) nickel cadmium battery. The battery is recharged by removing the screw cap covering receptacle and connecting one end of the charging cable to the instrument and the other end to a 115V AC outlet.

The battery can also be recharged using a 12V DC source. An accessory battery charging cable is available, one end of which plugs into the Model 260 while the other end is fitted with an automobile cigarette lighter plug.

Recommended charging time is 16 hours.

Before the calibration of the combustible gas indicator can be checked, the Model 260 must be in operating condition. Calibration check-adjustment is made as follows:

1. Attach the flow control to the recommended calibration gas tank.
2. Connect the adapter-hose to the flow control.
3. Open flow control valve.
4. Connect the adapter-hose fitting to the inlet of the instrument; after about 15 seconds the LEL meter pointer should be stable and within the range specified on the calibration sheet accompanying the calibration equipment. If the meter pointer is not in the correct range, stop the flow; remove the right hand side cover. Turn on the flow and adjust the "S" control with a small screwdriver to obtain a reading as specified on the calibration sheet.
5. Disconnect the adapter-hose fitting from the instrument.
6. Close the flow control valve.

7. Remove the adapter-hose from the flow control.
8. Remove the flow control from the calibration gas tank.
9. Replace the side cover on the Model 260.

CAUTION: Calibration gas tank contents are under pressure. Use no oil, grease, or flammable solvents on the flow control or the calibration gas tank. Do not store calibration gas tank near heat or fire or in rooms used for habitation. Do not throw in fire, incinerate, or puncture. Keep out of reach of children. It is illegal and hazardous to refill this tank. Do not attach the calibration gas tank to any other apparatus than described above. Do not attach any gas tank other than MSA calibration tanks to the regulator.

15.4 Nephelometer (Turbidity Meter)

LaMotte 2020WE Turbidity Meter is calibrated before each use. The default units are set to NTU and the default calibration curve is formazin. A 0 NTU Standard (Code 1480) is included with the meter. To calibrate, rinse a clean tube three times with the blank. Fill the tube to the fill line with the blank. Insert the tube into the chamber, close the lid, and select “scan blank”.

TABLE 14-4
List of Major Instruments
for Sampling and Analysis

<ul style="list-style-type: none"> • MSA 360 O₂/Explosimeter • Geotech Geopump II AC/DC Peristaltic Pump • QED MP50 Controller and QED Sample Pro MicroPurge Bladder Pimp • Horiba U-53 Multi-Parameter Water Quality Meter • LaMotte 2020WE Turbidity Meter • EM-31 Geomics Electromagnetic Induction Device • Mini Rae Photoionization Detectors (3,000, ppbRAE, etc.)
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16.0 Internal Quality Control Checks

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of field equipment. Field-based QC will comprise at least 10% of each data set generated and will consist of standards, replicates, spikes, and blanks. Field duplicates and field blanks will be analyzed by the laboratory as samples and will not necessarily be identified to the laboratory as duplicates or blanks. For each matrix, field duplicates will be provided at a rate of one per 10 samples collected or one per shipment, whichever is greater. Field blanks which may consist of trip, routine field, and/or rinsate blanks will be provided at a rate of one per 20

samples collected for each media, or one per shipment, whichever is greater. Frequency of QC data may vary from project to project; refer to the project-specific work plan for QC requirements.

Calculations will be performed for recoveries and standard deviations along with review of retention times, response factors, chromatograms, calibration, tuning, and all other QC information generated. All QC data, including split samples, will be documented in the site logbook and/or appropriate field logs. QC records will be retained and results reported with sample data.

16.1 Field Blanks

Various types of blanks are used to check the cleanliness of field handling methods. The following types of blanks may be used: the trip blank, the routine field blank, and the field equipment blank. They are analyzed in the laboratory as samples, and their purpose is to assess the sampling and transport procedures as possible sources of sample contamination. Field staff may add blanks if field circumstances are such that they consider normal procedures are not sufficient to prevent or control sample contamination, or at the direction of the project manager. Rigorous documentation of all blanks in the site logbooks is mandatory.

- **Routine Field Blanks** or bottle blanks are blank samples prepared in the field to access ambient field conditions. They will be prepared by filling empty sample containers with deionized water and any necessary preservatives. They will be handled like a sample and shipped to the laboratory for analysis.
- **Trip Blanks** are similar to routine field blanks with the exception that they are **not** exposed to field conditions. Their analytical results give the overall level of contamination from everything except ambient field conditions. For the RI/FS, one trip blank will be collected with every shipment of water samples for VOC analysis. Each trip blank will be prepared by filling a 40-ml vial with deionized water prior to the sampling trip, transported to the site, handled like a sample, and returned to the laboratory for analysis without being opened in the field. Trip blanks may be provided by the laboratory, shipped with the bottleware, and kept with the sampling containers until analysis.
- **Field Equipment Blanks** are blank samples (sometimes called transfer blanks or rinsate blanks) designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use, and that cleaning procedures between samples are sufficient to minimize cross contamination. If a sampling team is familiar with a particular site, they may be able to predict which areas or samples are likely to have the highest concentration of contaminants. Unless other constraints apply, these samples should be taken last to avoid excessive contamination of sampling equipment.

16.2 Duplicates

Duplicate samples are collected to check the consistency of sampling and analysis procedures. The following types of duplicates may be collected.

- **Blind duplicate** samples consist of a set of two samples collected independently at a

sampling location during a single sampling event. Blind duplicates are designed to assess the consistency of the overall sampling and analytical system. Blind duplicate samples should not be distinguishable by the person performing the analysis.

- **Matrix Spike and Matrix Spike Duplicates (MS/MSDs)** consist of a set of three samples collected independently at a sampling location during a single sampling event. These samples are for laboratory quality control checks.

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APPENDIX 4

PNOD Data and Permanganate Information



Carus Remediation Technologies
Remediation Report

7 August 2019

Customer: LaBella Associates
300 State Street
Rochester, NY 14614

Attention: Alex Brett
abrett@labellapc.com

From: T. Colgan
Cc: T. Lizer

TECH # 19-132

Subject: RemOx[®] S ISCO Reagent Permanganate Natural Oxidant Demand

Summary

The overall average RemOx[®] S ISCO reagent permanganate natural oxidant demand (PNOD) at 48 hours for the soil sample was determined to be 0.5 g/kg. The average demand ranged from 0.2 g/kg to 0.8 g/kg. These values are calculated on a weight as potassium permanganate (KMnO₄) per dry weight of soil.

Background

Soil samples were received from LaBella Associates from the Former Wollensack Optical project located in Rochester, NY. The sample was analyzed for permanganate natural oxidant demand. The measurement of the permanganate natural oxidant demand is used to estimate the concentration of permanganate that will be consumed by the natural reducing agents during a given time period of 48 hours.

Experimental

The sample was analyzed for permanganate natural oxidant demand following ASTM D7262-10 Test Method A. A brief summary is as follows:

To determine the PNOD, the soil was baked at 105°C for 24 hours then allowed to cool to room temperature. The soil was then blended and passed through a U.S. 10 sieve (2 mm). Reactors were loaded with 50 grams of soil and 100 mL of 20 g/L KMnO₄ for an initial dose of 40 g/kg KMnO₄ on a dry soil weight basis at a 1:2 soil to aqueous reagent ratio. Each soil dose was performed in triplicate. The reaction vessels were inverted once to mix the reagents. Residual permanganate (MnO₄⁻) was determined at 48 hours. The demands were calculated on a dry weight basis.

Results

The permanganate demand is the amount of permanganate consumed in a given amount of time. It should be noted that in a soil or groundwater sample, the oxidation of any compound by permanganate is dependent on the initial dose of permanganate and the reaction time available. As the permanganate dose is increased, the reaction rate and oxidant consumption may also increase. Some compounds that are not typically oxidized by permanganate under low doses can become

reactive with permanganate at higher concentrations. The 48-hour PNOD results can be seen in Table 1 (on a dry soil basis).

Table 1: 48-Hour PNOD *

Soil Sample Identification	Average and Standard Deviation (g/kg)	Replicate 1 (g/kg)	Replicate 2 (g/kg)	Replicate 3 (g/kg)
RIBW-B	0.5 ± 0.30	0.8	0.2	0.5
Overall Average	0.5			

*Demands were calculated on a weight KMnO₄/dry soil weight basis from an initial dose of 40.0 g/kg KMnO₄ initial dose at a 1:2 soil to aqueous solution ratio.

Conclusions

For this application the amount of permanganate needed will be dependent on the reaction time allowed. On average, the soil sample had a 48-hour permanganate demand value of 0.5 g/kg. The average demands ranged from 0.2 g/kg to 0.8 g/kg. Generally, remediation sites with a soil demand of less than 20.0 g/kg at the time of interest are favorable for *in situ* chemical oxidation with permanganate (see Table 2 for additional information).

Table 2: Correlation of Permanganate Natural Oxidant Demand Results*

PNOD (g/kg)	Rank	Comment
<10	Low	ISCO with MnO ₄ ⁻ is recommended. Soil contribution to MnO ₄ ⁻ demand is low.
10-20	Moderate	ISCO with MnO ₄ ⁻ is recommended. Soil contribution to MnO ₄ ⁻ demand is moderate. Economics should be considered.
>20	High	ISCO with MnO ₄ ⁻ is technically feasible. Other technologies may provide lower cost alternatives.

*Dry Weight Basis



RemOx[®] S and RemOx[®] L ISCO Reagents Estimation Spreadsheet

Input data into box with black font

Site Name: Former Wollensack Optical

Date: 8/14/2019

	Estimates	Units		Estimates	Units
Treatment Area Volume			Injection Volume for RemOx S		
Length	50	ft	Injection Concentration	3.0%	%
Width	60	ft	Total Volume of Injection Fluid	9,614	gal
Area	3,000	sq ft	Pore Volume Replaced	6.80	%
Thickness	21	ft			
Total Volume	2,333	cu yd	Amount of RemOx S Estimated:	2,405	pounds
Soil Characteristics/Analysis			Injection Volume for RemOx L		
Porosity	30	%	Injection Concentration	10.0%	%
Total Plume Pore Volume	141,382	gal	Calculated Specific Gravity	1.06	g/ml
Avg Contaminant Conc	180	ppm	Total Volume of Injection Fluid	2,443	gal
Mass of Contaminant	212.38	lb	Pore Volume Replaced	1.73	%
PNOD	0.5	g/kg			
Effective PNOD	20	%	Amount of RemOx L Estimated:	5,400	pounds
Effective PNOD Calculated	0.100			472	gallons
PNOD Oxidant Demand	693.00	lb			
Avg Stoichiometric Demand	2.4	lb/lb			
Contaminant Oxidant Demand	509.71	lb			
Theoretical Oxidant Demand	1,202.71	lb			
Confidence Factor	2				
Calculated Oxidant Demand	2,405.42				



SAFETY DATA SHEET

1. Identification

Product identifier	RemOx® L ISCO Reagent
Other means of identification	Not available.
Recommended use	Liquid oxidant recommended for applications that require a concentrated permanganate solution.
Recommended restrictions	Use in accordance with supplier's recommendations.
Manufacturer / Importer / Supplier / Distributor information	
Manufacturer/Supplier	CARUS CORPORATION
Address	315 Fifth Street, Peru, IL 61354, USA
Telephone	815 223-1500 - All other non-emergency inquiries about the product should be directed to the company
E-mail	salesmkt@caruscorporation.com
Website	www.caruscorporation.com
Contact person	Dr. Chithambarathanu Pillai
Emergency Telephone	For Hazardous Materials [or Dangerous Goods] Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC at CHEMTREC®, USA: 001 (800) 424-9300 CHEMTREC®, Mexico (Toll-Free - must be dialed from within country): 01-800-681-9531 CHEMTREC®, Other countries: 001 (703) 527-3887

2. Hazard(s) identification

Physical hazards	Oxidizing liquids	Category 2
Health hazards	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 1B
	Serious eye damage/eye irritation	Category 1
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
OSHA defined hazards	Not classified.	

Label elements



Signal word	Danger	
Hazard statement	May intensify fire; oxidizer. Harmful if swallowed. Causes severe skin burns and eye damage. May cause respiratory irritation.	
Precautionary statement		
Prevention	Keep away from heat. Take any precaution to avoid mixing with combustibles. Keep/Store away from clothing//combustible materials. Use only outdoors or in a well-ventilated area. Do not breathe mist or vapor. Wear protective gloves/protective clothing/eye protection/face protection. Do not eat, drink or smoke when using this product. Wash thoroughly after handling.	
Response	In case of fire: Use water for extinction. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. If swallowed: Rinse mouth. Do NOT induce vomiting. If inhaled: Remove person to fresh air and keep comfortable for breathing.	
Storage	Store locked up. Store in a well-ventilated place. Keep container tightly closed.	
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.	
Hazard(s) not otherwise classified (HNOC)	Not classified.	
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1

Supplemental information

Hazard symbol



Hazard statement

Very toxic to aquatic life with long lasting effects.

Precautionary statement

Prevention

Avoid release to the environment.

Response

Collect spillage.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Sodium permanganate	10101-50-5	36 - 40

Composition comments

All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation

If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Move to fresh air. For breathing difficulties, oxygen may be necessary. Call a physician or poison control center immediately. Get medical attention immediately. Call a physician if symptoms develop or persist. Get medical attention if symptoms persist.

Skin contact

Take off immediately all contaminated clothing. (Caution: Solution may ignite certain textiles). Immediately flush skin with plenty of water. Get medical attention immediately. Wash contaminated clothing before reuse.

Eye contact

Contact with skin may leave a brown stain of insoluble manganese dioxide. This can be easily removed by washing with a mixture of equal volume of household vinegar and 3% hydrogen peroxide, followed by washing with soap and water.

Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyelids wide apart. Continue rinsing. Get medical attention immediately.

Ingestion

Immediately rinse mouth and drink plenty of water. Never give anything by mouth to a victim who is unconscious or is having convulsions. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Get medical attention immediately.

Before using, read Material Safety Data Sheet (MSDS) for this product. Rinse container at least three times to an absence of pink color before disposing.

Most important symptoms/effects, acute and delayed

Contact with this material will cause burns to the skin, eyes and mucous membranes. Corrosive effects. Irritation of eyes and mucous membranes. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. May cause temporary blindness and severe eye damage. Permanent eye damage including blindness could result. Show this safety data sheet to the doctor in attendance.

Indication of immediate medical attention and special treatment needed

Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen. Decomposition products are alkaline. Brown stain is insoluble manganese dioxide.

General information

In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. For personal protection, see Section 8 of the MSDS. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media

Flood with water from a distance, water spray or fog.

Unsuitable extinguishing media

The following extinguishing media are ineffective: Dry chemical. Foam. Carbon dioxide (CO₂). Halogenated materials.

Specific hazards arising from the chemical

May intensify fire; oxidizer. May ignite combustibles (wood, paper, oil, clothing, etc.). Contact with incompatible materials or heat (135 °C / 275 °F) could result in violent exothermic chemical reaction. Oxidizing agent, may cause spontaneous ignition of combustible materials. By heating and fire, corrosive vapors/gases may be formed.

Special protective equipment and precautions for firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.

Fire-fighting equipment/instructions

Move container from fire area if it can be done without risk. Cool containers exposed to flames with water until well after the fire is out. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Dike fire control water for later disposal. Water runoff can cause environmental damage.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Keep unnecessary personnel away. Keep upwind. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Avoid inhalation of vapors and contact with skin and eyes. Wear protective clothing as described in Section 8 of this safety data sheet. Local authorities should be advised if significant spillages cannot be contained.

Methods and materials for containment and cleaning up

Keep combustibles (wood, paper, oil, etc.) away from spilled material. Should not be released into the environment. This product is miscible in water.

Large Spills: Stop leak if possible without any risk. Dike the spilled material, where this is possible. Proceed with either of the following two options depending upon the size of the spill and the availability of the neutralizing agents:

Option # 1: Dilute to approximately 6% with water, and then reduce with sodium thiosulfate, a bisulfite or ferrous salt solution. The bisulfite or ferrous salt may require some dilute sulfuric acid (10% w/w) to promote reduction. Neutralize with sodium carbonate to neutral pH, if acid was used. Decant or filter and deposit sludge in approved landfill. Where permitted, the sludge may be drained into sewer with large quantities of water.

Option # 2: Absorb with inert media like diatomaceous earth or inert floor dry, collect into a drum and dispose of properly. Do not use saw dust or other incompatible media. Disposal of all materials shall be in full and strict compliance with all federal, state, and local regulations pertaining to permanganates.

To clean contaminated floors, flush with abundant quantities of water into sewer, if permitted by federal, state, and local regulations. If not, collect water and treat as described above. Cover with reducing agent (e.g. sodium bisulphite/thiosulphate or a ferrous salt plus 2M H2SO4). Transfer to container with water and neutralize with soda ash. Otherwise, absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Do not use sawdust or other combustible material. Following product recovery, flush area with water. Prevent product from entering drains.

Small Spills: Cover with reducing agent (e.g. sodium bisulphite/thiosulphate or a ferrous salt plus 2M H2SO4). Transfer to container with water and neutralize with soda ash. Clean surface thoroughly to remove residual contamination.

Never return spills in original containers for re-use. Never return spills in original containers for re-use.

Environmental precautions

Do not allow to enter drains, sewers or watercourses. Contact local authorities in case of spillage to drain/aquatic environment.

7. Handling and storage

Precautions for safe handling

Take any precaution to avoid mixing with combustibles. Keep away from clothing and other combustible materials. Do not get this material in your eyes, on your skin, or on your clothing. Do not breathe mist or vapor. If clothing becomes contaminated, remove and wash off immediately. Spontaneous ignition may occur in contact with cloth or paper. When using, do not eat, drink or smoke. Good personal hygiene is necessary. Wash hands and contaminated areas with water and soap before leaving the work site. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep container tightly closed and in a well-ventilated place. Store in a cool, dry place. Store away from incompatible materials (See Section 10). Follow applicable local/national/international recommendations on storage of oxidizers. Store in accordance with NFPA 430 requirements for Class II oxidizers.

8. Exposure controls/personal protection

Occupational exposure limits No exposure limits noted for ingredient(s).

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Sodium permanganate (CAS 10101-50-5)	Ceiling	5 mg/m3

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Sodium permanganate (CAS 10101-50-5)	TWA	0.1 mg/m3	Inhalable fraction.
		0.02 mg/m3	Respirable fraction.

US NIOSH Pocket Guide to Chemical Hazards: Recommended exposure limit (REL)

Components	Type	Value	Form
Sodium permanganate (CAS 10101-50-5)	TWA	1 mg/m ³	Fume.

US NIOSH Pocket Guide to Chemical Hazards: Short Term Exposure Limit (STEL)

Components	Type	Value	Form
Sodium permanganate (CAS 10101-50-5)	STEL	3 mg/m ³	Fume.

Biological limit values	No biological exposure limits noted for the ingredient(s).
Exposure guidelines	Follow standard monitoring procedures.
Appropriate engineering controls	Provide adequate general and local exhaust ventilation. An eye wash and safety shower must be available in the immediate work area.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Wear safety glasses with side shields (or goggles). Wear face shield if there is risk of splashes.
Skin protection	
Hand protection	Wear chemical-resistant, impervious gloves. Use protective gloves made of: Rubber or plastic. Suitable gloves can be recommended by the glove supplier.
Other	Wear appropriate chemical resistant clothing. Rubber or plastic apron.
Respiratory protection	In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment. In the United States of America, if respirators are used, a program should be instituted to assure compliance with OSHA 29 CFR 1910.134.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using, do not eat, drink or smoke. Keep from contact with clothing and other combustible materials. Remove and wash contaminated clothing promptly. Wash hands before breaks and immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance	Dark purple liquid.
Physical state	Liquid.
Form	Aqueous solution.
Color	Dark purple.
Odor	Odorless.
Odor threshold	Not available.
pH	5 - 8
Melting point/freezing point	< 24.8 °F (< -4 °C)
Initial boiling point and boiling range	> 213.8 °F (> 101 °C)
Flash point	Does not flash.
Evaporation rate	As water.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not applicable.
Flammability limit - upper (%)	Not applicable.
Vapor pressure	760 mm Hg (105 °C)
Vapor density	Not available.
Relative density	1.37 - 1.4 (20 °C) (Water = 1)
Solubility(ies)	Miscible with water.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

Other information

Explosive properties	Not explosive. Can explode in contact with sulfuric acid, peroxides and metal powders.
Oxidizing properties	Strong oxidizing agent.

10. Stability and reactivity

Reactivity	The product is non-reactive under normal conditions of use, storage and transport.
Chemical stability	Stable at normal conditions.
Possibility of hazardous reactions	Contact with combustible material may cause fire. Can explode in contact with sulfuric acid, peroxides and metal powders.
Conditions to avoid	Contact with incompatible materials or heat (135 °C / 275 °F) could result in violent exothermic chemical reaction.
Incompatible materials	Acids. Peroxides. Reducing agents. Combustible material. Metal powders.
Hazardous decomposition products	By heating and fire, corrosive vapors/gases may be formed. Contact with hydrochloric acid liberates chlorine gas.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Causes digestive tract burns. Harmful if swallowed. Ingestion causes burns of the upper digestive and respiratory tracts.
Inhalation	May cause irritation to the respiratory system.
Skin contact	Causes severe skin burns.
Eye contact	Causes serious eye damage.

Symptoms related to the physical, chemical and toxicological characteristics
Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

Information on toxicological effects

Acute toxicity
Causes severe skin burns and eye damage. Causes burns. Harmful if swallowed. Health injuries are not known or expected under normal use. Harmful if swallowed.

Components	Species	Test Results
Potassium permanganate (CAS 7722-64-7)		
Acute		
<i>Dermal</i>		
LD50	Rat	2000 mg/kg
<i>Oral</i>		
LD50	Rat	2000 mg/kg

Toxicity data are not available for sodium permanganate. Toxicity is expected to be similar to that of potassium permanganate.

Skin corrosion/irritation	Causes severe skin burns.
Serious eye damage/eye irritation	Causes serious eye damage.
Respiratory sensitization	Not classified.
Skin sensitization	Not classified.
Germ cell mutagenicity	Not classified.
Carcinogenicity	Not classified.
Reproductive toxicity	Not classified.
Specific target organ toxicity - single exposure	May cause irritation of respiratory tract.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not classified.
Further information	Chronic effects are not expected when this product is used as intended. Prolonged exposure, usually over many years, to manganese oxide fume/dust can lead to chronic manganese poisoning, chiefly affecting the central nervous system.

12. Ecological information

Ecotoxicity
Very toxic to aquatic life with long lasting effects.

Components		Species	Test Results
Potassium permanganate (CAS 7722-64-7)			
Aquatic			
Fish	LC50	Bluegill (<i>Lepomis macrochirus</i>)	2.7 mg/l, 96 hours, static 2.3 mg/l, 96 hours, flow through 2.3 mg/l, 96 hours 1.8 - 5.6 mg/l
		Carp (<i>Cyprinus carpio</i>)	3.16 - 3.77 mg/l, 96 hours 2.97 - 3.11 mg/l, 96 hours
		Goldfish (<i>Carassius auratus</i>)	3.3 - 3.93 mg/l, 96 hours, static
		Milkfish, salmon-herring (<i>Chanos chanos</i>)	> 1.4 mg/l, 96 hours
		Rainbow trout (<i>Oncorhynchus mykiss</i>)	1.8 mg/l, 96 hours 1.08 - 1.38 mg/l, 96 hours 0.77 - 1.27 mg/l, 96 hours
		Rainbow trout, donaldson trout (<i>Oncorhynchus mykiss</i>)	0.275 - 0.339 mg/l, 96 hours

Toxicity data are not available for sodium permanganate. Toxicity is expected to be similar to that of potassium permanganate.

Persistence and degradability	Expected to be readily converted by oxidizable materials to insoluble manganese oxide.
Bioaccumulative potential	Potential to bioaccumulate is low.
Mobility in soil	The product is miscible with water. May spread in water systems.
Mobility in general	The product is miscible with water. May spread in water systems.
Other adverse effects	None known.

13. Disposal considerations

Disposal instructions	Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Rinse container at least three times to an absence of pink color before disposing.
Hazardous waste code	D001: Ignitable waste The Waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Do not allow this material to drain into sewers/water supplies. Dispose of in accordance with local regulations.
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Rinse container at least three times to an absence of pink color before disposing. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

UN number	UN3214
UN proper shipping name	Permanganates, inorganic, aqueous solution, n.o.s. (Sodium permanganate)
Transport hazard class(es)	5.1
Subsidiary class(es)	-
Packing group	II
Environmental hazards	
Marine pollutant	Yes
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	26, 353, IB2, T4, TP1
Packaging exceptions	152
Packaging non bulk	202
Packaging bulk	242

IATA

UN number	UN3214
UN proper shipping name	Permanganates, inorganic, aqueous solution, n.o.s. (Sodium permanganate)
Transport hazard class(es)	5.1
Subsidiary class(es)	-
Packaging group	II
Environmental hazards	Yes
Labels required	5.1
ERG Code	5L

Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number UN3214
UN proper shipping name PERMANGANATES, INORGANIC, AQUEOUS SOLUTION, N.O.S. (Sodium permanganate)
Transport hazard class(es) 5.1
Subsidiary class(es) -
Packaging group II
Environmental hazards
Marine pollutant Yes
Labels required 5.1
EmS F-H, S-Q
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code This substance/mixture is not intended to be transported in bulk.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

Drug Enforcement Administration (DEA) (21 CFR 1310.02 (b) 8: List II chemical.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Sodium permanganate (CAS 10101-50-5) LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Sodium permanganate	10101-50-5	36 - 40
Potassium permanganate	7722-64-7	2

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Sodium permanganate (CAS 10101-50-5)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Sodium permanganate (CAS 10101-50-5) 6588

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Sodium permanganate (CAS 10101-50-5) 15 % wt

DEA Exempt Chemical Mixtures Code Number

Sodium permanganate (CAS 10101-50-5) 6588

Food and Drug Administration (FDA) Not regulated.

US state regulations

This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

Not regulated.

US. New Jersey Worker and Community Right-to-Know Act

Sodium permanganate (CAS 10101-50-5) 500 lbs

US. Pennsylvania RTK - Hazardous Substances

Not regulated.

US. Rhode Island RTK

Sodium permanganate (CAS 10101-50-5)

US. California Proposition 65**US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance**

Not listed.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 27-November-2013

Revision date -

Version # 01

NFPA Ratings**References**

HSDB® - Hazardous Substances Data Bank
 Registry of Toxic Effects of Chemical Substances (RTECS)
 EPA: AQUIRE database
 NLM: Hazardous Substances Data Base
 US. IARC Monographs on Occupational Exposures to Chemical Agents
 IARC Monographs. Overall Evaluation of Carcinogenicity
 National Toxicology Program (NTP) Report on Carcinogens
 ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices

Disclaimer

This safety data sheet was prepared in accordance with the Safety Data Sheet for Chemical Products (JIS Z 7250:2005). The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change and, therefore, holders and users should satisfy themselves that they are aware of all current data and regulations relevant to their particular use of product. CARUS CORPORATION DISCLAIMS ALL LIABILITY FOR RELIANCE ON THE COMPLETENESS OR ACCURACY OR THE INFORMATION INCLUDED HEREIN. CARUS CORPORATION MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR USE OR PURPOSE OF THE PRODUCT DESCRIBED HEREIN. All conditions relating to storage, handling, and use of the product are beyond the control of Carus Corporation, and shall be the sole responsibility of the holder or user of the product.

(Carus and design) is a registered service mark of Carus Corporation. RemOx® is a registered trademark of Carus Corporation. Copyright 1998.



The information contained herein is accurate to the best of our knowledge and should be used as a guideline. Material manufacturing methods and grades can vary and materials testing in our laboratory for compatibility may not apply across all product brands/grades. The responsibility for determining appropriateness for specific applications resides with the user.

METALS/CERAMICS

Aluminum Oxide Ceramic
Carbon Steel
Cast Iron
Ductile Iron
Stainless Steel
Tungsten Carbide

PLASTICS, SEALS, DIAPHRAGMS, ELASTOMERS

HDPE
Hypalon® chlorosulfonated polyethylene
Kynar® polyvinylidene fluoride (PVDF) resin
Noryl® resin
Polyethylene
Polypropylene
**PVC Schedule 80
Santoprene™
Silicone
Teflon®

**Carus uses Chemtrol/NIBCO PVC fittings and ball valves and IPEX PVC pipe exclusively. Other manufacturers are not recommended.

STORAGE TANKS

Recommended Material: HDPE
Specific Gravity: 1.9
Manufacturers:

Assmann	www.assmann-usa.com	(U.S. only)
Poly Processing	www.polyprocessing.com	(U.S. only)
Snyder Industries	www.snydernet.com	(U.S. only)
Rototec	www.rototec.it	(Europe only)
Roplast	www.roplast.it	(Europe only)

TRANSFER PUMPS

Recommended Material: Kynar, Polypropylene, Stainless Steel
Seals/O-Rings: Santoprene, Silicone, Teflon
Manufacturers:

March Pumps	www.marchpumps.com	(International)
Grundfos	www.grundfos.com	(International)
Ebara	www.pumpsebara.com	(International)

METERING PUMPS - SOLENOID DRIVEN

Wetted Material: PVC, Stainless Steel
Diaphragm: Teflon
Seals/O-Rings: Hypalon, PTFE, Santoprene, Silicone
Manufacturers:

Neptune	www.neptune1.com	(International)
Prominent	www.prominent.com	(International)
LMI	www.lmi-pumps.com	(U.S. only)

METERING PUMPS - HYDRAULIC DIAPHRAGM

Recommended Material: Stainless Steel
Diaphragm: Santoprene, Teflon
Seals/O-Rings: Hypalon, Santoprene, Silicone, Teflon
Manufacturers:

Yamada	www.yamadacorp.co.jp	(International)
Neptune	www.neptune1.com	(International)
PulsaFeeder	www.pulsa.com	(International)

VALVES - PIPING - FLOWMETERS

Recommended Material: Stainless Steel, PVC
Seals/O-Rings: Santoprene, Silicone, Teflon
Manufacturers:

NIBCO® Chemtrol®	www.nibco.com	(International)
GPI	www.gpi.net	(U.S. only)
+GF+ Signet	www.gfsignet.com	(International)
FIP	www.fipnet.it	(Europe only)

GENERAL PRECAUTIONS

Follow good piping practices and the manufacturer's directions on surface preparation and cure times for solvent welding (gluing) PVC. Minimize threaded connections when possible. Weld all joints or use flanges with silicone or Teflon gaskets.

ALWAYS use personal protective equipment (PPE) and refer to the SDS for more information.

INCOMPATIBLE MATERIALS

Buna N	Natural Rubber	Viton
Buna S	Neoprene	
CPVC	Nitrobutyl rubber	
EPDM	Nylon	



RemOx® L ISCO reagent has been specifically manufactured for environmental applications such as remediation of soils and associated groundwater. This product can be used to degrade a variety of contaminants including chlorinated solvents, polyaromatic hydrocarbons, phenolics, organo-pesticides, and substituted aromatics. RemOx L is shipped with a certificate of analysis to document assay, pH, and trace metals.

PRODUCT SPECIFICATIONS

Assay

39.5-41.0% as NaMnO_4

pH

5.0-8.0

Trace Metals

(see Table I)

CHEMICAL/PHYSICAL DATA

Formula	NaMnO_4
Formula Weight	141.93 g/mol
Appearance	Dark Purple Solution
Specific Gravity	1.365-1.385
Freezing Point	-15° C / 5° F

Solubility in Water Miscible with water in all proportions.

Material will pass through a 10 micron filter.

APPLICATIONS

RemOx L is used for soil and groundwater remediation by *in situ* or *ex situ* chemical oxidation and as an active agent in subsurface reactive barriers for treatment of: chlorinated ethenes, phenolic compounds, polyaromatic hydrocarbons, RDX, HMX, and various pesticides.

SHIPPING CONTAINERS

5 gallon pail (20 L) (UN Specification: UN3H1/Y1.8/100) Made of high-density polyethylene (HDPE), weighs 3.3 lbs. (1.5 kg). The net weight is 57 lbs. (25.9 kg). The pail stands approximately 14.8 inches (37.6 cm) tall, 10.6 inches (26.9 cm) wide, and 11.0 inches (27.9 cm) deep. (Domestic and international)

55 gallon drum (208 L) (UN Specification: UN1H1/Y 1.9/100) Made of high-density polyethylene (HDPE), weighs 22 lbs. (10 kg). The net weight is 550 lbs. (250 kg). The drum stands approximately 34.8 inches (88.3 cm) tall, has an outside diameter of 23.3 inches (59.2 cm). (Domestic and international)

SHIPPING CONTAINERS

275 gallon IBC (Intermediate Bulk Container) (1040 L) (UN Specification: UN31HA1/Y1.9/100) They are also marked "MX" for multi-trip. IBC weighs 123 lbs. (55.8 kg). The net weight is 3000 lbs. (1361 kg). The IBC contains 263 gallons (1000 L) of product. The IBC dimensions are 45.3 inches (114.9 cm) high, 47.3 in (120.0 cm) long, and 39.4 in (100.0cm) wide. The IBC has a 2 in (5 cm) butterfly valve with NPT threads in bottom sump. (Domestic and international)

Bulk Quantities up to 4000 gallons (15,142 L) are available. (Domestic only)

HANDLING, STORAGE, AND INCOMPATIBILITY

Like any strong oxidizer RemOx L should be handled with care. Protective equipment during handling should include face shields and/or goggles, rubber or plastic gloves, and rubber or plastic apron. If clothing becomes spotted, wash off immediately; spontaneous ignition can occur with cloth or paper. In cases where significant exposure exists use the appropriate NIOSH-MSHA dust or mist respirator.

Store in accordance with NFPA 30 requirements in the United States or the European Fire Protection Association in Europe for Class II oxidizers. Additional regulations in Europe are REACH (Regulation for Registration, Evaluation, Authorisation and Restriction of Chemicals), and CLP (Classification, Labeling, Packaging). REACH is a regulation that increases the responsibility of the industry to manage the risks that the chemical may pose. For REACH registration numbers refer to the eSDS. The product should be stored in a cool, dry area in closed containers. Concrete floors are preferred. Check local regulations to ensure proper storage. Avoid wooden decks. Spillage should be collected and disposed of properly. To clean up spills and leaks follow the steps recommended in our SDS or eSDS.

Avoid contact with acids, peroxides, and all combustible organic or readily oxidizable materials including inorganic oxidizable materials and metal powders. With hydrochloric acid, chlorine gas is liberated. RemOx L is not combustible, but will support combustion. It may decompose if exposed to intense heat. Fires may be controlled and extinguished by using large quantities of water. Refer to the SDS or eSDS for more information.



RemOx[®] L ISCO reagent is classified as an oxidizer for both domestic and international transportation.

Proper Shipping Name: Permanganates, inorganic, aqueous solution n.o.s. (contains sodium permanganate).

Hazard Class: Oxidizer, Class 5.1

Identification Number: UN 3214

Division/APR/RID Class: 5.1

Label Requirements: Oxidizer, 5.1

Packaging Group: II

Packaging Requirements: 49 CFR Parts 171 to 180

Sections: 173.152, 173.202, 173.242

Quantity Limitations:

1 liter net for passenger aircraft or railcar:

5 liters net for cargo aircraft.

Vessel Stowage, (IMDG Regulation):

D-material must be stowed "on-deck" on a cargo vessel, but is prohibited on a passenger vessel. Other provisions: stow separately from ammonium compounds, hydrogen peroxide, peroxides, super-oxides, cyanide compounds, and powdered metal.

H.S. Code 28.41.69.00

SHIPPING CONTAINERS

RemOx L is compatible with many metals and synthetic materials. Natural rubbers and fibers are often incompatible. Solution pH and temperature are also important factors. The material selected for use with liquid permanganate must be compatible with any kind of acid or alkali being used.

In neutral and alkaline solutions, RemOx L is not corrosive to carbon steel and 316 stainless steel. However, chloride corrosion of metals may be accelerated when an oxidant such as liquid permanganate is present in solution. Plastics such as Teflon, polypropylene, and HDPE are also compatible with liquid permanganate.

Aluminum, zinc, copper, lead, and alloys containing these metals may be (slightly) affected by RemOx L. Actual corrosion or compatibility studies should be made under the conditions in which RemOx L will be used.

Table I: Typical Trace Metal Content and Specifications

Element	Typical Analysis (mg/kg)	Specifications (mg/kg)	DL* (mg/kg)	Element	Typical Analysis (mg/kg)	Specifications (mg/kg)	DL* (mg/kg)
Ag	BDL	0.15	0.034	Fe	BDL	2.00	0.053
Al	BDL	2.00	0.24	Hg	BDL	0.03	0.003
As	BDL	4.00	0.006	Ni	BDL	0.1	0.03
Ba	2.96	15.00	0.016	Pb	BDL	0.70	0.16
Be	BDL	0.50	0.08	Sb	BDL	0.70	0.16
Cd	BDL	0.10	0.016	Se	0.204	0.50	0.0003
Cr	3.2	5.00	0.031	Tl	BDL	3.50	0.80
Cu	BDL	0.10	0.022	Zn	BDL	0.40	0.011

DL* is detection limit

BDL is below detection limit





APPENDIX 5

AMS Work Plan for RAOC #2



Austin Master Services, LLC

RADIATION PROTECTION PLAN – Former Wollensack Optical Radiological Decontamination and Waste Disposal Project

August 22, 2019

Prepared by:
Peter Collopy, ^{PC}CHP, CIH,
CSP
Radiation Safety Officer
Austin Master Services, LLC

Introduction and Purpose

This plan provides the radiological protection requirements for personnel and activities associated with the remediation and waste packaging/transport of thorium/radium contaminated materials at the Former Wollensack Optical facility in Rochester, NY. This Radiation Protection Plan (RPP) design is based upon the following:

- Characterization data¹ gathered by AMS during initial investigation of the facility in April/May of 2019.
- Austin Master Services (AMS) New York State (NYS) Radioactive Materials License (RML) C5738 requirements

AMS, while working under its NYS RML, follows the implementing requirements of the RML specifications as well as the associated procedures submitted as part of the original RML application. Portions of those procedural requirements are altered for this project due to requirements imposed upon the project by NYSDEC and NYSDOH. Where deviations from license requirements occur, those deviations will be footnoted or otherwise annotated in this document. In all cases the deviations from current AMS procedural requirements are more restrictive.

Background

In May of 2019 AMS was contracted to perform a radiological scoping survey of the former Wollensack Optical facility located at 886 Hudson Avenue in Rochester, NY. AMS under their New York State Department of Health (NYSDOH). The purpose of the survey was to support New York State Department of Environmental Conservation Brownfield Clean-up program at Site C828209, otherwise known as former Wollensack Optical.

External land and internal building surface surveys were performed as described in reference 1 noted below in the footnotes. The survey results indicated no external ground contamination. Most of the internal surface indicated no contamination levels distinguishable from background. However, a basement sump and a small, 3'x3') third floor area had detectable levels of contamination distinguishable from background.

The client, Jefferson Wollensack, LLC, in consultation with their environmental services consultant, LaBella Associates and the New York State Department of Environmental Conservation (NYSDEC) have agreed that re-use of the building requires removal of the remaining contaminants and decontamination of those area surfaces.

¹ July 11, 2019 *Wollensack Optical Scoping Survey Report* to J. Gillen (LaBella Associates) from P. Collopy (AMS)

Scope of Work

AMS's role in this project is to perform the radiological decontamination/remediation of the two impacted areas within the Wollensack Optical building and then package and transport the waste materials for disposal at a permitted/licensed non-New York State facility. This work also requires a survey of the decontaminated surfaces to verify that the residual surface contamination is below the limits in Appendix A, Table 7 of New York State Code Rule (NYSCR) 16. Activities governed by New York State Department of Environmental Conservation (NYSDEC) policies and regulations are incorporated by reference in this RPP.

AMS's specific scope of work for this project includes:

- Mobilization to site and equipment set-up.
- Decontamination of the contaminated third floor area and the basement sump
- Providing the appropriate Personal Protective Equipment (PPE) for work involving contact with elevated (i.e. non-background) levels of radioactivity.
- Establishing engineering controls to limit the spread of any removable or airborne contaminants
- Final Status survey of the remediated floor and sump surfaces to verify the RPP contamination goals have been met.
- Survey of the accessible portions of the sump drains, if they exist.
- Radiological safety briefing of ancillary workers to ensure non-AMS personal do not enter an active remediation area
- Packaging the waste materials for shipment to an out of state waste disposal facility
- Completing Non-Hazardous Waste Manifests for transporting the thorium contaminated waste materials to the appropriate facilities.
- Providing radiological monitoring and transportation/disposal documentation to the client.

Note: AMS's scope of work does not include decontamination or further surveys of non-accessible portions of the sump or other building drain lines.

Training and Qualifications

AMS Project Personnel

1. The following complement is the expected number and type of personnel assigned to the project.
 - a. A Site Supervisor responsible for managing the project, directing AMS personnel in their work activities and serving as the AMS project liaison with any non-AMS contractor personnel on site.
 - b. Two Health Physics/Decontamination Technicians responsible for performing surface decontamination, waste packaging and radiological monitoring.

- c. A Site Radiation Safety Officer (SRSO) will be assigned as the AMS individual designated to determine radiological surveys and protective controls required for project operations.
 - The SRSO must meet the training and experience requirements in AMS RML procedures. In this case the SRSO will require a minimum of five years' experience supervising radiation protection programs where radium, uranium, or thorium and their associated progeny are the principal contaminants.
 - The AMS Project Supervisor can also serve as the SRSO provided he/she has the requisite radiological safety experience and training
2. AMS personnel assigned to the project will have received, as a minimum, basic radiological safety awareness training that meets the requirements of the AMS RML.
3. Personnel performing dose rate, gross gamma count rate or surface contamination measurements will either have one year's experience performing measurements where the radionuclides and nature/level of contaminants are similar to those of the project Site or will be under the direct supervision of an individual who has greater than five years of such experience.
4. Personnel performing waste packaging or shipping functions must meet the training requirements in 49CFR172, Subpart H.

Subcontractors and Observers/Visitors

1. Personnel not actively involved in performing decontamination, survey or waste packaging/transport tasks will be considered visitors and need only receive a short radiological safety brief concerning the relative hazards and the precautions they must take to avoid entering an active decontamination area or areas where packaged waste materials are stored awaiting transport.

Task Specific Safety and Radiological Requirements

Occupational Safety

The overall Project Health and Safety Plan (HASP) safety requirements will be adhered to throughout all AMS on-site operations.

Radiological Safety

1. Work Controls
 - a. All work will require use of a Radiation Work Permit in accordance with RPP-AMS-031 *Radiation Work Permits*.
 - b. The SRSO will review all RWPs prior to issue and each worker involved in the task will be briefed on the RWP requirements and requested to sign off acknowledgement of the radiological work control requirements.
2. Engineering and Contamination Controls
 - a. Initially before invasive decontamination techniques a HEPA vacuum or wet wiping will be used clean the surfaces.
 - b. It is expected that the contaminated surfaces that are not successfully remediated using a HEPA Vac or wet wipes will either be decontaminated using a pressure washer or a grinder.

- All areas to be decontaminated will be “tented” such that resuspended material will be caught within the tent and not spread from the decontamination areas.
 - Slits or holes in the tents will be made to allow for the decontamination tech to clean the contaminated surface without entering the tent in full.
 - If grinders are used, then vacuum systems connected to a HEPA filter will be used; in this case the SRSO may elect to not use a tent.
- c. An exit/frisking area will be established adjacent to the decontamination area where workers will change out of their PPE and perform a personal body/clothing scan to verify their clothing and skin have no detectable contamination.
3. Personnel Monitoring
- a. The dose rates and total dose from exposure to radiation and radioactive materials is expected to be less than 1 milli-Sievert (100 mrem) and as a consequence no external monitoring device such as Thermoluminescent dosimeters (TLDs) will be issued.
 - Dose rates, however, will be recorded and can be used for a retrospective dose assessment if needed.
 - b. Air sampling of work areas where radiological materials are expected to be re-suspended will be performed to assess potential worker intakes.
4. Surface Contamination Monitoring for Releasing Site Materials and Personnel
- CAUTION: THIS SECTION IS A DEVIATION FROM AMS PROCEDURES WHICH USE NYSDOH APPENDIX A SURFACE CONTAMINATION VALUES FOR RELEASE OF PERSONNEL AND EQUIPMENT FROM RADIOLOGICALLY CONTROLLED PROJECT AREAS. IT IS NYSDEC POLICY THAT NO CONTAMINATION DISTINGUISHABLE FROM BACKGROUND WOULD BE ALLOWED TO BE RELEASED FROM THE SITE.**
- a. Surface contamination surveys will be performed with a Ludlum 2360 connected to a 43-93 alpha-beta detector; instrumentation with equivalent or better detection capabilities may be substituted.
 - b. Both beta and alpha emissions will be monitored but emphasis is on detection of alpha emissions at rates greater than natural background count rates.
 - c. Detection limits will be established such that the instrument is capable of detecting at levels no greater than 500 dpm/100 cm².
- Note:** Normally AMS uses ANSI 13.12 limits but the NYSDOH Appendix A, Table 7 limits for personnel clothing and skin limits are more restrictive so the most restrictive value will be used for this project.
- d. Attachment 1 to this RPP shows the calculations (using MARSSIM² calculation guidance) for the expected minimum detection rates when scanning a surface. A minimum alpha scan detection of 275 dpm/100 cm² and a minimum alpha scalar count detection level of 45 dpm/100 cm² is expected to be achieved for most situations.

² NUREG-1575, Multi-Agency Radiation Survey and Site Investigation Manual (Rev. 1 August 2000)

- e. Personnel and health physics technicians will be provided training that requires them to listen for audible detector signals and where two beeps or more of alpha emissions are detected within a one second period the worker or technician will be required to slow down the rate of scan and attempt to determine if the increased count rates are sustained and not a normal background variation. In those cases where two or more counts per second are sustained the monitor will be placed in scalar mode and a two-minute count initiated over the suspect area. If the scalar count indicates contamination levels greater than minimum detection levels then the suspect area will be considered contaminated and steps taken to remove the contamination prior to release from site.
 - f. All personnel and their clothing will be scanned prior to exiting a work area where intrusive disturbance of contaminants occur.
 - g. Equipment surfaces that have come in contact with potentially contaminated materials will be surveyed prior to release from site.
5. Final Status Surface Contamination Monitoring and Accessible Drain Outlet Monitoring
- a. All remediated surfaces will be directly scanned with a Ludlum 43-93 or detector with equivalent detection capability.
 - b. Where two or more audible beeps are noted within a one second period the surveyor will halt and attempt to locate any area where the activity appears greater than the background count rate.
 - c. If a sustained greater than background count rate is detected, then that area will have both a one-minute direct alpha count taken but also a 100 cm² surface wipe taken.
 - d. If not greater than background activity is taken then at least one, one-minute scalar count and one surface wipe will be taken for every one square meter of surface area.

Waste Packing and Transport

1. Waste Packaging

- a. It is expected that none of the waste materials will require special DOT packaging and only strong-tight packages as defined by 49CFR will be needed.
- b. Waste materials will be placed in drums or boxes, the box/drum opening secured, and the drum/box labeled as the contents including a radioactive material sticker or sign on the package.
- c. All waste containers will be stored in the same area until shipment and the area shall be barricaded such that anyone attempting to enter the area will see a sign noting it is a radioactive waste storage area and only personnel authorized by the AMS SRSO may enter.

2. Waste Shipping

- a. Waste will be shipped in accordance with 49CFR 172 and 173 requirements.
- b. Surveys will be performed, even if the waste is determined to be non-DOT hazardous, in accordance with 49CFR173 Subpart H requirements.
- c. AMS will track the shipment until receipt of final burial at the disposal site is received
- d. The perimeter area one foot out from the decontamination area will also be surveyed, as noted above, to ensure no resuspended contamination has spread to a previously "clean" area.
- e. In addition to meet the Appendix A, Table 7 total beta/gamma release criteria a direct (at contact) survey with a Ludlum 19 uR meter or detector with equivalent detection capability will be used to scan the surface and verify no exposure rates greater than 0.02 mS/h (0.2 mR/h)V are present.

3. Dose/Exposure Rate Surveys
 - a. Work area exposure rates will be established prior to task work and workers informed as to the areas with the highest and lowest rates.
 - b. Accumulated waste materials and their storage area will be surveyed daily and barriers erected to ensure no one can enter an area with an exposure rate greater than .2 mSv/h (2mR/h)
4. Transport Vehicle Surveys
 - a. Each loaded truck will be scanned using a Ludlum Model 19 micro-R meter or meter with equivalent exposure rate detection capabilities.
 - b. The surfaces of the truck conveyance will have removable contamination surveys performed and results will be compared with DOT limits prior to release of the truck for transport to an out of state disposal facility.
5. Source Control
 - a. AMS possesses exempt check and calibration sources; when sources are not under direct control of AMS personnel will be secured in a locked container or room
6. Instrumentation
 - a. The instrument operation and calibration procedures that are part of AMS's RML will be used for this project.
 - b. All instruments will be calibrated annually, at a minimum, and will be functionally checked daily prior to use.
 - c. The procedures and calibration/functional check logs will be maintained in hard copy form at the Site and available for review by regulatory authorities upon request.
7. Personal Protection Equipment (PPE)
 - a. It is expected that PPE will consist of disposable outer coveralls, gloves and booties.
 - b. The SRSO may modify the PPE via the RWP where radiological conditions warrant either greater or lesser protection.
 - c. PPE for occupational safety purposes will be worn in accordance with the HASP. An example is the use of hearing protection if a pressure washer or grinders are used.
8. Records
 - a. Records of surveys will be maintained for the duration of the project at the Site.
 - b. Records will be available for review by regulatory authorities upon request.
 - c. A report detailing the decontamination and waste disposal activities will be provided to the client and will include the following:
 - Final status survey results
 - waste disposal information such as manifests, weigh tickets, waste profile acceptance, certificate of disposal, etc.
 - d. Upon completion of project, copies of the records will be provided to LaBella and the originals will be transferred to the AMS main office in Pottstown, PA until deemed appropriate for disposal by the AMS RSO.

Attachments to Radiation Protection Plan

Attachment 1 – Instrument Detection Limit Calculations

Attachment 2 - AMS NYS RML

Attachment 1
Scanning and Static MDA Calculations

Scanning MDA Calculations

All equations/calculations based on the guidance in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM, NUREG 1575, Rev 1). The Navy Radiological support group guidance recommends (see attached) alpha detection at probabilities of no less than 68%.

Beta Scan MDA Calculations

Variable	Symbol	Surface	
		Concrete/Cloth/ Wood	Steel
Residence Time or Count Interval (s)	t	4.5	4.5
Background Count Rate (cpm)	B	250	250
Performance Factor (see table 6.5 of MARSSIM)	d_i	1.38	1.38
Background Counts in Count Interval	b_i	0.9	0.9
Minimum Detectable Number of Net Source Counts	s_i	1	1
Minimum Detectable Count Rate (cpm)	MDCR	27	27
Surveyor Efficiency	p	0.5	0.5
Detector Efficiency (%)	e_i	8.00%	8.00%
Surface Efficiency	e_s	0.54	0.8
Area of Probe (cm ²)	A	100	100
Minimum Detectable Scan Activity (dpm/100 cm ²)	MDA	869	587

Alpha Scan MDA Calculations

Variable	Symbol	Surface	
		Concrete/Cloth/ Wood/Skin	Steel
Contamination Level (dpm)	G	275	140
Detector Efficiency (%)	e_i	22.00%	22.00%
Surface Efficiency	e_s	25.00%	50.00%
Background Count Rate (cpm)	B	0.2	0.2
Residence Time (s) - d/v	t	4.5	4.5
Width of Detector (cm)	d	9	9
Scan Speed (cm/s)	v	2	2
Probability of detecting more than 1 count	P ($n \geq 1$)	68%	68%

Static MDA Calculations for Ludlum 43-93

Instrument	Probe	Application	Probe Area (cm ²)	Detector Efficiency	Background Count Rate (cpm)	Background Count Time (min)	Sample Count Time (min)	Filter or Surface Factor	MDA Static (dpm/100 cm ²)	DL Static (dpm/100 cm ²)
Ludlum 2360	43-93	Total alpha	100	0.22	0.2	10	2	0.25	45	35
Ludlum 2360	43-93	Total beta	100	0.08	250	10	2	0.54	964	498



RASO GUIDANCE DOCUMENT

Conducting Alpha Scans for Radium

17 Dec 2013

Provided is guidance to be utilized in development of procedures for conducting alpha scan surveys for radium-226 at Navy sites. The purpose of performing alpha scans is to locate areas with elevated activities or hot spots that may require further investigation or action. Final release decisions will be based on evaluation of the static and bias sample locations as they compare with the reference area.

This guidance assumes the reader is very familiar with the following reference documents from which this guidance is established.

- Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM, NUREG 1575, Rev 1)
- A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys (NUREG 1505, Rev 1)
- Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions (NUREG 1507)
- Evaluation of Surface Contamination - Part 1 Beta Emitters (greater than 0.15 MeV) and Alpha Emitters (ISO 7503-1)
- Decommissioning Health Physics (Abelquist 2001)

Typically, for alpha scanning Equation 1 is not practical to determine an alpha scan MDC.

$$\sqrt{\bar{p}} \quad \text{Equation 1}$$

Instead, when scanning for alpha contamination, Equations 2 and 3 are used to determine the probability of detecting an area of contamination at a predetermined activity, for a given scan rate or resident time, and certain amount of background activity.

$$P(n \geq 1) \quad \text{Equation 2}$$

$$P(n \geq 2) = \left(1 - \frac{(G + B)t}{2\pi}\right) \left(e^{-\frac{(G + B)t}{2\pi}}\right) \quad \text{Equation 3}$$

Where:

P	Probability of detecting a count (n)	
B	background count rate	cpm
G	hot spot activity	dpm
e _i	detector efficiency	2 π
e _s	surface efficiency	0.25
d	width of detector	cm
v	scan speed	cm s ⁻¹
t	resident time (d/v)	s



RASO GUIDANCE DOCUMENT

Conducting Alpha Scans for Radium

17 Dec 2013

Using Equations 2 or 3, a probability of detection should be as close as practicable to 90%, but shall not be lower than 68%. Equation 3 is more practical to use when the background activity is greater than 5 cpm. The hot spot activity (G) will be derived from Table 1 of Regulatory Guide 1.86. Use the “average” surface activity level of 100 dpm as a starting point, not to exceed the “maximum” activity level of 300 dpm. There will be a trade-off for using a surface activity level of greater than 100 dpm, which will be discussed below. Next, select a scan speed (v) that will provide the best probability to detect. Obviously slower scan speed can provide greater resident times and improve the detection probability, but there are limits to how slowly an individual can scan. “Human factors suggest that, if a hot spot was not detected during 5 or 6 s of scanning over an elevated area, another several seconds added to the observation interval does not improve the scan sensitivity (Abelquist 2001).” Therefore, use the best probability equation and the most practical surface activity level to optimize a reasonable scan speed or resident time.

Regarding the detector efficiency in Equations 2 and 3, the detector selection can positively improve the detector’s efficiency. But, the detector efficiency cannot be improved by taking advantage of the additional alpha radiations from the Ra-226 progeny, unless there is proof the progeny exist. The surface efficiency in Equations 2 and 3, will be 0.25.

During alpha scanning if the surveyor determines there is a detection that warrants the individual to stop and verify the detection, the surveyor will pause over the location for the resident time (d/v) that was used in Equation 2 or 3. If the detection event(s) is confirmed, the surveyor can take a bias static measurement to confirm the activity level is below the 100 dpm/100 cm², or mark the location and return later to investigate.

If a surface activity level of greater than 100 dpm is used to calculate the alpha scan “probability to detect,” in Equations 2 and 3, then the number (density) of systematic samples will also be increased. The magnitude of the increase will be based on the ratio of the “average” surface activity level of 100 dpm and the surface activity level use, not to exceed the maximum of 300 dpm. For example, if surface activity used during the alpha scan was 200, the ratio would be $200/100 = 2$. Thus, the number of systematic samples initially determine for the survey unit would be doubled.

When analyzing the alpha scan data, use RESRAD-BUILD to calculate the maximum potential dose from the survey unit based on the largest unsampled area between systematic sample points with the maximum allowable source activity averaged over that area. In addition, calculate the actual risk and dose for the entire survey unit based on the mean of the systematic readings to be utilized as the final risk/dose reported for the survey unit.

Attachment 2
AMS NYS RML



NEW YORK STATE DEPARTMENT OF HEALTH

RADIOACTIVE MATERIALS LICENSE

Pursuant to the Public Health Law, Part 16 of the New York State Sanitary Code, Industrial Code Rule 38, and in reliance on statements and representations heretofore made by the licensee designated below, a license is hereby issued authorizing radioactive material(s) for the purpose(s), and at the place(s) designated below. The license is subject to all applicable rules, regulations, and orders now or hereafter in effect of all appropriate regulatory agencies and to any conditions specified below.

1. NAME OF LICENSEE FEIN 27-3265991 Austin Master Services, LLC Phone (518) 859-1944	3. LICENSE NUMBER C5738
2. ADDRESS OF LICENSEE 355 Circle of Progress Drive Pottstown, PA 19464	4. EXPIRATION DATE April 7, 2026 5a. REFERENCE b. AMENDMENT NO. DH 15-800 --

- | | | |
|--|---|--|
| 6. Radioactive Materials (elements in mass number)

A. Any radioactive material subject to licensing under Part 16 of the New York State Sanitary Code or Article 175 of the New York City Health Code | 7. Chemical and/or physical form

A. Any, as potentially contaminated materials | 8. Maximum quantity licensee may possess at any one time

A. Any, as found at client sites |
|--|---|--|

9. Authorized use.

Condition 6.A.:

Possession incident to performing site characterization, decontamination, decommissioning and final status surveys at temporary jobsites anywhere within the State of New York, where the Department of Health exercises jurisdiction for regulating the use of radioactive material.

10. A. Licensed material shall be used by, or under the onsite supervision of, the following individuals:

John Bement
Peter Collopy
Pat Horkman

Troy Mazur
Melissa Smalley



NEW YORK STATE DEPARTMENT OF HEALTH
RADIOACTIVE MATERIALS LICENSE

3. License Number C5738

5a. Reference DH 15-800

10. B. Radioactive material listed in Item 6 shall be used by Peter Collopy, as appropriate to fulfill the responsibilities of the Radiation Safety Officer.
11. Except as specifically provided otherwise in this License, the licensee shall conduct its program in accordance with the statements, representation and procedures contained in the documents, including any enclosures, listed below. The Department's Regulations shall govern, unless the statements, representation and procedures in the licensee's application and correspondence are more restrictive than the Regulations.
- A. License No. 03219-070000 issued by Ohio Department of Health, expiration dated February 1, 2019.
- B. Application dated November 18, 2015, signed by John Bement, with attachments.
- C. Letter dated February 22, 2016, signed by John Bement.
12. Materials authorized in Condition 6.A. shall only be used at client sites within New York State where the New York State Department of Health or the New York City Department of Health and Mental Hygiene exercises jurisdiction for regulating the use of radioactive material. Possession of authorized material at a client site shall be limited to material originating from the site.
13. A. The licensee shall provide written notification to the Department at least seven (7) days prior to engaging in activities at temporary jobsites anywhere within the State of New York. The notification shall include the following information:
- i) site specific radiological procedures if they have not been previously approved by the Department;
 - ii) estimated type, quantity, and physical/chemical forms of radioactive material;
 - iii) address and physical location of the decontamination or remediation activity;
 - iv) description of project activities that are planned for the site, including management and disposition of radioactive material;
 - v) estimated project start date and duration of project;
 - vi) name, address, title and phone number or a point of contact for the person managing radiological operations at the temporary jobsite; and
 - vii) copy of agreement required under Condition 14.
- B. The licensee shall provide written notification to the Department within 7 days after completion of activities at each jobsite.



NEW YORK STATE DEPARTMENT OF HEALTH
RADIOACTIVE MATERIALS LICENSE

3. License Number C5738

5a. Reference DH 15-800

14. A written agreement must be established between the licensee and the customer if the customer also holds a license issued by the Department or the New York City Department of Health and Mental Hygiene. The agreement must specify which licensed activities shall be performed under the customer's license and supervision, and which licensed activities shall be performed under the licensee's supervision. A copy of this agreement shall be included in the notification required under Condition 13.
15. A. Personnel who handle radioactive materials shall have at least 40 hours of on-the-job training in the use of radioactive materials under the direct supervision of an authorized user.
- B. All personnel who perform work under the license will be instructed in applicable regulations, license conditions, and the licensee's operating and emergency procedures, and other information contained in documents incorporated in Condition No. 11.
- C. Records of training received pursuant to paragraphs A and B of this Condition shall be maintained for a period of three (3) years and shall include:
- i) the name of the individual who conducted the training;
 - ii) the name of the individual who received the training;
 - iii) the dates and duration of the training; and
 - iv) a list of topics covered.
16. The licensee shall have available appropriate survey meters which shall be maintained operational and shall be calibrated before initial use and at subsequent intervals not exceeding twelve months by a person specifically authorized by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services. Records of all calibrations shall be kept a minimum of three years.
17. Pursuant to 10 NYCRR 16.26 (c) (4), the licensee shall notify the Department in writing at least thirty (30) days prior to the use of respiratory protection equipment for restricting internal exposure to radioactive materials.

FOR THE NEW YORK STATE DEPARTMENT OF HEALTH

Date: **APR 07 2016**

DJS/DCG:ks

By Daniel J. Samson
Daniel J. Samson, CHP, Chief
Radioactive Materials Section
Bureau of Environmental Radiation Protection



Wollensack Optical Remediation Project HASP Rev. 0

Project Site Location: 886 Hudson Avenue, Rochester, New York (see map in Attachment 1)

Proposed Date(s) of Work: 7/29/2019 to 9/30/2019

SHSO/SRSO: J. Bement

Project Manager/Supervisor: Jack Bement

Prepared and Approved¹ by: Peter Collopy, CSP, CIH, CHP *PC*

Date: 8/22/2019

AMS Scope of Work: Austin Master Services, LLC (AMS) has been contracted to perform remediation and waste disposal work at the former Wollensack Optical facility in Rochester, NY.

This HASP covers hazards and controls that are associated with decontamination and waste packaging/loading tasks. The AMS New York State Department of Health (NYSDOH) Radioactive Materials License (RML) #C5738 and associated Radiological Procedures and Plans provide the controls and requirements for radiological aspects of this work and are included in a separate document titled *Radiation Protection Plan for the Former Wollensack Optical Radiological Decontamination and Waste Disposal Project*.

Project/Site Description: The project area is within a five story, concrete building located at 886 Hudson Avenue. The building is being restructured/reconfigured as part of the New York State Department of Environmental Conservation (NYSDEC) Brownfield’s cleanup program; within the program this facility is noted as Site C828209.

Previous radiological scoping surveys have identified two areas has containing surface contamination that is greater than natural background levels. These are a small, 3’x 3’ third floor area and the basement sump. The project scope for AMS is to remove the contamination from the third floor contaminated area and sump surfaces, survey to ensure the surfaces meet New York State release criteria, survey the accessible portion of the drain outlet in the sump, package any radioactive waste materials accumulated during the decontamination process and ship the waste for disposal at an out of state facility.

Project Tasks²:

Task Description
Site Mobilization
Initial Surface Cleaning using Wet Wipes and HEPA vacuum
Survey to determine remaining contaminated surfaces
Pressure washing/Grinding to remove contaminants
Final Status Survey
Waste Packaging
Waste Loading and Shipping

AHAs for general site safety, radiological decontamination and waste loading are shown in attachments 4,5 and 6, respectively. An index listing all of AMS’s EHS procedures is shown in Attachment 7 and it will be those procedures that are used for controlling various safety hazards for the project.

¹ Approval also serves as certification of a Hazard Assessment as required by 29 CFR 1910.132

² Note AHA and/or Work Procedure to be used when performing tasks

Required Training and Medical Surveillance (add additional training topics, as required):

Type	Required	Remarks
Medical Surveillance	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Respirator Physical	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Respirators may not be used but if they are assigned by the SRSO then users must meet AMS procedural and OSHA requirements
Respirator Fit Test	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
8-Hour Supervisor ³	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
8-Hour Refresher	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
First Aid/CPR ⁴	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	One person per crew must have current first aid training
Hazard Communication	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	AMS will have no chemicals on site for their use in project. However, if other contractors bring on chemicals and AMS employees may be exposed then SRSO will obtain SDS and review with AMS employees.
AMS Rad Worker Awareness Training	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	AMS personnel are specifically trained and qualified in radiological safety and as such do not require the training. However, the AMS SRSO will conduct a safety briefing for other site workers who have the potential for entering any of the decontamination areas.

Known or Suspected Contaminants (include PELs/TLVs):

Contaminants of Concern (COC)	Maximum Concentrations			PEL/TLV
	Soil (mg/kg)	Water/Groundwater (µg/l)	Interior Concrete Surfaces	
Thorium-232	N/A	N/A	100-3000 dpm/100 cm ² alpha	1E-12 uCi/cc DAC

Monitoring Action Levels:

Contaminant	Meter Type	Reading (specify units)	Action
Radiation-Exposure Rate	Ludlum 19 uR or equivalent	> 2 mrem/hr	Review work task to determine ALARA actions
Airborne (specify contaminant)	SKC AirChek or RAS-1 or equivalent	> 2.5E-13 uCi/cc (25% of thorium 232 (Class Y DAC))	Stop work and review dust control measures – assess previous radiological air sample data to determine if DACs may be exceeded.
Removable alpha contamination	Ludlum Model 3 w/43-89 or equivalent	Indistinguishable from Background	Temporarily stop work, determine what work practice changes needed
Total Alpha contamination	Ludlum Model 3 w/43-89 or equivalent	Indistinguishable from Background	Temporarily stop work, determine what work practice changes needed

³ Required for Project Supervisor/Manager and Site Health and Safety Officer if HAZWOPER Site

⁴ At least one worker must be trained in First Aid/CPR and have received Bloodborne Pathogen Training

HAZARD IDENTIFICATION SUMMARY

Standard Hazards						
<input type="checkbox"/> Falling Objects	<input checked="" type="checkbox"/> Slips and trips	<input checked="" type="checkbox"/> Pinch points	<input checked="" type="checkbox"/> Rotating equipment			
<input type="checkbox"/> Falls	<input checked="" type="checkbox"/> Power equipment/tools	<input type="checkbox"/> Elevated work surfaces	<input type="checkbox"/> _____			
Eye Hazards						
<input checked="" type="checkbox"/> Particulates	<input checked="" type="checkbox"/> Liquid splashes	<input type="checkbox"/> Welding Arc	<input type="checkbox"/> _____			
Hearing Hazards						
<input type="checkbox"/> None	<input type="checkbox"/> Impact noise	<input checked="" type="checkbox"/> High frequency noise	<input type="checkbox"/> High ambient noise			
Respiratory Hazards						
<input type="checkbox"/> None	<input checked="" type="checkbox"/> Dust/aerosols/particulates	<input type="checkbox"/> Organic Vapors	<input type="checkbox"/> Acid Gases	<input type="checkbox"/> O ₂ deficient	<input type="checkbox"/> Metals	<input type="checkbox"/> Asbestos
Chemical Hazards						
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Organic solvents	<input type="checkbox"/> Reactive metals	<input type="checkbox"/> PCBs			
<input type="checkbox"/> Acids / bases	<input type="checkbox"/> Oxidizers	<input type="checkbox"/> Volatiles/Semi-volatiles	<input type="checkbox"/> _____			
Environmental Hazards						
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Cold Stress	<input type="checkbox"/> Heat Stress	<input type="checkbox"/> Wet location	<input type="checkbox"/> Biohazards (snakes, insects, spiders, poisonous plants, etc.)		
<input type="checkbox"/> Explosive vapors	<input type="checkbox"/> Confined space	<input type="checkbox"/> Engulfment Hazard	<input type="checkbox"/> _____			
Electrical Hazards						
<input type="checkbox"/> None	<input checked="" type="checkbox"/> Energized equipment or circuits	<input type="checkbox"/> Overhead utilities	<input type="checkbox"/> Underground utilities	<input checked="" type="checkbox"/> Wet location		
Fire Hazards						
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Cutting, welding, or grinding generated sparks or heat sources	<input type="checkbox"/> Flammable materials present	<input type="checkbox"/> Oxygen enriched location			
Ergonomic Hazards						
<input checked="" type="checkbox"/> Lifting	<input checked="" type="checkbox"/> Bending	<input type="checkbox"/> Twisting	<input type="checkbox"/> Pulling/tugging	<input type="checkbox"/> Repetitive motion	<input checked="" type="checkbox"/> Carrying	
Computer Use in the:		<input type="checkbox"/> Office	<input type="checkbox"/> Field	<input type="checkbox"/> _____	<input type="checkbox"/> _____	
Radiological Hazards						
<input type="checkbox"/> None	<input checked="" type="checkbox"/> Alpha	<input checked="" type="checkbox"/> Beta	<input checked="" type="checkbox"/> Gamma/X-rays	<input type="checkbox"/> Neutron	<input type="checkbox"/> Radon	<input type="checkbox"/> Non-Ionizing
Other Hazards						
<input checked="" type="checkbox"/> Contact with moving construction equipment during waste loading						
<input checked="" type="checkbox"/> Potential contact injury from pressure washer due to high pressure spray						
<input type="checkbox"/>						

Personal Protective Equipment (PPE)

Initial PPE for all non-decontamination tasks will be standard Level D clothing including hard-hat, hearing protection, high visibility vest, ANSI approved Safety Shoes. For decontamination work the SRSO will assign disposable coveralls, booties and gloves to prevent skin contamination. If spray by water is likely face shields including protective eyewear underneath will be worn.

At present there is no plan for use of respiratory protection but if decontamination is performed where the decontamination technician must enter inside the "tented" enclosure than a half face air purifying respirator should be worn during activities resuspending surface contaminants.

Work Zones:

The SRSO will determine the work zone boundaries and where exit radiological surveys of equipment and personnel will be performed.

Site Communication:

Note: At least two person teams while deconning or packaging/loading waste. Visual contact between team members at all times.

- Verbal
 - Two-way radio
 - Cellular telephone
 - Hand signals
- | | | |
|---|-------|----------------------------------|
| Hand gripping throat | _____ | Out of air, can't breathe |
| Grip partner's wrist or both hands around waist | _____ | Leave area immediately |
| Hands on top of head | _____ | Need assistance |
| Thumbs up | _____ | OK, I am all right, I understand |
| Thumbs down | _____ | No, negative |
- Horn
 - Siren
 - Other:

Daily Radiological Safety Briefings:

The AMS SRSO (also the assigned SSHO) will provide an update on radiological conditions, PPE needs, radiological safety controls needed for the that day's work. Personnel will sign-off that they have received and understood the daily safety briefing. An example safety briefing sign-off sheet is shown in Attachment 2 to this HASP.

Emergency Response

See Attachment 3.

Decontamination Procedures and Equipment:

Level D Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Boots, and Gloves Wash and Rinse (if worn)	Scrub outer boots, and outer gloves decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal (if worn)	Remove outer boots and gloves. Deposit in plastic bag.
Station 4: Inner glove removal	Remove inner gloves and place in plastic bag.
Station 5: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Modified Level D and Level C PPE Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Canister or Mask (Level C only) Change	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	Boots, chemical resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6: Face Piece Removal (Level C only)	Facepiece is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet.
Station 7 – Field Wash	Hands and face are thoroughly washed. Shower as soon as possible

Attachment 1
Site Location



0 25 50 75 100
Feet

1 inch = 75 feet

INTENDED TO PRINT AS: 11" X 17"

PROJECT:
REMEDIAL INVESTIGATION
WORK PLAN

FORMER WOLLENSACK OPTICAL
NYSDEC BCP C828209
872 & 886 HUDSON AVENUE
ROCHESTER, NEW YORK

DRAWING NAME:

SITE FEATURES

PROJECT #/DRAWING #/ DATE

2182207

FIGURE 2

Legend

- BCP Site Parcels
- Basement (Approx.)
- Sump (Approx.)
- Tank Vault (Approx.)
- Current & Former Site Buildings

NOTES:

- 1) Property boundaries obtained from Monroe County GIS and are considered approximate.
- 2) April 2018 aerial image obtained from Pictometry International, Inc. and may not represent current conditions.
- 3) Former Site buildings georeferenced from Sanborn Fire Insurance Mapping. Locations are approximate.

Attachment 2
Daily Safety Briefing Sign-Off Sheet

Attachment 3
Project Emergency Response Contacts and Hospital Map

EMERGENCY CONTACTS

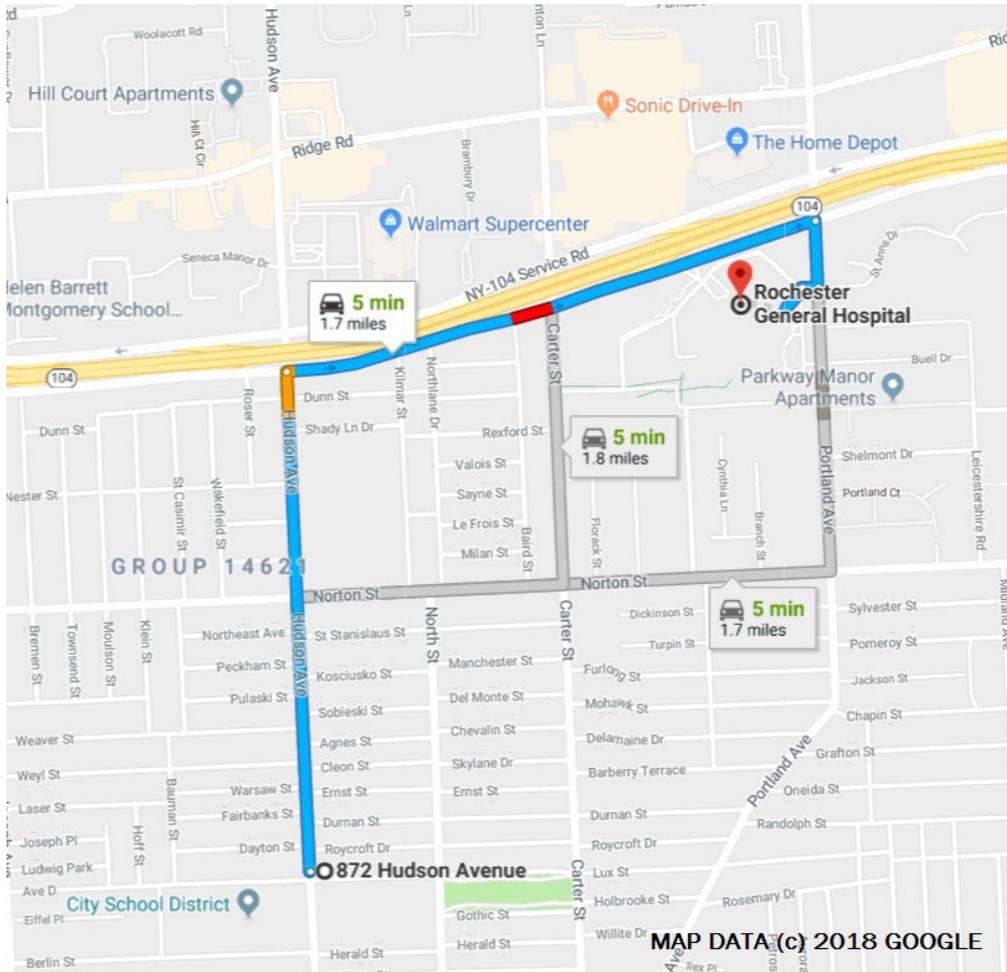
	Name	Phone Number
Ambulance:	As Per Emergency Service	911
Hospital Emergency:	Rochester General Hospital	585-922-4000
Poison Control Center:	Finger Lakes Poison Control	716-275-5151
Police (local, state):	Rochester Police Department	911
Fire Department:	Rochester Fire Department	911
Site Contact:	Ms. Carolyn Vitale	585-325-6530
Agency Contact:	NYSDEC – Ms. Charlotte Theobald NYSDOH – Mr. Arunesh Ghosh	585-226-5354 518-402-7880
Project Manager:	Jack Bement	585-704-2744
SSHO/SRSO:	Jack Bement	585-704-2744
AMS RSO	Peter Collopy	518-859-1944

MAP AND DIRECTIONS TO THE MEDICAL FACILITY - ROCHESTER GENERAL HOSPITAL

Total Est. Time: 5 minutes Total Est. Distance: 1.7 miles

- | | | |
|-----------|--|-----------|
| 1: | Start out going NORTH on HUDSON AVENUE toward ROYCROFT DRIVE | 0.7 miles |
| 2: | Turn RIGHT onto NY-104 SERVICE ROAD EAST | 0.8 miles |
| 3: | Turn RIGHT onto PORTLAND AVENUE | 0.1 miles |
| 4: | Turn RIGHT onto ROCHESTER GENERAL HOSPITAL DRIVE | 0.1 miles |

End at 1425 Portland Avenue
Rochester, NY 14621



Attachment 4
AHA-WODP-001, General Site Safety

Wollensack Optical Decontamination and Waste Disposal Project

Activity/Work Task:	General Site Safety			Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location:	886 Hudson Ave., Rochester, NY			Risk Assessment Code (RAC) Matrix					
AHA Number:	AHA-WODP-001			Severity	Probability				
Date Prepared:	8/21/2019	Date Accepted:	8/22/2019		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title):	Peter Collopy AMS RSO <i>PC</i>			Catastrophic	E	E	H	H	M
Reviewed by (Name/Title):	Jack Bement, Project Manager <i>J. Bement</i>			Critical	E	H	H	M	L
				Marginal	H	M	M	L	L
				Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)				Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)					
This AHA's scope is for all general safety hazards that could be encountered during the Wollensack Optical Decontamination and Waste Disposal Project Work. Hazards and controls specific to decontamination and waste loading are delineated in AHA-WODP-002 and 003, respectively.				"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
				"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
				Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				H = High Risk	
								M = Moderate Risk	
								L = Low Risk	
Job Steps	Hazards	Controls					RAC		
All Job Steps	Slips, trips, and falls	<ul style="list-style-type: none"> Identify and remedy tripping hazards. Follow good housekeeping procedures. Walk slowly on slippery surfaces Go up and down stairs with at least one hand free to hold railing 					M		

Wollensack Optical Decontamination and Waste Disposal Project

Job Steps	Hazards	Controls	RAC
<p>All Job Steps</p>	<p>Severe Weather</p>	<p>If any of the below emergencies are expected to impact operations or are expected to be severe, all outdoor work will be stopped, and all personnel will seek shelter inside the project building.</p> <p><u>Fire</u></p> <ul style="list-style-type: none"> • All onsite personnel will be responsible for observing and reporting any fire and conditions that could potentially lead to fires. • The employee may attempt to quench the fire with a fire extinguisher if safe to do so. <p><u>Flooding</u></p> <ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard, depending on the site activity, and will be continually monitored by the SSHO. <p><u>High winds</u></p> <ul style="list-style-type: none"> • Take cover next to a building, under a secure shelter, or in a project vehicle with the windows up, then contact the SSHO and proceed to the designated rally point as soon as it is safe to do so. • Avoid anything that may be touching downed lines, including vehicles or tree branches. <p><u>Lightning</u></p> <ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work will be halted, and all personnel will meet at the established rally point. • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes <p><u>Tornadoes</u></p> <ul style="list-style-type: none"> • The interior rooms of nearby buildings will function as a storm shelter. 	<p>L</p>
	<p>Motorized Vehicles Contact With/By</p>	<ul style="list-style-type: none"> • A valid license/permit is required for all vehicles being operated. • Cellular phones use is not permitted while driving. • Seat belts are to be worn at all times. • Vehicles may not be driven at speeds greater than the posted speed limit. • Pedestrians on the former UNISYS property always have the right of way regardless if they are in the crosswalk or walking in the street or parking areas. • Workers or work traffic shall never use the road the runs parallel to the main entrance of the hospital. 	<p>L</p>

Wollensack Optical Decontamination and Waste Disposal Project

Job Steps	Hazards	Controls	RAC
All Job Steps	Noise	<ul style="list-style-type: none"> •Wear Hearing Protection when Heavy Equipment Operating •Where practical maintain distance from noise source 	L
	Back Strain or Sprain	<ul style="list-style-type: none"> •size up the load, use teamwork or mechanical advantage machine or device where practical •Use proper lifting techniques, <ul style="list-style-type: none"> ○ never twist or turn when lifting ○ The back will be kept as straight as possible. ○ Legs will be bent 	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<p>1. Tools</p> <ul style="list-style-type: none"> • First Aid Kit • Fire extinguisher <p>2. PPE</p> <ul style="list-style-type: none"> • Gloves • Steel toed Boots • Hard Hat • Safety Glasses • High Visibility Vests 	<p>Competent / Qualified Personnel: First Aid/CPR Trained (at least one per shift) Radiation Safety – AMS SRSO/SSHO</p> <p>Training Requirements:</p> <ul style="list-style-type: none"> • HASP Orientation • OSHA HAZWOPER • Radiation Awareness Training • AHAs prior to start of each task • Daily Safety Tailgate • RWP (if needed) 	<p>Daily inspection of equipment per manufacturer's instructions.</p> <p>Daily inspection of work site for slip, trip and fall hazards and potential housekeeping deficiencies</p> <p>Visual inspection monthly of fire extinguisher. An annual maintenance check by an authorized fire extinguisher maintenance provider. And hydrostatic testing as required by 29 CFR 1910.157(f).PPE prior to use.</p> <p>Inspect First Aid Kit monthly</p> <p>Inspect PPE prior to use</p>

AHA-001. General Site Safety Review Sign-off

Print Name	Signature	Employee ID	Date
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Attachment 5
AHA-WODP-002, Decontamination

Wollensack Optical Decontamination and Waste Disposal Project

Activity/Work Task:	Decontamination			Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location:	886 Hudson Ave., Rochester, NY			Risk Assessment Code (RAC) Matrix					
AHA Number:	AHA-WODP-002			Severity	Probability				
Date Prepared:	8/21/2019	Date Accepted:	8/22/2019		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title):	Peter Collopy AMS RSO <i>PC</i>			Catastrophic	E	E	H	H	M
Reviewed by (Name/Title):	Jack Bement, Project Manager <i>JLB</i>			Critical	E	H	H	M	L
				Marginal	H	M	M	L	L
Notes: (Field Notes, Review Comments, etc.) This AHA's scope is for the decontamination portion of the Wollensack Optical remediation and Waste Disposal Project. General site safety hazards are listed in AHA-WODP-001 and should also be reviewed before start of work.				Step 1: Review each " Hazard " with identified safety " Controls " and determine RAC (See above)					
				" Probability " is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.					RAC Chart
				" Severity " is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible					E = Extremely High Risk H = High Risk
				Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.					M = Moderate Risk L = Low Risk
Job Steps	Hazards	Controls						RAC	
Wet wipes	Dust disturbance	<ul style="list-style-type: none"> Use gentle spray bottle and mist area with water before wiping 						M	
HEPA Vac	Electrical Shock	<ul style="list-style-type: none"> Use GCFI and avoid running power cord through water 							
	Tripping	<ul style="list-style-type: none"> Don't run power cord through main traffic flow area and tape down cord 							

Wollensack Optical Decontamination and Waste Disposal Project

Job Steps	Hazards	Controls	RAC
Power Washing	Electrical shock	<ul style="list-style-type: none"> • Use GFCI for power cord connection and avoid running cord through water 	L
	Tripping	<ul style="list-style-type: none"> • Don't run power cord through main traffic flow area and tape down cord 	L
	Eye/Face Contact	<ul style="list-style-type: none"> • Use plastic tenting with access slit or hole for wash to limit spray impact on user and area • Wear goggles and protective face shield if need to enter wash zone 	M
	Contaminant Inhalation	<ul style="list-style-type: none"> • Use plastic tenting with access slit or hole for wash to limit spray impact on user and area • Wear half face air purifying respirator if need to enter wash zone 	L
	Contact by High Pressure stream	<ul style="list-style-type: none"> • Never point wash wand in direction of other personnel or self even if powered off • Slowly place wand on floor when discontinuing use but dot release handle until sure the pressure on wand has ceased 	L
	Noise	<ul style="list-style-type: none"> • At minimum wear ear plus during operation and consider additional use of earmuffs if indoor echoing increases noise level to greater than 98 dB_A 	M
Grinding	See hazards for power washing	<ul style="list-style-type: none"> • In addition to above controls consider use of HEPA vac connection to collect grindings from surface 	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<p>1. Tools</p> <ul style="list-style-type: none"> • First Aid Kit • Fire extinguisher • Power Washer • Grinder (possibly) <p>2. PPE</p> <ul style="list-style-type: none"> • Gloves • Steel toed Boots • Hard Hat • Safety Glasses • High Visibility Vests • Disposable coveralls and respirator if tented area entered 	<p>Competent / Qualified Personnel: First Aid/CPR Trained (at least one per shift) Radiation Safety – AMS SRSO/SSHO</p> <p>Training Requirements:</p> <ul style="list-style-type: none"> • HASP Orientation • OSHA HAZWOPER • Radiation Awareness Training • AHAs prior to start of each task • Daily Safety Tailgate • RWP (if needed) 	<p>Daily inspection of equipment per manufacturer's instructions.</p> <p>Daily inspection of work site for slip, trip and fall hazards and potential housekeeping deficiencies</p> <p>Visual inspection monthly of fire extinguisher. An annual maintenance check by an authorized fire extinguisher maintenance provider. And hydrostatic testing as required by 29 CFR 1910.157(f).PPE prior to use.</p> <p>Inspect First Aid Kit monthly</p> <p>Inspect PPE prior to use</p>

AHA-001. Decontamination Safety Review Sign-off

Print Name	Signature	Employee ID	Date
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Attachment 6
AHA-WODP-003, Waste Loading

Wollensack Optical Decontamination and Waste Disposal Project

Activity/Work Task:	Waste Loading			Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location:	886 Hudson Ave., Rochester, NY			Risk Assessment Code (RAC) Matrix					
AHA Number:	AHA-WODP-003			Severity	Probability				
Date Prepared:	8/21/2019	Date Accepted:	8/22/2019		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title):	Peter Collopy AMS RSO <i>PC</i>			Catastrophic	E	E	H	H	M
Reviewed by (Name/Title):	Jack Bement, Project Manager <i>JLB</i>			Critical	E	H	H	M	L
				Marginal	H	M	M	L	L
				Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)				Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)					
This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the Project HASP and AHA-WODP-001 for additional requirements.				"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				RAC Chart	
				"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				E = Extremely High Risk	
								H = High Risk	
				Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				M = Moderate Risk	
								L = Low Risk	
Job Steps	Hazards	Controls						RAC	
1. General Safety Steps for facility	• See Project HASP and AHA-WODP-001, General Site Safety								L
2. General Radiation Safety Steps for Process	• See Project RPP and Task RWP								L
3. Transfer waste into containers or suitable plastic/bag wrap.	Pinch Point – lid closure (if drum used)	<ul style="list-style-type: none"> Wear leather work gloves Use closure tool designed for drum lid Two-person job 						M	
	Ergonomic-Lifting Strain	<ul style="list-style-type: none"> Two person teams if large objects Don't lift over 50 lbs without additional personnel or mechanical advantage device 							

Wollensack Optical Decontamination and Waste Disposal Project

Job Steps	Hazards	Controls	RAC
4. Place containers/bags/wraps into Truck conveyance	4 (a) Caught Between	<ul style="list-style-type: none"> • Ensure no personnel position themselves between conveyance and forklift (if forklift used) 	M
	4 (b) Struck by forklift	<ul style="list-style-type: none"> • Keep pathway clear of pedestrian traffic • Use delineated travel pathway and ensure no other vehicle or pedestrian traffic in travel path • Continuous communication while moving equipment: All personal operating any equipment shall be equipped with handheld radio, and all other personal shall be equipped with a handheld radio • or in near vicinity of someone with a radio, not greater than 10 meters 	L
	4 (c) Ergonomic-Lifting Strain	<ul style="list-style-type: none"> • Two person teams if large objects • Don't lift over 50 lbs without additional personnel or mechanical advantage device 	M
	4 (d) Vehicle Traffic	<ul style="list-style-type: none"> • Use delineated travel pathway and ensure no other vehicle or pedestrian traffic in travel path • High Visibility Vests must be worn at all times. • Have a spotter for all incoming trucks. • Ensure back-up alarms functioning • Determine and inform workers of vehicle travel path for work to be performed • Continuous communication while moving equipment: All personal operating any equipment shall be equipped with handheld radio, and all other personal shall be equipped with a handheld radio or in near vicinity of someone with a radio, not greater than 10 meters 	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Tools <ul style="list-style-type: none"> • Forklift • Handheld Tools • Handheld Radios 2. PPE <ul style="list-style-type: none"> • Gloves • Steel toed Boots • Hard Hat • Safety Glasses • High Visibility Vests 	<p>Competent / Qualified Personnel: Radiation Safety – AMS SRSO or HP Technician assigned to process</p> <p>OSHA qualified forklift operators</p> <p>Training Requirements:</p> <ul style="list-style-type: none"> • HASP Orientation • OSHA HAZWOPER • Radiation Awareness Training • AHAs/JHAs prior to start of each task • Daily Safety Tailgate • RWP 	<p>Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service.</p> <p>Daily inspection of work site for slip, trip and fall hazards and potential housekeeping deficiencies</p> <p>PPE prior to use</p>

AHA-003, Waste Loading AHA Sign-Off Sheet

Print Name	Signature	Employee ID	Date
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Attachment 7
AMS EH&S Procedures Index

AMS EH&S Procedures Index
July 2019

Procedure No.	Title	Rev.	Rev. Date
001-009	EH&S Management Procedures		
001	EH&S Management Program	3	April 2015
001A	General Health and Safety Provision	0	February 2016
001B	Behavior Based Safety Program	0	September 2016
002	Incident Investigation and Analysis	1	August 2014
003	Subcontractor Management	0	April 2012
003A	Process Safety Management – Contractor Responsibilities	0	June 2016
004	Short Service Employee Program	0	September 2016
005	Stop Work Program	0	February 2016
006	Hazard Identification and Risk Management Program	1	February 2016
007	Medical Surveillance	Not Drafted	N/A
007A	First Aid Program and Policy	0	February 2016
007B	Austin Master Services Drug and Alcohol Abuse Prevention and Control Program	1	September 2016
008-010	Reserved		
011-029	Industrial Hygiene Procedures		
011	Hazard Communication	1	January 2016
011A	Benzene Awareness Program	1	September 2015
011B	Hydrogen Sulfide Awareness Program	1	September 2015
011C	Gas Hazards Awareness Program	0	February 2016
011D	Lead Awareness Procedure	0	September 2016
012	Bloodborne Pathogens	0	August 2014

AMS EH&S Procedures Index
July 2019

Procedure No.	Title	Rev.	Rev. Date
013	Hearing Conservation	0	June 2012
013A	Noise Awareness	0	May 2016
014	PPE	0	April 2012
015	Respiratory Protection Program	1	May 2015
016	Lead Exposure Compliance Plan	0	November 2014
017-028	Reserved		
029	Heat Illness Prevention	0	May 2016
030-199	Occupational Safety Procedures		
030	Electrical Work	0	April 2012
030A	Assured Equipment Grounding Program	1	September 2016
031	Excavation and Trenching	0	April 2012
032	Hot Work	0	April 2012
033	Rigging and Lifting	1	April 2012
034	Scaffolding	1	April 2012
035	General Industry Confined Space Program	2	January 2016
035A	Confined Space Permitting Instructions	0	October 2015
035B	Confined Space Plan - Construction	0	January 2016
036	Ladder Safety SOP	2	April 2015
037	Lockout/Tagout Policy and Procedures	0	April 2012
038	Driving Safety	0	September 2015
039	Emergency Response Plans	0	October 2015
040	Mobile Equipment Program	0	January 2016

AMS EH&S Procedures Index
July 2019

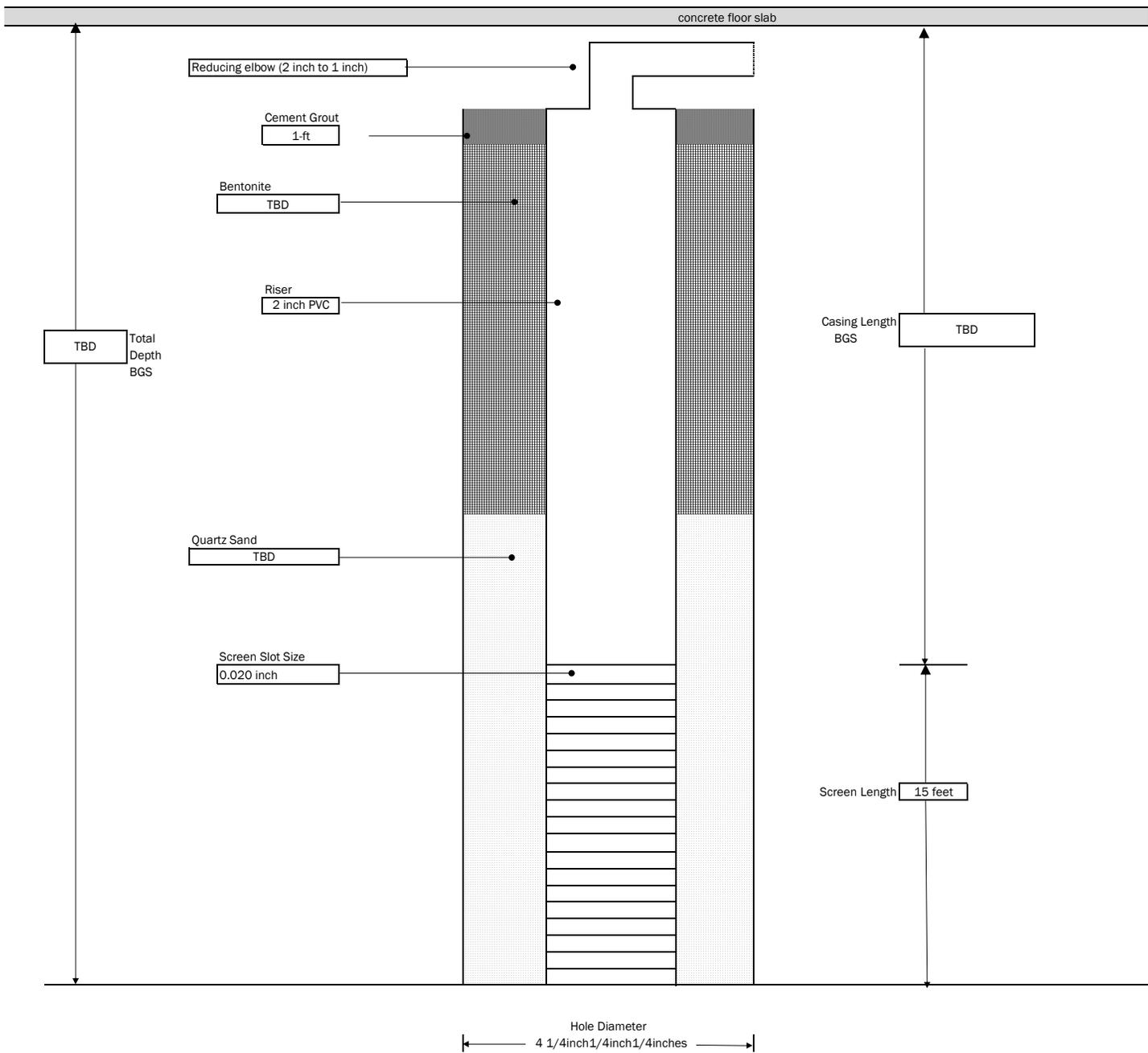
Procedure No.	Title	Rev.	Rev. Date
041	Hand and Power Tool Safety	1	April 2015
042	Abrasive Blasting	0	September 2016
043-099	Reserved		
200-299	Environmental Procedures		
200	General Waste Management	0	September 2015
201	Reserved		
202	Spill Prevention and Response	0	October 2015
203	HAZWASTE and RCRA Guidance for AMS Projects	0	February 2016
300-399	Project Health and Safety Plans		
	Generic Well Pad ISOCS Analysis HASP		
400-499	Job Safety Analyses (JSAs) and Activity Hazard Analysis (AHAs)		
500-xxx	Martins Ferry Procedures and JHAs		
500	MFF Health and Safety Plan	1	March 2016
501	Reserved		
502	Martins Ferry Emergency Response Plan	1	April 2016
503	Martins Ferry Spill Response Procedure	1	In Progress
503A	Martins Ferry Spill Prevention, Control and Counter Measures Plan (SPCCP)	0	November 2016
504	Martins Ferry Oil and Gas Radiological Control Program	1	March 2016



APPENDIX 6

Injection Well Diagram

 300 STATE STREET, ROCHESTER, NEW YORK ENVIRONMENTAL ENGINEERING CONSULTANTS	PROJECT Former Wollensack Optical 872 & 886 Hudson Ave Injection Well Diagram		MONITORING WELL : SHEET 1 OF 1 JOB # 2182207
	CONTRACTOR: DRILLER: LABELLA REPRESENTATIVE:	BORING LOCATION: GROUND SURFACE ELEVATION: START DATE:	DATUM: END DA END DA END DATE:



GENERAL NOTES:
 1) NOT TO SCALE